

Transportation

Regional Traffic

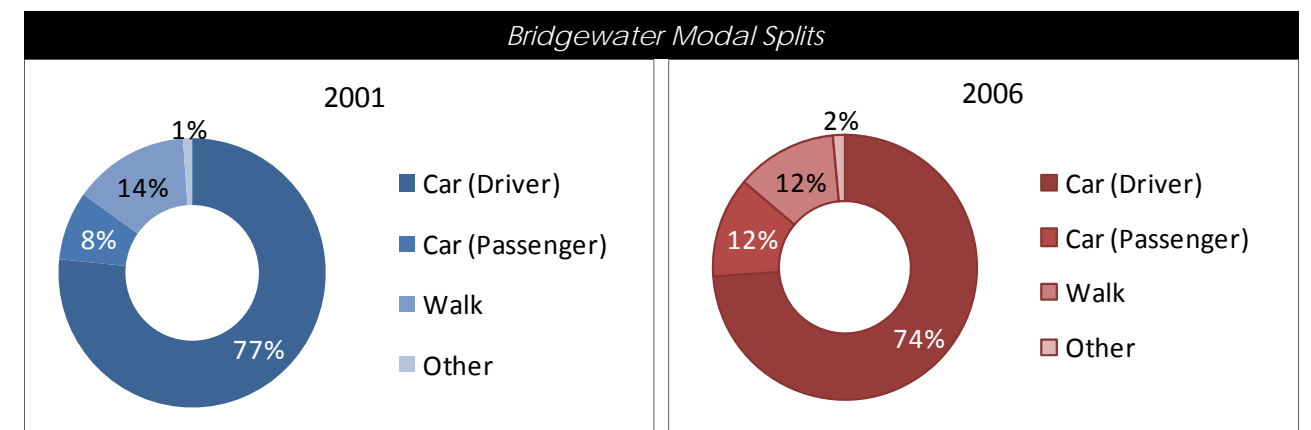
Due to its central location, strong manufacturing sector, and history as a commercial destination, Bridgewater has become a regional hub for the South Shore. There is an influx of people who enter the town on a daily basis, in order to work, access services, or participate in community life. The overwhelming majority of people visiting Bridgewater rely heavily on automobile use to get to and move about town. Like many communities, Bridgewater has accommodated the demands for the automobile following WWII. Examples of this include large parking lots in shopping districts and drive-thru restaurants. As the population continues to rise, so too will the demands placed on the town's roads and related infrastructure.



The town depends on its roads and automobile use so heavily for regional transportation purposes, that the road network is often designed without full consideration of surrounding land uses, future development, or pedestrian accessibility. **Moving forward, it is important to consider the impact that roads have on the surrounding environment. Integrating transportation needs with development demands and community values and objectives will help create more livable, vibrant neighbourhoods and enjoyable public spaces.**

Mode of Transportation

Modal splits indicate how mobile workers get to their place of employment. Bridgewater residents rely heavily on automobiles to move about the community. The vast majority of workers use single occupancy trips and few car pool, although high occupancy vehicle trips are increasing. Very few residents use active transportation to get to work - the number of walkers has decreased during the past two census periods. This has several consequences for society, including negative environmental impacts and decreased activity levels. However, Bridgewater still has a lower rate of single vehicle trips and a higher rate of walkers than the County as a whole.



Vehicular Traffic

In 1847, Bridgewater had only one street running along the LaHave River. This street was named Commercial Street, but was later renamed King Street in 1901. King Street was the primary route in Town for a number of years, connecting Bridgewater to LaHave and New Germany. Over time, the street network expanded to include many new streets such as LaHave Street to the east of the river and Pleasant and Queen on the west. In 1928, the mayor decided to pave all main streets as the automobile continued to become increasingly popular (DesBrisay Museum Trustees, 1967). As of 1941 the street network extended west to York and Alexandra, while Dufferin Street led to the exhibition grounds.

In the years that followed, the street network maintained its grid like pattern as it expanded further west between Dufferin and Victoria Road to satisfy the increased demand for residential dwellings and automobile use. Over time, the traditional, compact grid pattern was largely abandoned. In the early 1970s, new roads began ending in cul-de-sacs to satisfy the preference of developers and some residents to avoid through traffic. The addition of terminating streets east of the river has resulted in less compact and less connected development due to the absence of east-west connections. Applying a comprehensive approach to community design and transportation in the future will help optimize connectivity and infrastructure.

Current Street Network

Three street classifications exist in Bridgewater: arterial, collector, and local. Arterial streets are the major streets that support regional traffic and link districts. According to design standards, arterials must have the capacity to support high traffic flows and speeds of 70km per hour. This means that 75% of their capacity is assumed to be through traffic while 25% is local access. Currently, no streets are designed in accordance with the specified arterial design standards, but five older streets function as arterials even though they only support traffic speeds of 50km or less. These streets are King Street, Victoria Road, Aberdeen Road, LaHave Street, and Dufferin Street.

Collector streets acts as collectors for local streets in residential areas and connect to arterial routes. 50% of the time collector streets support through traffic and the other 50% is dedicated to local access. New collector streets are designed to support lower speeds and require sidewalks on at least one side of the street. Local streets are those located within residential neighbourhoods and are used to access other streets at least 75% of the time. Local streets are narrower and they often lack any sidewalks.

In total, the Town of Bridgewater owns 66.5km of streets and 35km of sidewalks within town boundaries (Lunenburg Queens Regional Development Authority, 2010). The Town does not have a map indicating the street conditions of individual roads, but the Engineering Department monitors road conditions as part of their pavement management program. Bridgewater is often regarded as having excellent road and sidewalk infrastructure for a town of its size.



York Street (Collector Street)



Glen Allan Road Extension (2010)



Hirtle Drive (Local Street)

Transportation

Future Street Network

The map on page 61 shows the existing and future street network, including all proposed and approved road extensions. A significant expansion is expected to occur in the Glen Allan neighbourhood over the upcoming years. It is important to note that future street expansions should be accompanied with a strong understanding of the proposed future land uses in the corresponding areas to ensure sound planning objectives are met. Doing so will result in complete, vibrant neighbourhoods. **Creating a future street master plan for the town would be beneficial because it would avoid a piecemeal development approach that often results in connectivity issues or inefficient infrastructure.**

Traffic Flow Volumes

Traffic volumes in the downtown are considered to be fairly reasonable. All intersections are operating at a Level of Service (LOS) C or better, meaning that signal stoppage delays are in the range of 20 to 35 seconds. The majority of movement only experiences 10 to 15 second delays. Small lines can form during peak times but these are typically short-lived (CBCL, 2008).

Aberdeen Road is the only street that is approaching its capacity. Intersections along Aberdeen tend to operate at an LOS C in many cases; however, several intersections operate at an LOS D which means delays generally last between 35 and 55 seconds. A major construction project is slated for the intersection of Aberdeen Road and North Street in order to reduce traffic congestion and improve pedestrian safety.

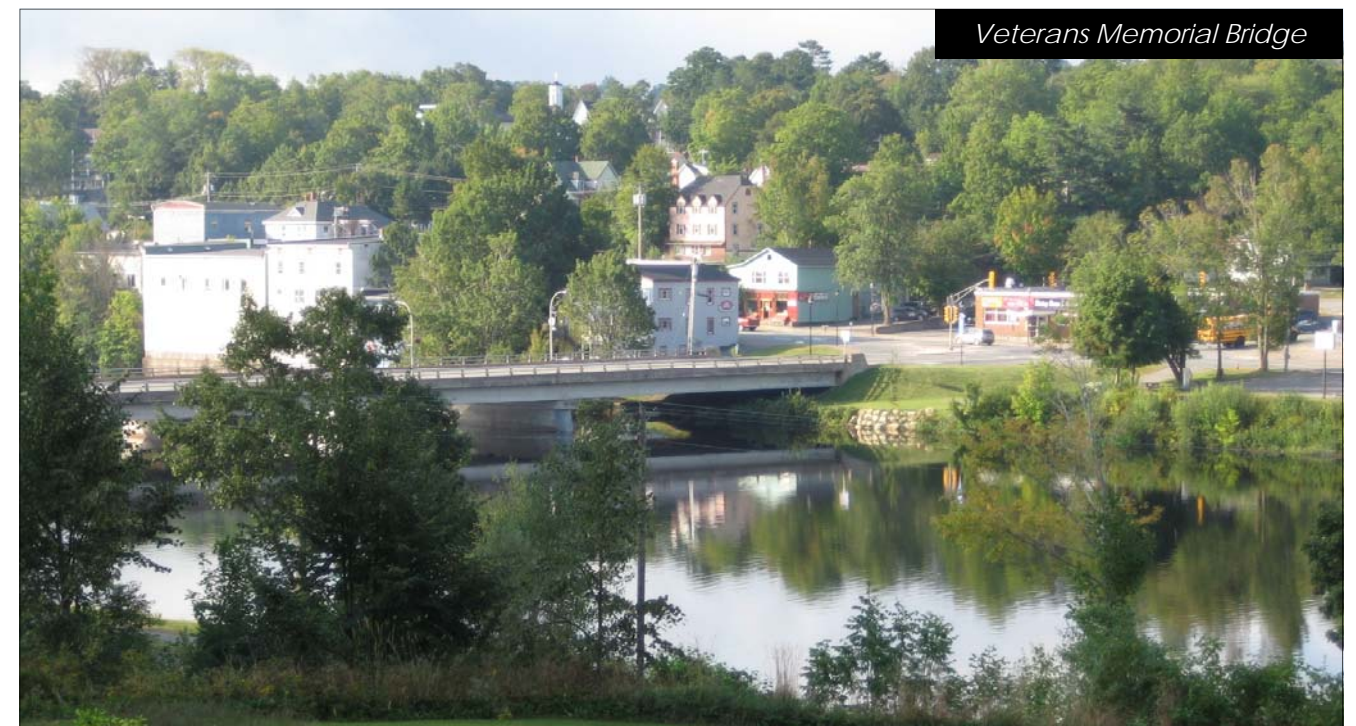
Veterans Memorial Bridge and the Old Bridge support a significant amount of traffic on a regular basis. Traffic counts show that Veterans Bridge is used by 9,000 vehicles per day and the Old Bridge is used by 7,200



vehicles per day. While Veterans Bridge was designed to support high traffic volumes, it is surprising that that narrow, iron Old Bridge supports such high traffic on a daily basis. This illustrates the relatively high demand for vehicle access in the downtown core

Bridges

Bridges are a key, functional element of the town's history. The first bridge was constructed over the LaHave River in 1825, and remained for 20 years before it was rebuilt. This bridge was reconstructed yet again in 1869, but was washed away during a storm in April 1923. A second bridge, named the Champlain Bridge, was constructed of iron and completed by the Dominion Bridge Company on December 17th, 1891. This bridge, now referred to as the Old Bridge, was supposed to last for a century but was damaged by a storm and subsequently repaired in 1971. While the Old Bridge is still in working condition, it will likely need to be replaced within the next 5 years. The newest bridge, Veterans Memorial Bridge, was built at the foot of Victoria Road and was opened in August 1987 (Sheppard, 2008). In addition to these main vehicular bridges, there are also a number of other smaller bridges throughout town (See page 71).

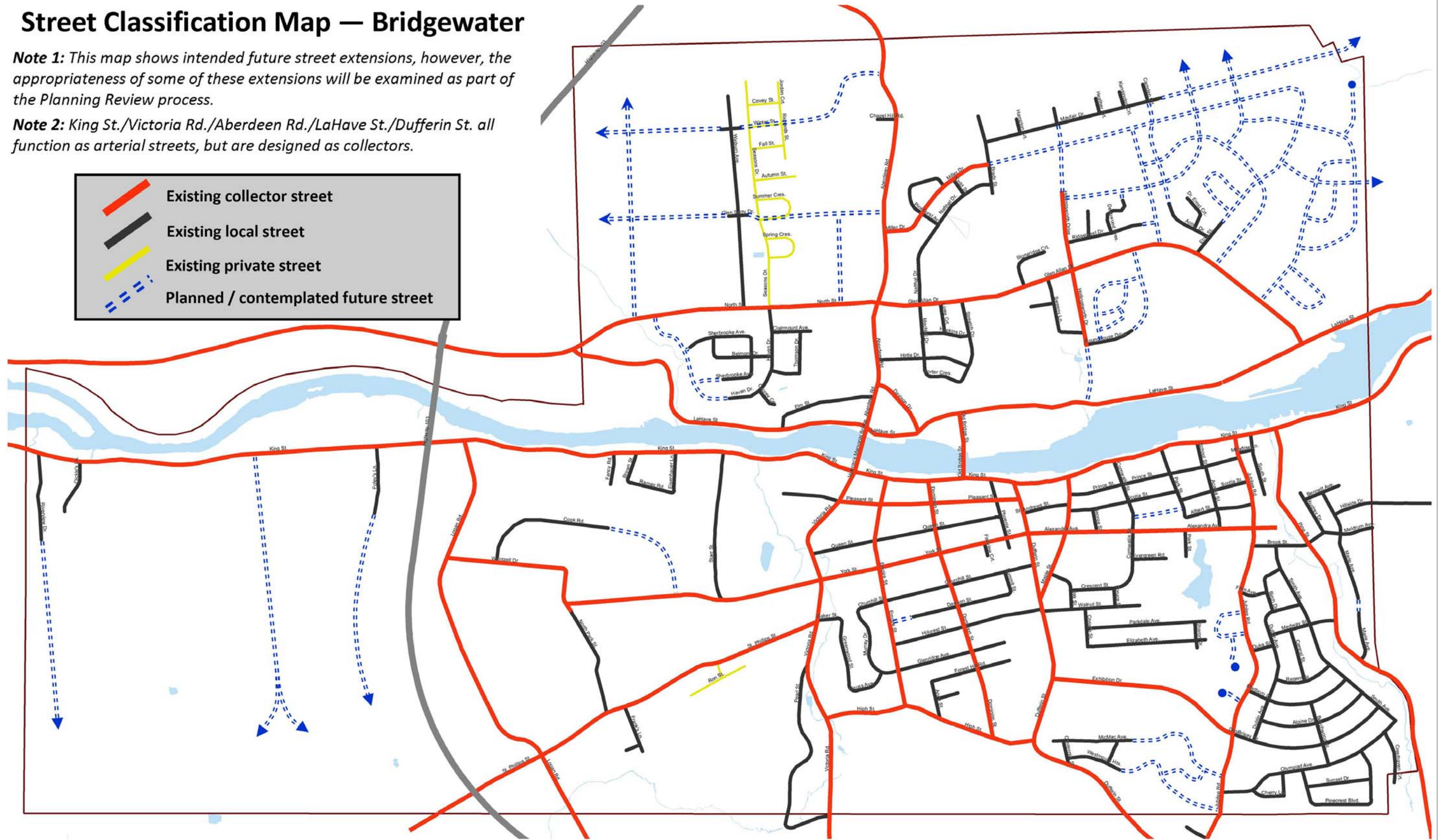


Street Classification Map — Bridgewater

Note 1: This map shows intended future street extensions, however, the appropriateness of some of these extensions will be examined as part of the Planning Review process.

Note 2: King St./Victoria Rd./Aberdeen Rd./LaHave St./Dufferin St. all function as arterial streets, but are designed as collectors.

	Existing collector street
	Existing local street
	Existing private street
	Planned / contemplated future street



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King Street Parking

While on-street parking has been available along King Street since the 1920s, the parkades have only been in existence for about 40 years. In 1968, Bridge-Park Limited began constructing two parking structures adjacent to the Old Bridge. The north and south parkades were designed to accommodate increased regional traffic, along with the parking demand of King Street merchants and customers. Bridge-Park Limited owned and operated the parkades for over 30 years until ownership was transferred to the Town of Bridgewater. The Town subsequently made repairs to the parkades to improve their longevity. The Bridgewater Parking Commission is responsible for managing the parkades, along with two other lots along King Street.

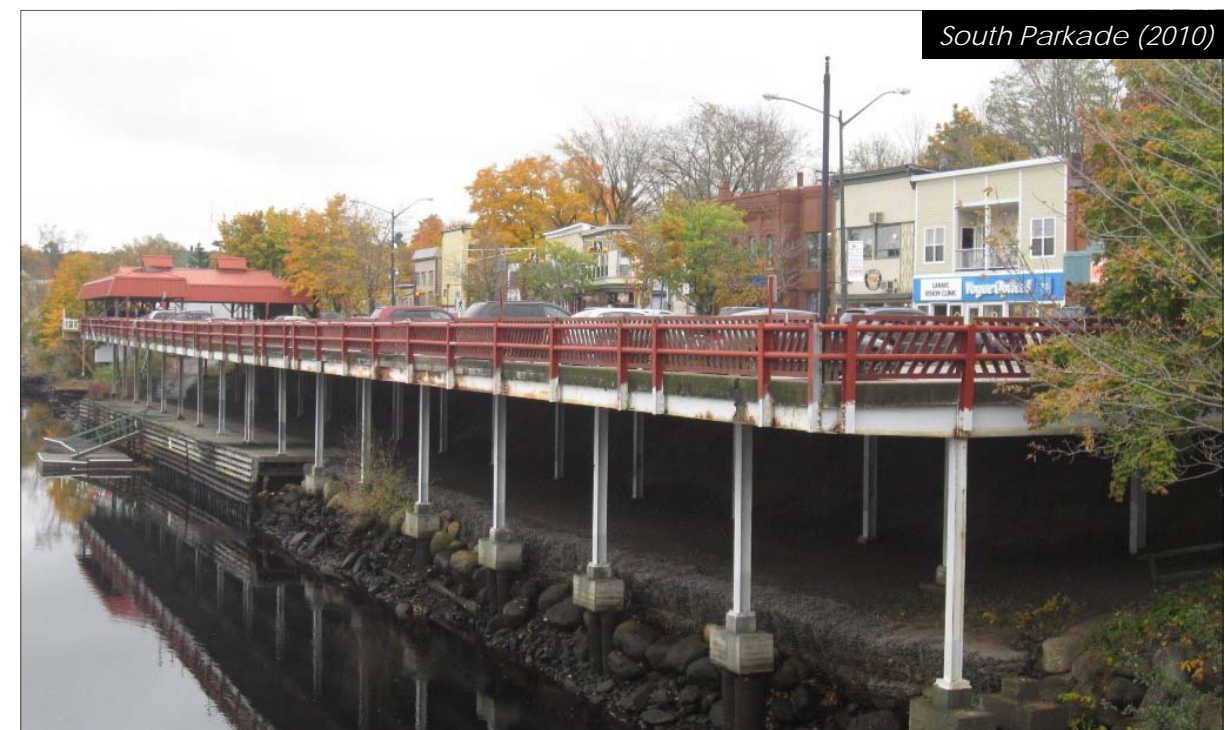
In 2007, the Bridgewater Development Association commissioned a study to assess parking conditions in downtown Bridgewater and evaluate the feasibility of removing the south parkade. The majority of downtown parking is provided through the north parkade (68 spaces) and the south parkade (82 spaces). CBCL's parking study concluded that the lots were significantly underutilized.

There is a number of on-street parking options located in the downtown along King Street, Pleasant Street, and Phoenix Street. Two major public parking lots are also located along King Street. The lot adjacent to the former Dooley's building contains over 40 parking spaces, some of which are reserved for pass holders. The Bridgewater Town Centre lot has 32 two hour parking spaces. The utilization rates of these lots were 51% and 53% respectively in December 2007. Three major private parking lots are also located in the downtown. There are 15 parking spaces alongside Floors Plus, 20 on the corner of King and Empire Streets, and 30 spaces near the bakery on Victoria Road. Aside from the bakery, these lots are highly utilized (CBCL, 2008).

Within the parking Study, CBCL explored the feasibility of removing the south parkade in order to capitalize on the natural features of the LaHave River. CBCL determined that the north parkade was 42% full on average while the south parkade was 56% full. These estimates may vary, but they suggest eliminating the south parkade may be feasible.

Using these current occupancy rates, only 46 parking spaces in the south parkade are used. If this parade were closed, parking could be redirected to the 40 unused spaces in the north parkade and 6 spaces elsewhere in the downtown. During maximum peak times 21 cars would need to be redistributed to other parking spaces in the downtown. CBCL suggests justifying the closure of the south parkade may depend on the ability to replace all 82 spaces to account for current needs and future growth (CBCL, 2008).

In 2007, CBCL determined that there is poor connectivity between parking and final destinations. Residents expressed concerns on their ability to cross between the two parkades to the western side of King Street. Poor side walk conditions, especially in the winter, and lack of way-finding signs contribute to this issue (CBCL, 2008). Since the 2008 study, a pedestrian crosswalk was added near the south parkade on King Street to help improve connectivity.



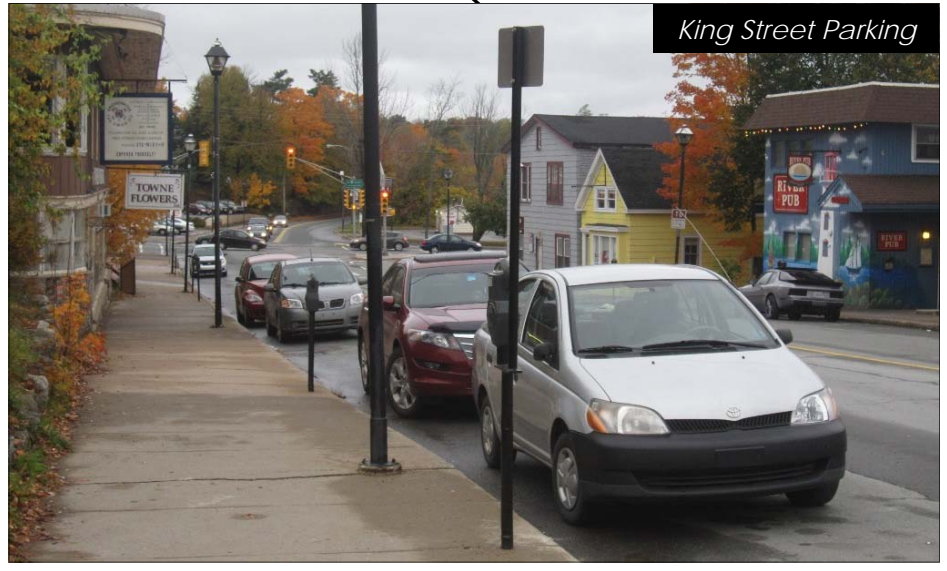
Historic Downtown Parking Bridgewater, 2010



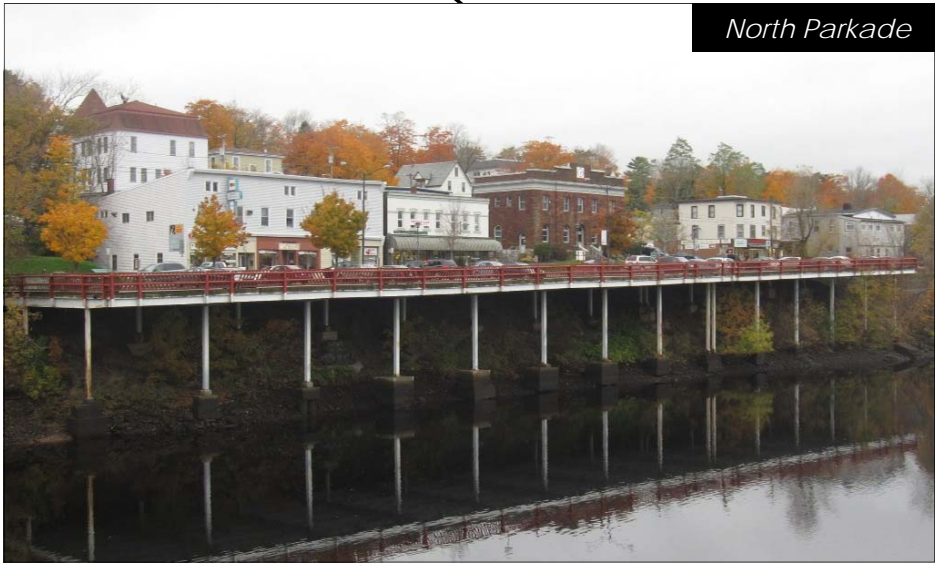
Corner of Victoria Road and King Street



King Street Parking



North Parkade



Transportation

Active Transportation

Active Transportation (AT) means using human-powered transportation to move around. It also describes the necessary infrastructure (for example, bike lanes and sidewalks) communities need to allow citizens to safely commute to and from work, school, businesses, playgrounds and green spaces. Using AT alternatives reduces the amount of fossil fuels released into the environment, improves the health of citizens, increases pedestrian activity, and saves citizens and the Town money. AT opportunities and infrastructure will continue to increase as more actions and design standards from these documents are implemented.

In 2008, the Town of Bridgewater released its Active Transportation and Connectivity Plan which outlined a new AT Network, design standards, and recommended policy actions to improve connectivity throughout the Town. The map on the following page is Bridgewater's proposed AT network. The AT network includes trails and three types of routes: Primary, Secondary and Tertiary. Primary routes connect key destinations in Bridgewater and contain a high level of AT infrastructure. Examples of primary routes are King Street, LaHave Street, High Street and Aberdeen Road. Secondary routes provide connections to primary routes and act as collectors for tertiary routes in residential neighbourhoods. Secondary routes are well serviced by AT infrastructure.

Examples of secondary routes include North Street, Dufferin Street, and Glen Allan Drive. Finally, tertiary routes provide key connections for residential areas to primary and secondary routes. Tertiary routes provide safe travel options to important destinations and have good AT infrastructure, but not necessarily on both sides of the road.

The Town of Bridgewater has installed 25 *Share the Road* signs in strategic locations throughout areas of the town, reminding motorists and cyclists to demonstrate proper etiquette on the road at all times. The Department of Parks, Recreation & Culture has bike racks in various areas of the community. Several other offices and business have also installed their own racks.

The Town of Bridgewater has made an effort to improve sidewalks whenever possible by providing proper curb cuts. Sidewalk improvements were made near King Street Court, along with some aesthetic



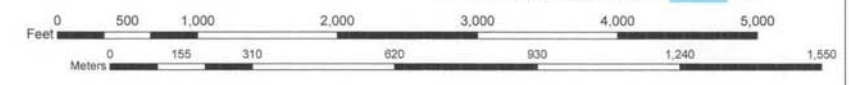
enhancements and improved park access. Signage and sidewalk improvements were added near Mainline Market on King Street in recent years. Proper sidewalks and crossing markings were added to the intersection at Victoria Road and High Street to improve pedestrian safety. Lastly, a joint funding effort between the Town and the Ecology Action Centre's Green Mobility Fund helped create 1600M of shared bike lanes on Glen Allan Drive in 2010. Shared bike lanes are an effective way to improve bike safety when there is inadequate space or money to create dedicated bike lanes.



Town of Bridgewater Active Transportation Plan

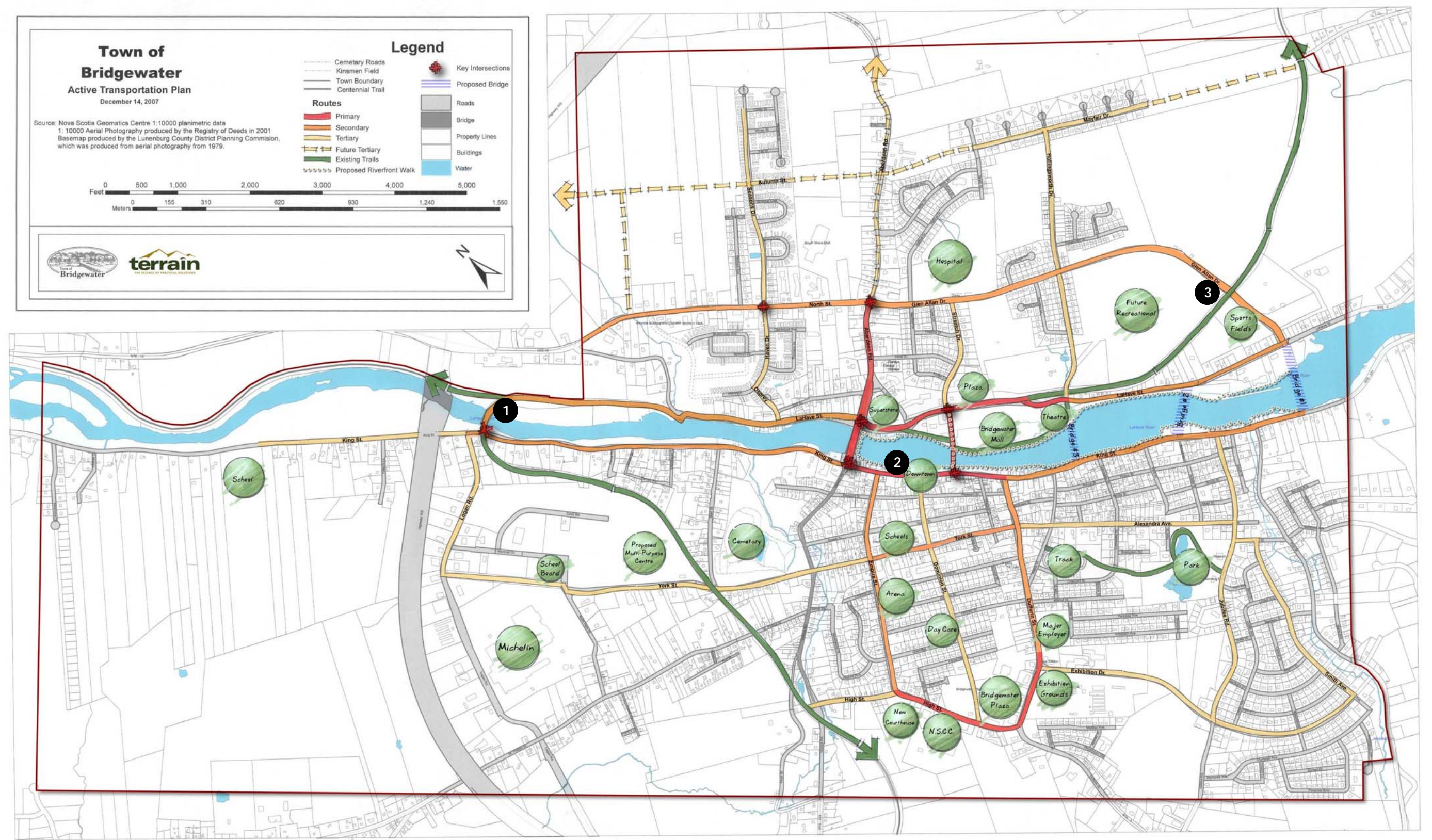
December 14, 2007

Source: Nova Scotia Geomatics Centre 1:10000 planimetric data
1:10000 Aerial Photography produced by the Registry of Deeds in 2001
Basemap produced by the Lunenburg County District Planning Commission,
which was produced from aerial photography from 1979.



Legend

- Cemetery Roads
- Kinsmen Field
- Town Boundary
- Centennial Trail
- Primary Routes
- Secondary Routes
- Tertiary Routes
- Future Tertiary Routes
- Existing Trails
- Proposed Riverfront Walk
- Key Intersections
- Proposed Bridge
- Roads
- Bridge
- Property Lines
- Buildings
- Water



Transportation

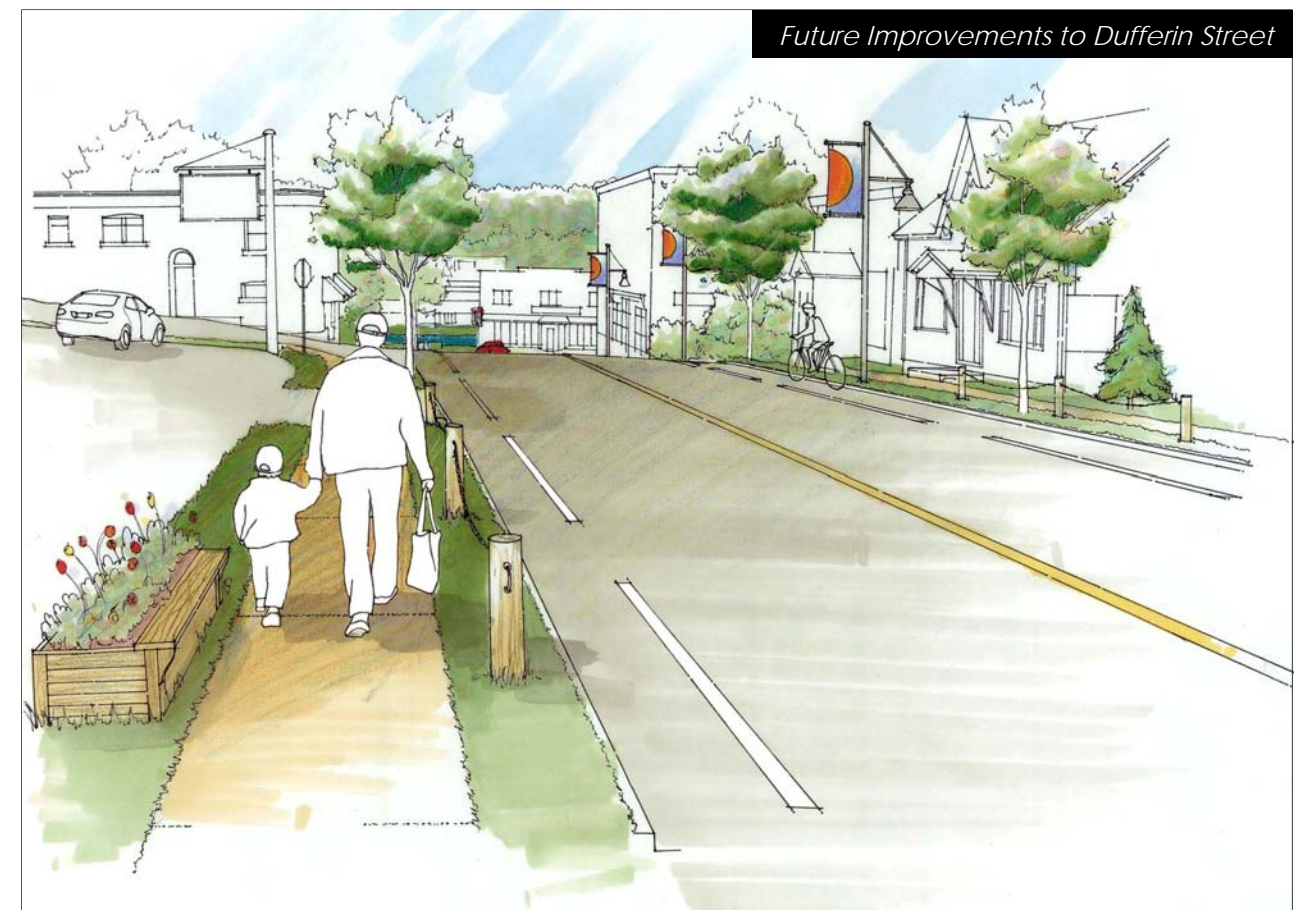
Active Transportation (cont'd)

Several major projects to improve Bridgewater's AT connections will begin in the coming years. The intersection at North and Aberdeen is congested and requires improvements, including pedestrian and bicycle infrastructure enhancements. North Street will be retrofitted with two five-foot dedicated bike lanes and two six foot sidewalks for pedestrians. Aberdeen Road will see the addition of 10 foot wide multiuse paths on both sides of the street. Other long-term AT projects are being contemplated, including aesthetic improvements on LaHave Street and new sidewalks on Dufferin Street.

In late 2009, the Bridgewater Active Transportation Committee (BATC) released a Public Engagement Action Plan, outlining the three year strategy they will use to increase education on AT. Following the release of the strategy, the BATC focused on disseminating information and planning for future actions for the remainder of the year. Several of the major accomplishments in 2010 included designing a two year AT program, conducting an active transportation survey, and developing an AT brochure and a new website. In 2011, the BATC will be working with the Bridgewater Elementary School and one or two small businesses to help eliminate barriers and create dedicated programs to improve AT participation in the community. In 2012, the committee will evaluate and refine the Public Engagement Action Plan to determine how to move forward in subsequent years.



The BATC's AT survey was designed to evaluate residents' walking and cycling behaviours. The findings from this survey will be used as a *baseline* with which to compare results when the survey is repeated every few years. That way, long-term changes in walking and cycling habits can be measured to evaluate the success of the Public Engagement Action Plan and other AT efforts. **The survey shows that 74% of adult residents are walkers and 33% of this total walk on a daily basis, however, more for leisure purposes than active transportation. Approximately 21% of the adult population cycle, whereas only 8% bike daily.** Overall, there are no significant barriers that limits residents ability to walk or cycle. In fact, one third of the population considers Bridgewater to be *extremely walkable*. The most common reasons for not walking/cycling are that they would prefer to use their car, that Bridgewater is *too hilly*, or that there is a shortage of bike parking (Nova Insights, 2010).



Transit

The first private bus service began operating out of Bridgewater in 1917, however, this short lived enterprise only lasted for two years (Sheppard, 1998). In 1933, a more successful private bus service called Mackenzie Bus Lines started taking customers to Halifax. The company expanded significantly during the war as demand for transit began to rise. Growth continued following the war, as did the number of stops and communities served. In 1985, MacKenzie Bus Lines estimated they served approximately 100,000 passengers a year and volumes were expected to improve annually. In September of 1998, MacKenzie Bus Ltd. ended their routes, which were then taken over by DRL Coachlines LTD (Cunningham, 1985).

Trius Tours Ltd. is currently operating the bus line from Halifax to Yarmouth. From Monday to Saturday, the bus leaves Bridgewater at 10:30am and arrives in Halifax at 12:30. Departure time is 4 hours later on Sundays and Holidays. The line from Bridgewater to Yarmouth leaves daily at 7:40pm.

While Bridgewater continues to lack a public transit system, there are several para-transit services in the region. The two largest para-transit services are Bridgewater Senior Wheels and VON (Victorian Order of Nurses). Bridgewater Senior Wheels is a pre-booked door-to-door transportation system for seniors (60+) or those of any age who have a disability. Their sole bus makes approximately 750 trips per month within its 7km operating radius. 600 of these trips are within the town boundary. VON Lunenburg County Chapter uses one van to operate a door-to-door transportation service that brings people into Bridgewater from surrounding areas. VON provided 900 rides to 40 users between April 2009 and February 2010. Half of these users have a disability and the majority of users are seniors. Several shuttle services are available throughout the region. Cloud Nine Shuttle and Campbell's Shuttle Service both serve the South Shore between Halifax and Yarmouth.

In 2009, the Province funded a feasibility study which considered options for a regional public transit system in Lunenburg County. The study suggested that the ideal system would have an all day two-way service and a two-way express service during peak times between Bridgewater and Lunenburg. The system would also provide additional access to the county's exterior during two days of the week. Participating municipal units determined that the costs of such a system were prohibitive in the immediate future and have recently decided to suspend discussions on a public transit system, but intend to examine the matter again in a few years.



Municipal Infrastructure

Municipal Infrastructure

The Town of Bridgewater owns and manages municipal infrastructure that is required to meet basic human needs. While the Town's Engineering Department is responsible for delivering and constructing municipal infrastructure, these services are intrinsically linked to land uses and development. Due to the connection between infrastructure, development, and community well being, the Planning Department works closely with engineers to help ensure that municipal infrastructure will meet the needs of current and future populations. Planners bring their knowledge of growth patterns, land uses, connectivity, and environmental sustainability to help implement systems that are both efficient and effective.

Infrastructure can be made more sustainable by using green technology, but also by limiting strain on public utilities, such as water and sewage. By promoting infill development, the Town can encourage developers to build where municipal infrastructure is already in place, thus eliminating the need for major extensions. When a new subdivision is built, the Town must connect these areas to the primary infrastructure system. By supporting compact subdivision design and discouraging low density development the Town can ensure that servicing extensions are less taxing on the overall system.

Municipal infrastructure is the Town's greatest annual expense. Not only does infill development and compact community design improve infrastructure efficiency, it can also save the Town a great deal of time and money that would otherwise be spent building and maintaining new infrastructure. The Planning Review offers the opportunity to create new standards that will save money and promote more efficient, and green infrastructure requirements.

Water

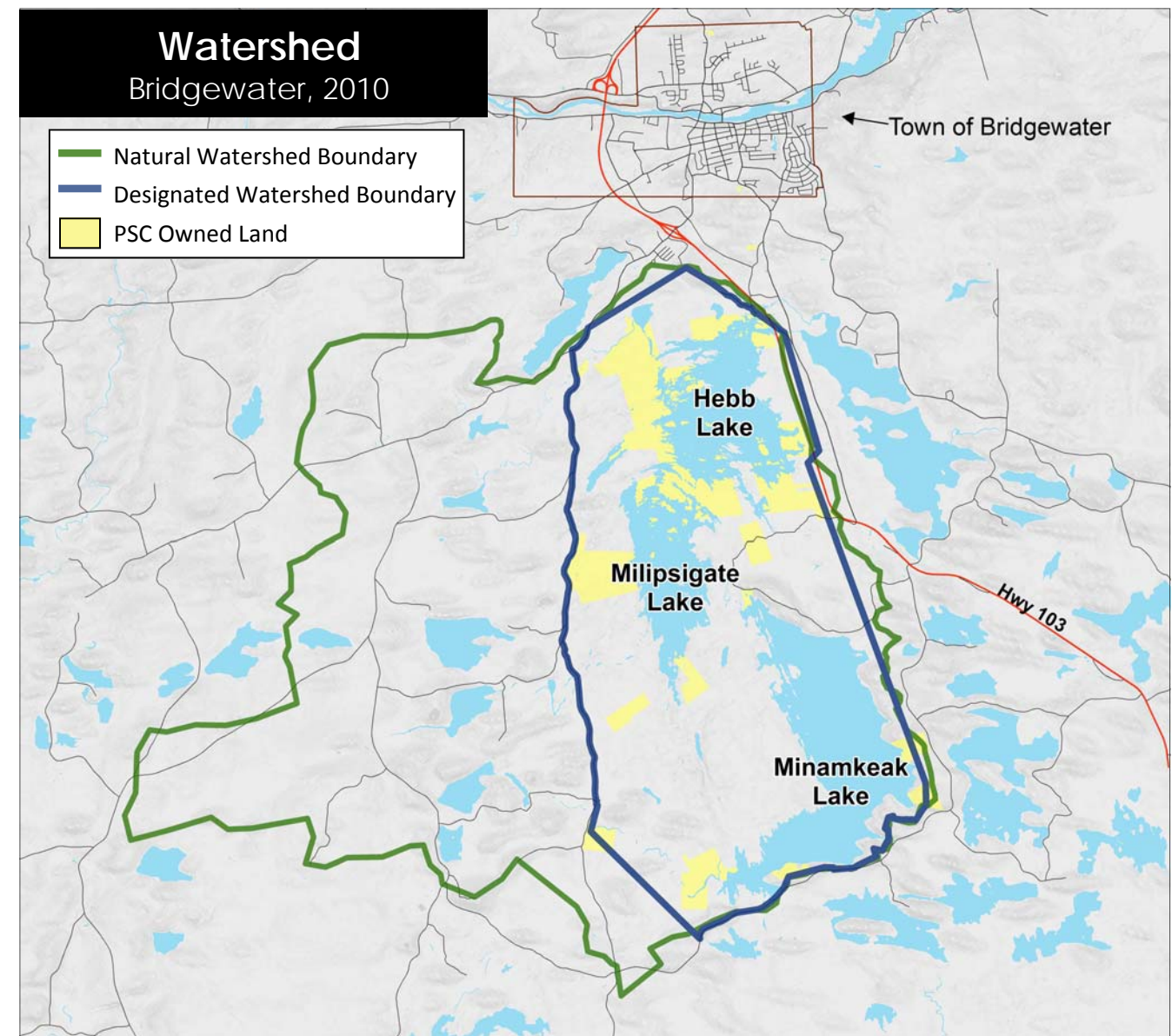
The Town's water supply is managed by the Bridgewater Public Service Commission (PSC). The PSC supplies potable water for approximately 3,100 customers in Bridgewater and surrounding areas. Once collected from nearby rivers, water is taken to the Treatment Plant where it is treated before being distributed to residents (Town of Bridgewater, 2010). The Treatment Plant can clean and deliver as much as 18,000m³/day in the summer, compared to 14,880m³/day during the winter (Lunenburg Queens Regional Development Authority, 2010).

The Town of Bridgewater has access to a large watershed that is located in the Municipal District of Lunenburg County, southwest of the town's boundary. This watershed, which was designated as a protected watershed area in 2006, is comprised of three lakes: Hebb Lake, Millipsigate Lake, and Minamkeak Lake. The natural area of these lakes is 92km², while the official Hebb, Millipsigate, Minamkeak Watershed designation has an area of 56km².

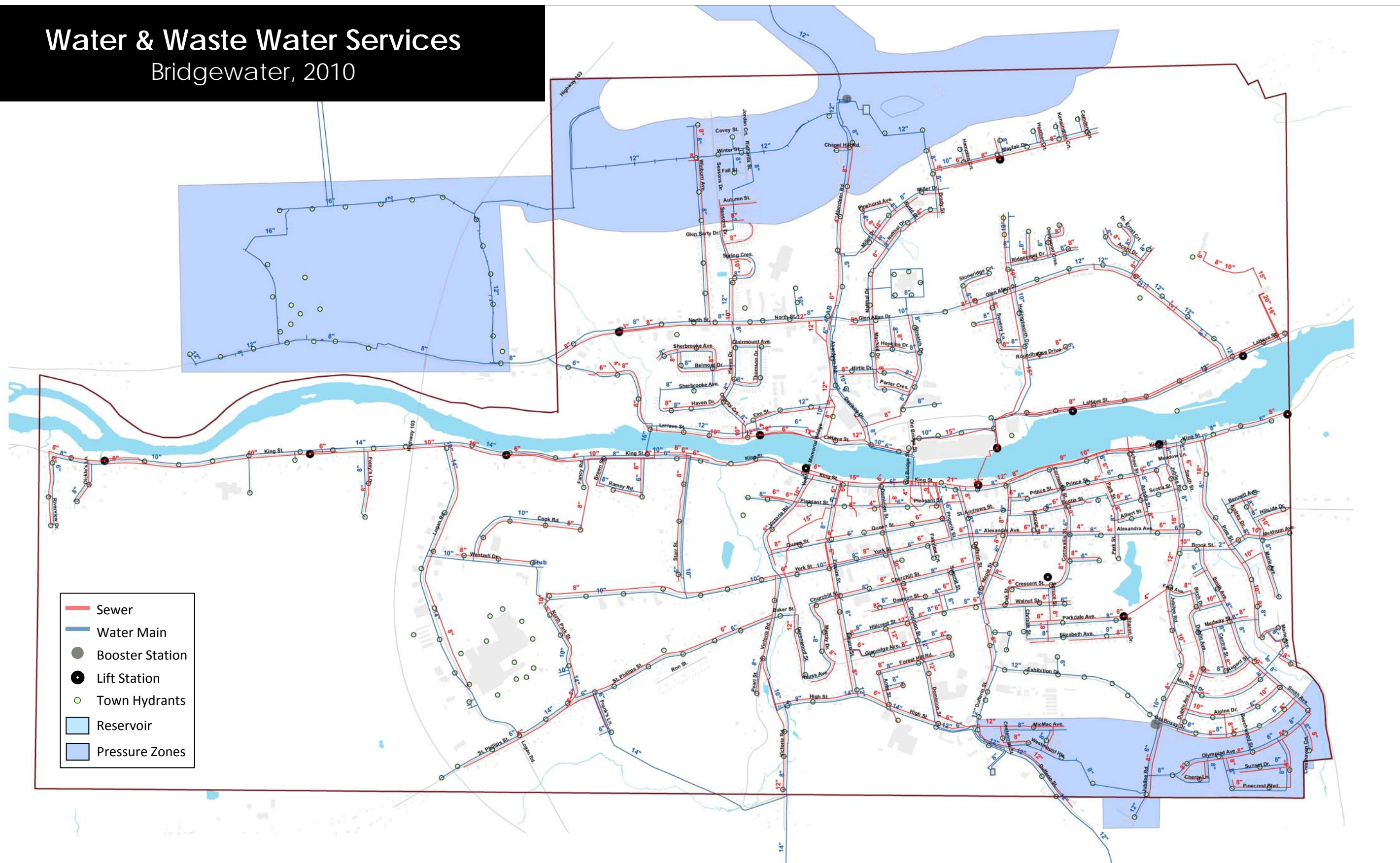
The Town needs a Comprehensive Water Master Plan to address its water infrastructure deficit and guide its future development to ensure it is done in an efficient manner. Damns and the water distribution system will be renewed to meet increasing safety standards and prevent system failure. In the future, a water conservation education program will be launched to encourage residents to use their water more efficiently.

Waste Water

In total the Town is responsible for 67km of sanitary sewers and 46.5km of combined sanitary/storm water sewers (Lunenburg Queens Regional Development Authority, 2010). Since major storm events can cause combined sewers to overflow into the LaHave River, the Town is expanding the dedicated storm water system in Bridgewater.



Water & Waste Water Services Bridgewater, 2010



Municipal Infrastructure

Waste Water (cont'd)

The waste water system is a gravity-fed collection system that directs waste to a treatment plant facility, which has a capacity of 2 million gallons per day. The Director of Engineering says the sewer treatment plant is functioning at 80% capacity and may become strained in the coming years.

The Town will continue to install separated storm water sewers to reduce overflows and limit the stress on the treatment system. Money will be spent on investing in technologies to improve the effectiveness of the treatment process. Implementing energy efficiency upgrades in the treatment plant, pumping stations and other areas will reduce limit environmental impacts and strain on the overall system.

Storm Water

Bridgewater's storm water infrastructure is a collection of water-carrying systems that bring rain and melt water to the LaHave River and other natural drainage features. As mentioned, the Town is expanding its separated storm water system to avoid problems associated with combined sewers. While these systems have a basic design and require little maintenance, the Town will need additional resources to continue this process in the future.

The previously discussed separated storm water sewers and water education program will greatly benefit the Town's storm water system. The Town intends to update procedures and create a storm water policy for new developments to ensure storm water is addressed in an efficient and environmentally friendly manner. Lastly, a comprehensive storm water management plan is needed to guide the storm water management.

Service Limits

The Town's Director of Engineering suggests that all undeveloped land in Bridgewater is serviceable and there are no major service limit challenges. According to the Town's *Water System Master Plan* the current system has the capacity to support an extension of water services into 7 candidate areas, 6 of which are within town boundaries. This would, however, require several capital infrastructure improvements in each area. Currently, the volume of water storage is adequate but more will be needed in the near future if the population continues to grow at a high rate. Both the Plan and the Director of Engineering did identify the presence of water pressure zones in lands above 55m contour lines suggesting that developing these areas is especially costly (Terrain, 2009).

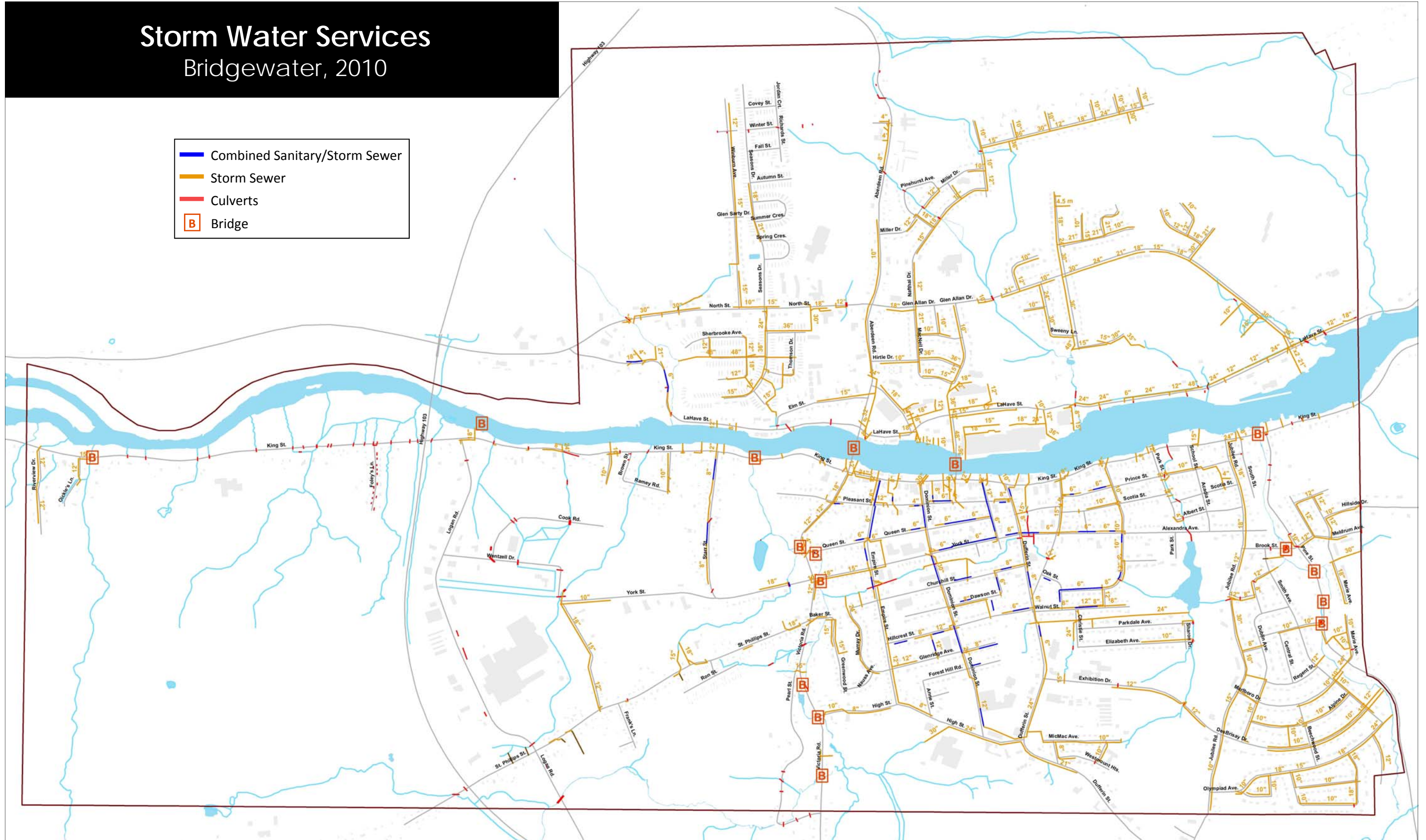
While all town land is developable, the Director of Engineering stresses the need for more infill development in established areas to reduce the Town's expenditures on servicing extensions. Bridgewater's developed areas are well under the maximum density that existing municipal services can support. The Director of Engineering did say that substantial development in one concentrated region could potentially push the system to capacity, but no development has reached this point to date.



Storm Water Services

Bridgewater, 2010

- Combined Sanitary/Storm Sewer
- Storm Sewer
- Culverts
- Bridge



Municipal Infrastructure

Vacant Serviced Land

The promotion of infill development helps us to maximize existing infrastructure and reduce municipal costs. The map on page 73 shows land that is considered to be vacant or underutilized in the Town of Bridgewater.

Using the servicing maps from the previous pages, we're able to divide vacant land into two distinct categories: land that has access to existing services and land that is currently unserved. The following assumptions were made: 1) Lots are considered to be *unserved* when they're 100+ feet away from the service line in residential areas and 300+ feet away in both commercial and industrial areas; and 2) Land is deemed to be *unserved* on the portion of large *underutilized* lots (> one acre in area), 100+ feet from the extent of developed structures on the lot.

The red colour identifies areas that have existing services, and therefore, are ideal sites for future infill development. Most forms of development on these lots would likely add little pressure to existing municipal infrastructure systems, and it would save both developers and the Town money. Furthermore, developing in these areas would help create a more compact urban fabric, which correlates with positive health and environmental benefits. **Planning tools and incentives to promote infill should be explored in this planning review process.**



Vacant Land Bridgewater, 2010



Natural Environment

Environmental Implications

Bridgewater's local environment provides countless benefits to residents, including scenic beauty, recreational options, and important ecosystems that sustain life and essential elements for people. Because the environment is such an integral component of the town's natural history and identity, and plays a vital role in maintaining the health of all living things, it is important to limit the negative impacts that can result from development and land use.

Bridgewater's environment is comprised of physical, biological and built elements. Good planning involves using knowledge about these elements to provide options for decision making. Physical elements include air, climate, rocks, terrain and water; biological elements include plants and animals; and built elements include buildings, streets, yards, and parks. When land is developed, efforts should be made to preserve areas of the site which demonstrate ecological value, including streams, lakes, wetlands, mature trees and known habitat areas. Vegetated areas and wetlands are home to a number of wildlife and plant species. Limiting unnecessary deforestation and developing outside of sensitive areas protects natural habitats, reducing the likelihood of local ecosystem disruptions. Reducing negative impacts in our watershed and along the LaHave River and other water features in town not only helps to sustain habitats, but it ensures that we have high quality water for drinking and recreational activities. Protecting vegetation and green space also provides Bridgewater with numerous benefits. The presence of forests and shrubbery helps reduce both soil and coastal erosion, which can have very significant impacts on our built environment. Growing vegetation absorbs carbon dioxide (CO₂) from the atmosphere, in a process called a *carbon sequestration*. By reducing CO₂ levels, trees are able to improve the quality of our air, which essential to human well-being.

Certain environmental characteristics, such as elevation mapping, flood risk areas, surficial geology, and coastal erosion can dictate where future development must be avoided. Knowledge of this information may also prevent developers from investing in land where development is likely to be cost-prohibitive. However, many developers build near natural assets, such as forests and streams, to capitalize on the benefits they provide. Residential, commercial, and certain institutional uses are often considered to be more attractive and valuable when they benefit from environmental attributes, such as waterfront property. Though Bridgewater provides a number of these opportunities for developers, good planning must balance the desire to build near environmental assets with the need to preserve said assets for current and future generations. **The Province of Nova Scotia has established a number of policies and regulations which help to limit negative impacts on the environment through development, however, municipalities must also play an essential role in protecting our local environment.**

Forest Cover & Vegetation

More people are choosing to live where they can experience nature as a daily part of their lives. This has brought development into the forest in both urban and rural areas. As urbanization increases, green spaces decrease. This is a reality in nearly every urban setting. Planners have long recognized the need to protect important green space within urban areas, as forested land, whether publically or privately owned, offers

benefits of open space, clean air, clean water, wildlife, and recreational opportunities. As our community grows, some of these opportunities may become less available for residents and visitors. It is therefore important to retain and design green space in areas undergoing the transition from forest to urban interface. This requires careful analysis and comprehensive planning.

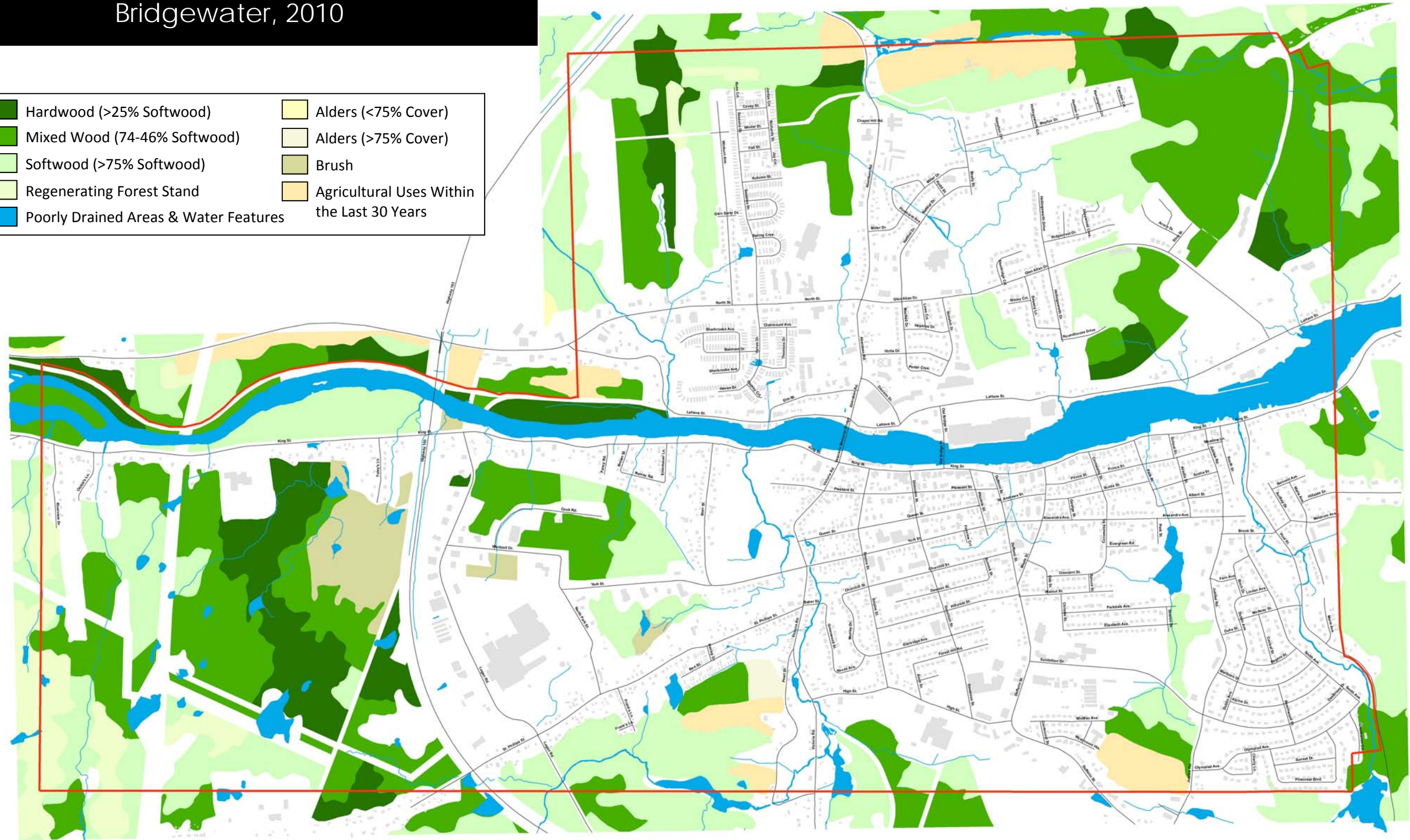
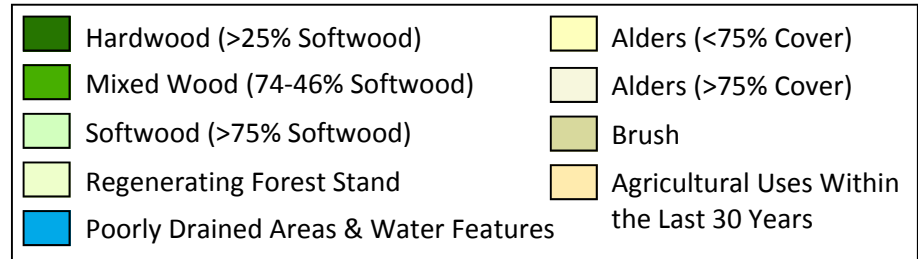
The map on page 75 shows forested areas within the town. As you can see, the largest forested areas are located outside of the town's core in undeveloped areas; namely in the north end of town, the southeast end (Glen Allan area) and the northeast end (between North Street and Highway 103). The largest classifications of vegetation are mixed wood and softwood, followed by some areas with hardwood, regenerating forests and alders. **This map is useful for several reasons. Along with other important information, it may assist us with identifying and evaluating a) preferred locations for future settlement; b) the location of new parks, open space and trails; and c) sensitive lands which may require protection.** For example, the town may wish to protect and/or reserve open space where certain healthy, mature forests and poorly drained areas are located, and where development is unsuitable. This would assist with protecting valuable ecosystems while also providing new opportunities for future parks and recreation areas. This mapping may also assist developers in maximizing the existing natural heritage on their land to complement their development, which is increasingly being sought out by new home owners.



Mixed Wood Forest Near Mayfair Drive

Forest Cover

Bridgewater, 2010

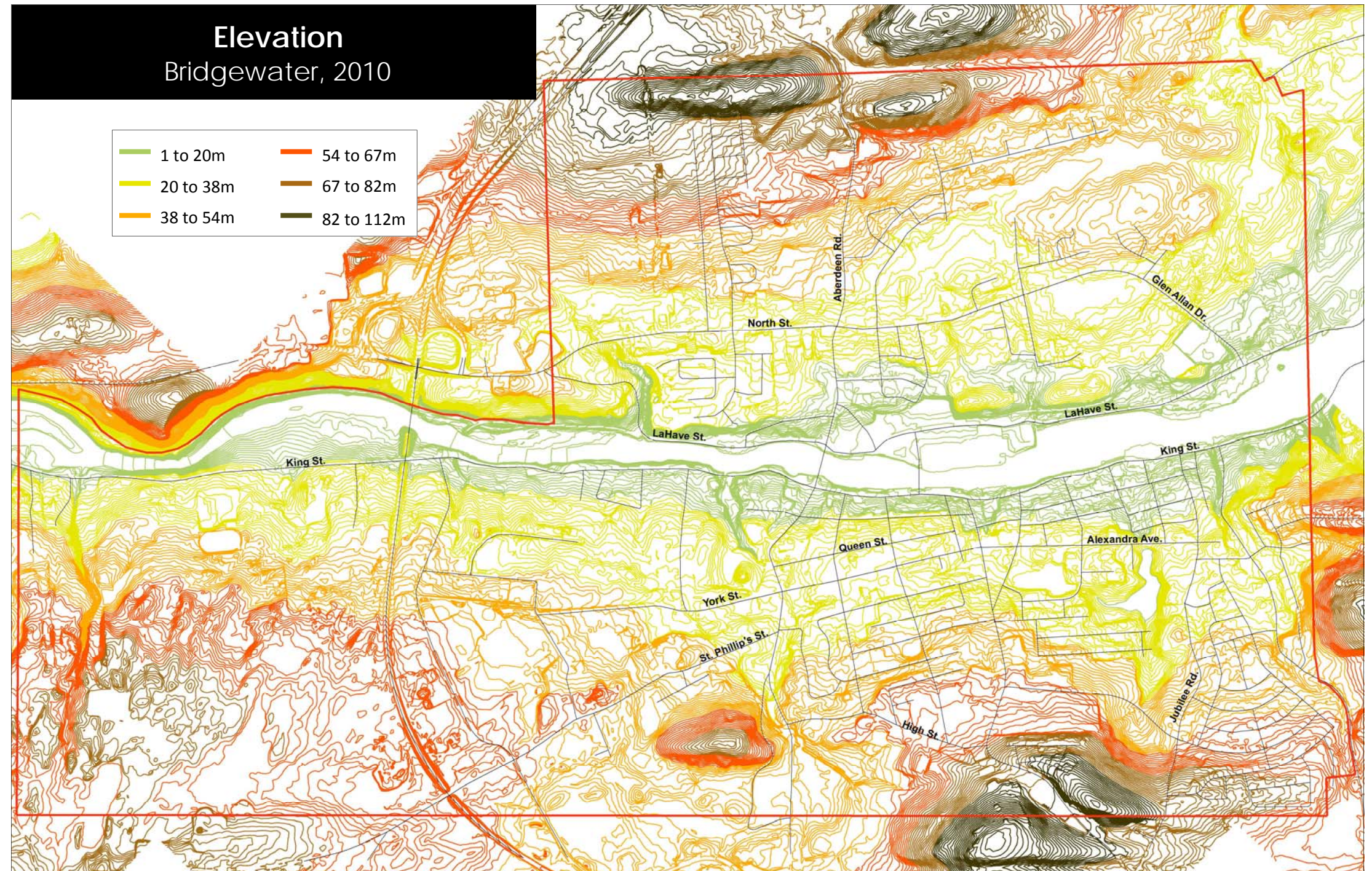


Natural Environment

Elevation Mapping

The following map shows the town's elevation using one meter contour lines. Contours are divided into one of six categories to visualize varying degrees of height, using Jenk's Natural Break Classification Method. This method identifies the categories that effectively groups the most similar areas, while maximizing the differences between the categories. In other words, Jenk's Natural Break reduces the variance within a group and increases the variance between groups.

Bridgewater was developed in the LaHave River valley, which leads to rising elevation levels as you move towards the town's eastern and western boundaries. Along the northern section of the LaHave River, you can see that the contours are closer together, indicating that the land is steep in these areas (correlating with the slope map on page 77). The town's highest elevations are located near the Old Town Golf Course in the west, along with the eastern most boundary. This map is useful because it shows high elevations and steep inclines, which are typically more expensive to develop.



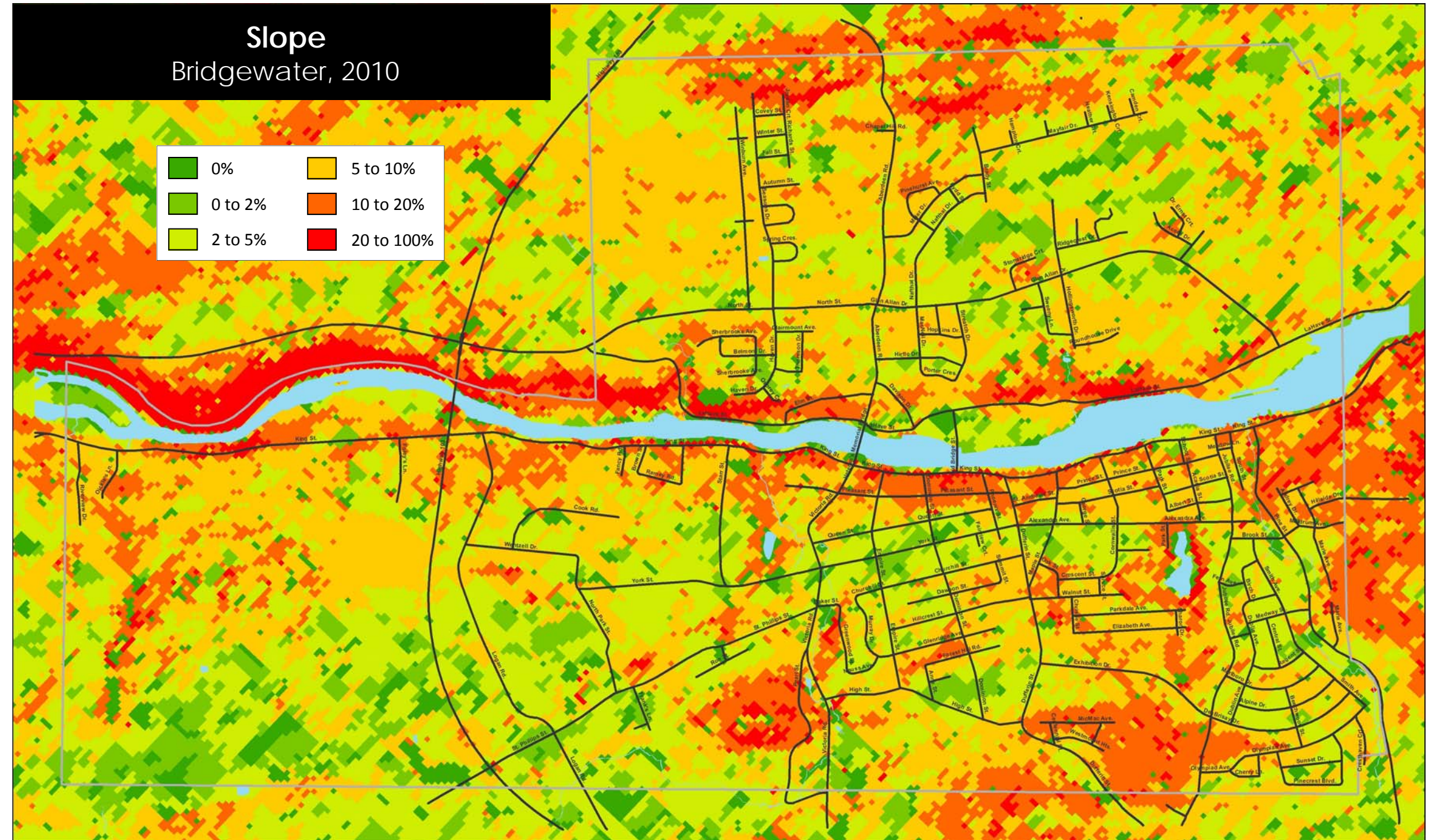
Slope

Slope is the rate of change in elevation between two points in a given area. Slope is measured by: a) determining the difference in elevation between two points (the rise); and b) dividing the elevation by the horizontal distance between the two points (the run).

Slope must be known to properly design roads and structures and to evaluate the stability or extent of potential erosion at a site. Roads need to be designed so that the slope is not too steep. The maximum permitted slope for streets is often between 5 and 10%. To achieve this, site grading may be required; this involves either removing or adding soil (cutting or filling) to create the proper slope.

It is also important to know a site's slope to design appropriate re-vegetation plans to hold soils in place after final grading is complete. In steeply sloped areas, an erosion control fabric is often used to retain soils until the vegetation takes hold (American Planning Association, 2006).

In Bridgewater, some of the most significant slopes (10%+) exist along the LaHave riverbank. Some of these areas are prone to erosion and instability. Efforts to minimize land use impacts, strain, and vegetation loss on significantly sloped lands will be essential to the riverbank's preservation in the coming years.



Natural Environment

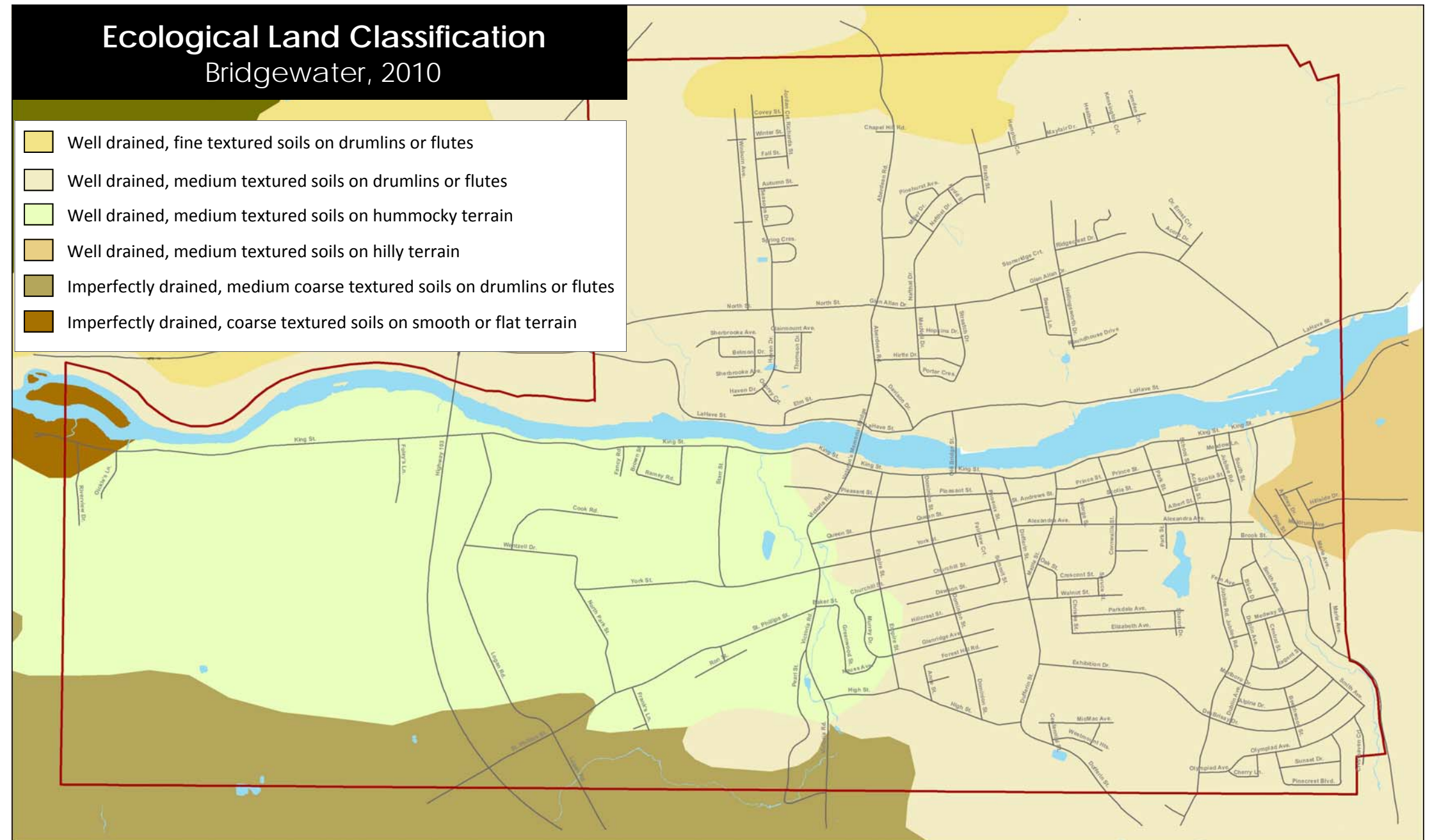
Ecological Land Classification

The following map uses an Ecological Land Classification mapping tool to identify and describe areas of similar attributes. This tool provides hierarchical levels of description, which can integrate several defining features. This particular map combines soil drainage, soil texture, and topography into one map. The map shows no evidence of major development obstacles, with respect to these three ecological categories.

You can see that the vast majority of Bridgewater has well drained soil, including all major developed areas. A small amount of land near the north and northwestern boundary is considered to be imperfectly, or moderately, drained.

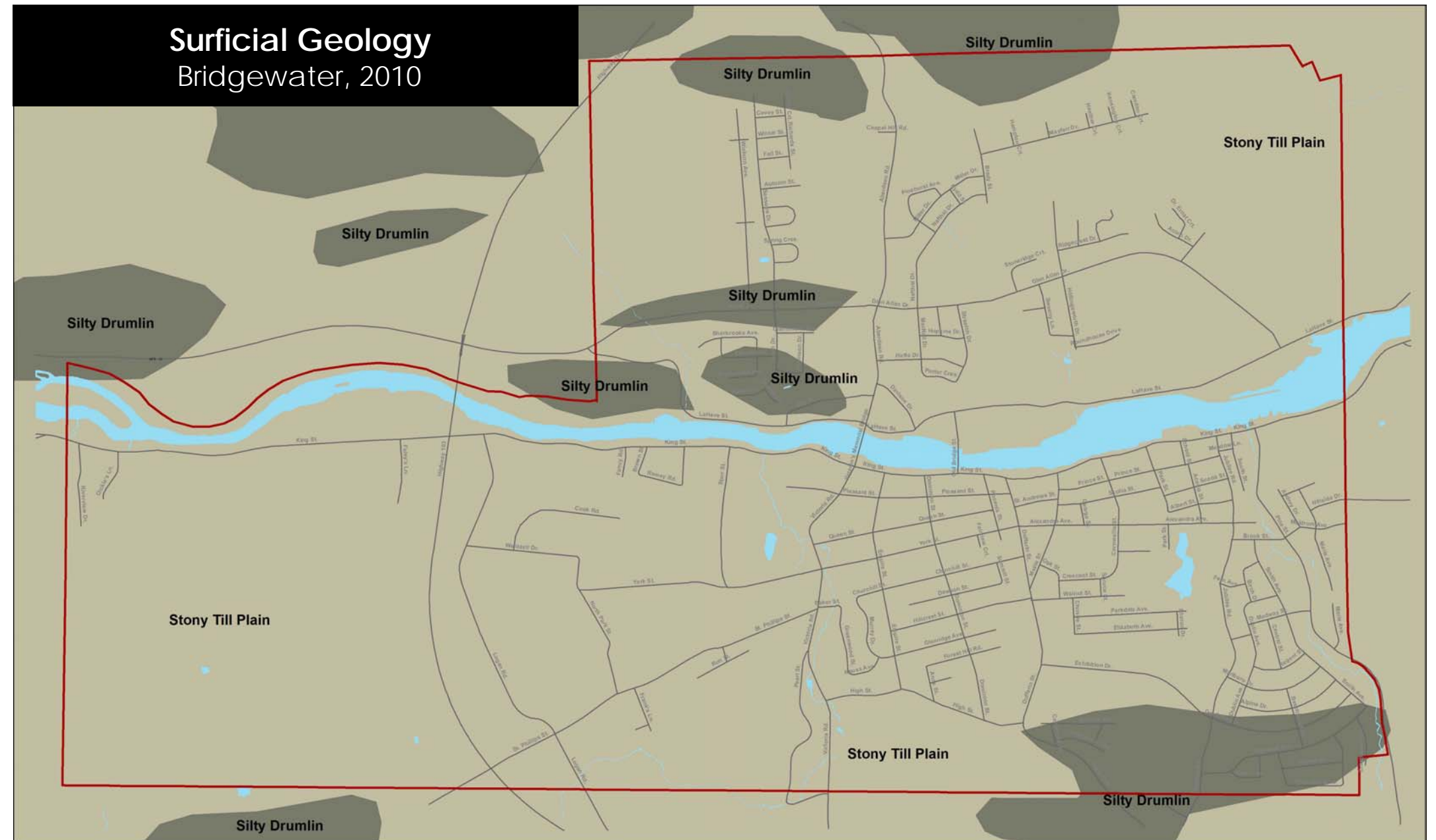
The majority of the town's soil is classified as medium textured soil, which consists of loams, sandy loams, or silt loams. A small portion of land along the northern edge of the LaHave River is classified as coarse. The only source of fine soil is found near the eastern end of Aberdeen Road.

Bridgewater's core developed areas are characterized by drumlin or flute landform patterns. Drumlins and flutes are caused by glacial ice movement and are recognized as patterns of elongated smooth streamline hills (aka drumlins) and shallow straight, parallel roughs (aka flutes). The topography between Victoria Road and the northern town boundary is classified as hummocky terrain. This land has a series of small rounded hills with a height less than 1.5 times their base and a height less than 15m. The remaining land is either hilly or lacking a distinct topographic pattern.



Surficial Geology

The Surficial Geology map shows that there are no major sources of bedrock within the town. The presence of bedrock would significantly increase excavation costs required during future development. As you can see, there are two kinds of landforms in Bridgewater: stony till plains and silty drumlins. Neither of these classifications poses major obstacles during development.



Natural Environment

Water Features

Bridgewater's most notable water feature is the LaHave River which bisects the town. The LaHave River watershed covers a 1,700 km² area that extends 97 km through Annapolis, Kings, and Lunenburg Counties. LaHave River is a popular recreation and fishing site for residents. Many brooks and streams extend from the river into town. Wiles and Hebb Brooks, which are the largest in town, both extend westward. Hebb Brook runs parallel to Pine Street and Wiles Brook is located north near Victoria Road. Silvers and Miller Brooks stretch east of the river. Finally, Town Pond is the largest body of water in Bridgewater. This manufactured pond is located in Woodland Gardens and is a popular leisure site.



LaHave River Water Quality

The Bluenose Coastal Action Foundation coordinates the LaHave Water Rescue Project which focuses on the long-term monitoring of the LaHave Watershed. The project uses 15 monitoring stations, including two Bridgewater stations, to measure water quality of the LaHave River in Lunenburg County.

Between August 2007 and March 2008, all 15 monitoring sites recorded pH levels below the Canadian Environmental Quality Guidelines, which is not necessarily surprising since the region has above average acidic conditions. The River becomes less acidic as it runs downstream, a correlation that may be associated with many factors including nutrient loads, population density or high nutrient levels (Bluenose Coastal Action Foundation, 2008).

Unfortunately, Bridgewater, along with the West Branch station, had the highest frequency of detectable fecal coliform levels in the LaHave system. Six of eight measurements in Bridgewater were above acceptable fecal coliform standards for drinking and agricultural purposes (one cfu/100ml), while two of these readings exceeded recreational standards (four cfu/100ml). The presence of fecal coliform suggests increased wastewater or agricultural inputs are being distributed into the river in the area (Bluenose Coastal Action Foundation, 2008). The LaHave Water Rescue Project is ongoing and new reports will be available in the near future.

Coastal Erosion

There are many sites along the LaHave River that show signs of coastal erosion. The east bank of the river has eroded, particularly north of Aberdeen Road. In recent years, retaining walls have been constructed along areas of the coast to limit further erosion. Engineering staff have worked with property owners to limit the severity of coastal erosion on the east side of the LaHave River.

Coastal erosion is a significant challenge on the west side of the river, particularly in three regions. The coast between Maple and School Streets has eroded to a significant extent. While the Engineering Department repaired the area, further attention will be needed to combat further erosion in the region. The shoreline south of Pine Street has been flagged as an area that will need attention in the coming years. Lastly, some significant erosion has occurred where Wiles Brook meets the LaHave River.

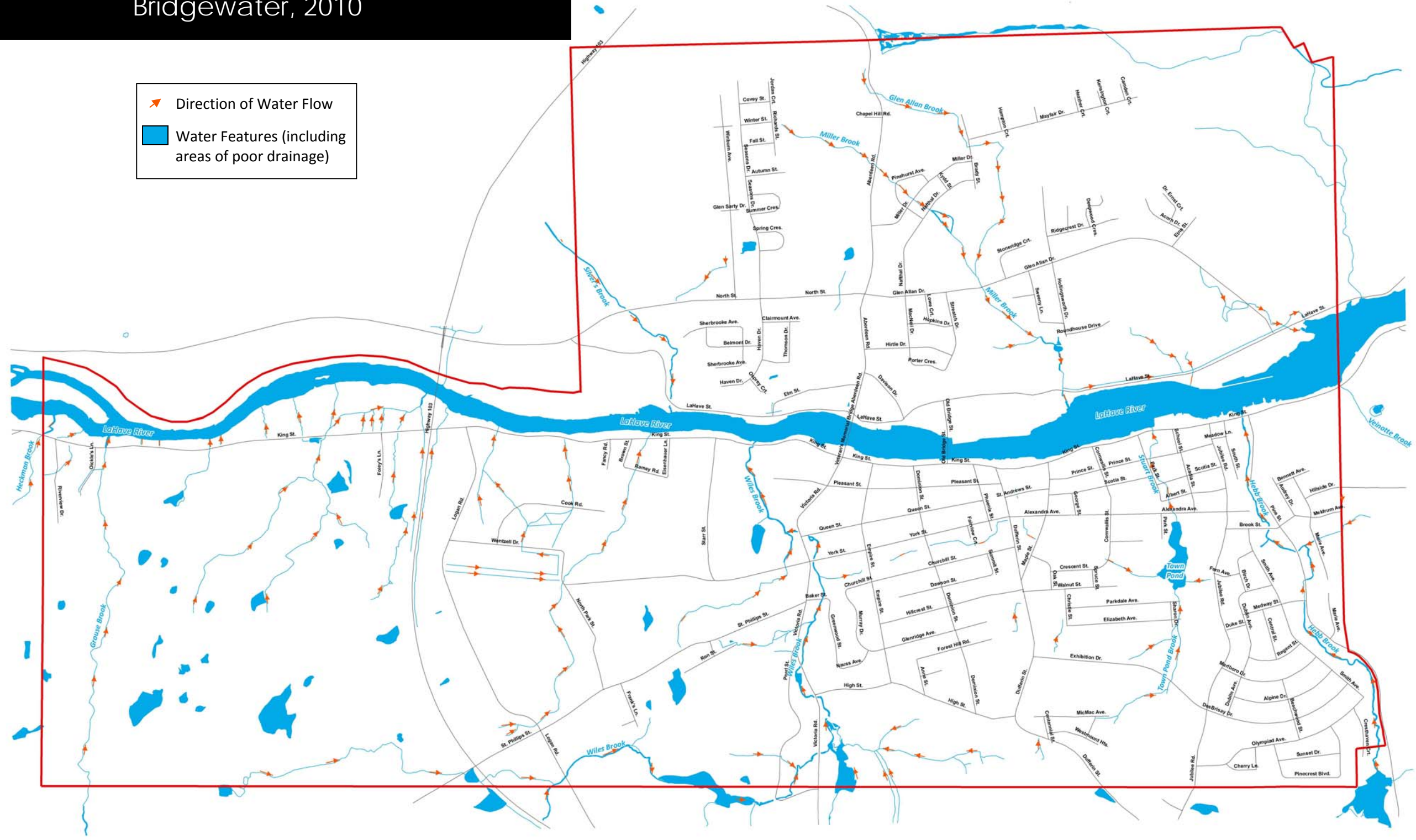
Even with the presence of retaining walls, the rates of coastal erosion will continue to increase in the future as the impacts of climate change become more severe. As a result, it is important to ensure that development along the river is done in a manner that accounts for challenges associated with erosion and climate change. Many brooks also show significant signs of erosion and have subsequently cost the town and residents a great deal of money in repairs. Hebb, Grouse, and Silvers Brooks have all been retrofitted with rock walls to reduce the effects of erosion, however, brooks continue to experience observed levels of erosion.



Water Features

Bridgewater, 2010

- Direction of Water Flow
- Water Features (including areas of poor drainage)



Natural Environment

Flood Areas

Several sites within town boundaries are prone to significant flood events. There is poor drainage in areas in the north end of town and adjacent to Wiles Brook that pose increased flood risks. The town's stream system is near capacity, partially because new development often requires streams to be diverted elsewhere. **Streams and brooks generally exceed their capacity during significant storm events, or during the fall when debris creates problematic blockages.** Properties abutting streams and brooks, particularly those near Wiles and Hebb Brooks, are susceptible to flooding during major storm surges or in the fall. The Town Pond has also been prone to flooding.

The LaHave River is exposed to storm surges and high tide levels which can cause flooding along sections of the riverbanks. The Bridgewater Mall, which was built on fill within the LaHave River floodplain, is prone to flooding and has done so in the recent past. Parts of the eastern and western shoreline has flooded on occasion, often where coastal erosion is present. The frequency and severity of flooding will only increase as the effects of climate change and coastal erosion become more severe.



Natural Environment

Wildlife

Bridgewater and Lunenburg County are home to a number of wildlife species, many of which have declining populations and are considered to be at-risk. Atlantic salmon have been associated with the LaHave River for many centuries. Atlantic salmon are an anadromous, or migrating, species of fish that spend the majority of their life in the Atlantic ocean, although they return to native fresh water streams and rivers to spawn.

The population of Atlantic salmon originally started to decline in the 1800s, as the growing number of lumber mills and dams hampered their ability to migrate to spawning grounds. Population declines magnified in the mid 1900s due to further damming, pollution, and commercial overfishing. Efforts to increase the population of Atlantic salmon during the 1960s and 70s were successful, but as the worldwide salmon stocks began declining in the 1990s, so too did LaHave River stocks.

Salmon counts conducted in New Germany show that only 200 Atlantic salmon migrated up the LaHave River in 2009. To put this number in perspective, 1,300 salmon must reach their spawning grounds at Morgan's Falls in order to maintain their current population. Due to these low numbers, there was a ban on salmon fishing during the previous fishing season. Early indications in 2010 suggest that just over 400 Atlantic Salmon traveled up the LaHave to New Germany, which represents 100% increase over the previous year (Randall, 2010). Several other fish species migrate through Bridgewater, including sea run trout, smelt, American shad, and gaspereau (aka alewife or kyack).

Lunenburg County is home to the Atlantic whitefish, which is unique to Nova Scotian waters. Atlantic whitefish were plentiful in the early 1900s, but overfishing and the introduction of foreign fish species has led to their decline. In 1986, the Atlantic Whitefish was designated as an endangered species due to declining stocks. While the Atlantic whitefish aren't found right in Bridgewater, they are sometimes caught accidentally in Petite Rivere and the Millipsigate, Minamkeak Watershed (Mersey Tobeatc Research Institute, 2008).

Many other plant and animal species are considered to be at-risk in Bridgewater and in the Lunenburg County Region, including the boreal felt lichen. Lichens are an organism that is part fungus and part algae. The boreal felt lichen has distinctive upturned lobes that have a fuzzy upper surface. The upper side of these lobes are green or blue when damp, or grey when dry, while undersides are white. This species typically reaches two to five centimeters in diameter, but have been observed as large as 12 cm. According to Species at Risk (2008) and Nova Scotia Department of natural Resources (2010), other at-risk species in Lunenburg County include:

- Blanding's turtle
- Wood turtle
- Eastern ribbonsnake
- Piping plover
- Southern flying squirrel
- Eastern lilaeposis
- Ghost antler
- Golden-crest
- Red Root
- Moose



Atlantic Salmon



Boreal Felt Lichen

Climate Change

Climate Change

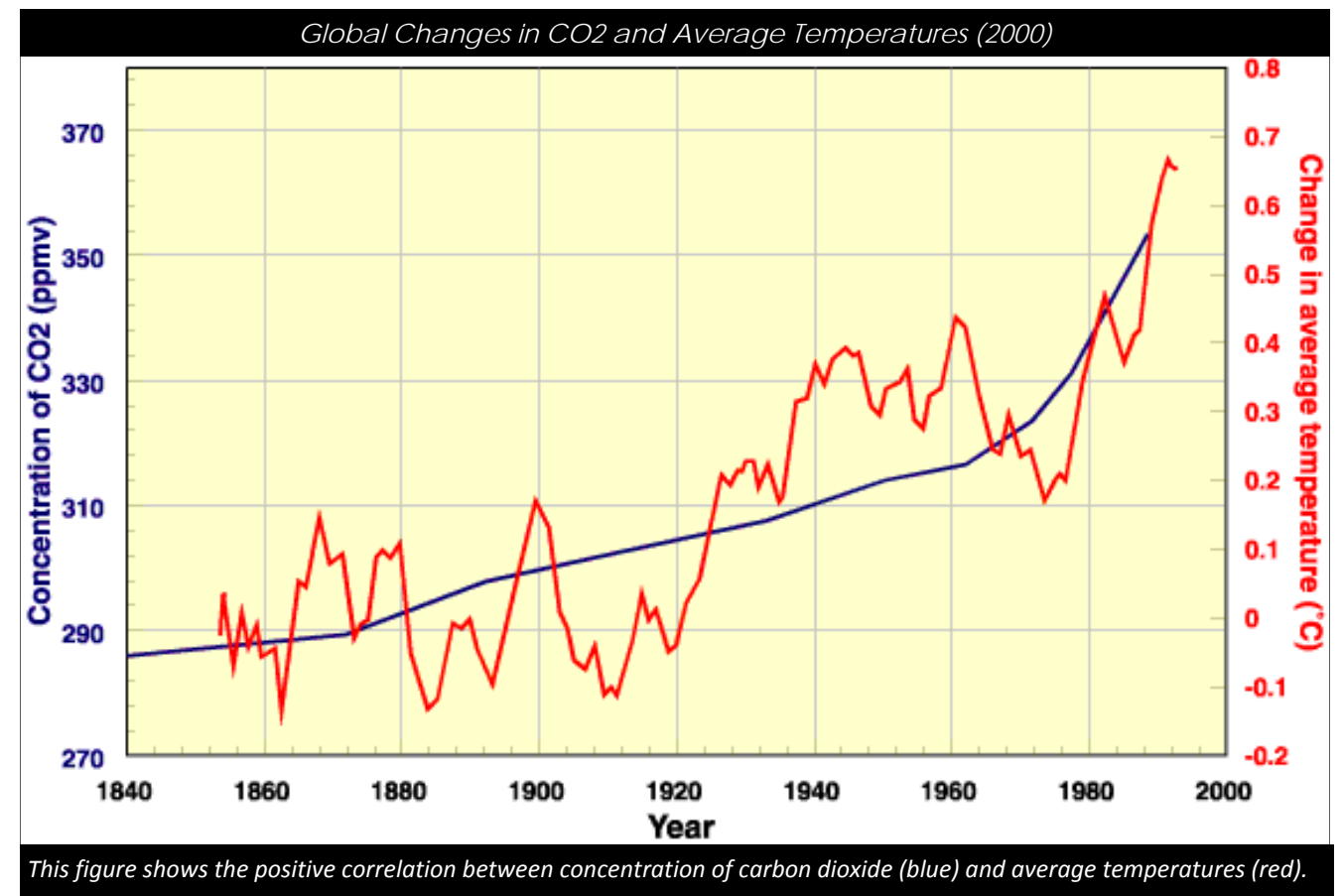
The Government of Nova Scotia recognizes the current impact and potential threats that climate change will have on the province. *Climate change is defined as a change in the average weather that a given region experiences. Average weather includes all the features we associate with the weather such as temperature, wind patterns and precipitation. When we speak of climate change on a global scale, we are referring to changes in the climate of the Earth as a whole* (Natural Resources Canada, 2007).

Rates of climate change, or atmospheric warming, have increased as a result of the increased presence of greenhouse gases (GHG) in our ecosystem. Our species produces an overwhelming amount of carbon dioxide and other GHGs through measures such as burning fossil fuels, aerosol cans, and cutting trees. Humans have caused so much damage that the atmosphere contains 32% more carbon dioxide than it did before the industrial age. As a result of increased carbon dioxide and GHGs, average temperatures have risen by 0.6°C since 1990 (David Suzuki Foundation, 2010). According to the Intergovernmental Panel on Climate Change, average world temperatures are expected to increase by 1.1 to 6.4 °C by 2100 (Government of Nova Scotia, 2010).



Before industrialization our atmosphere contained 275 parts per million (ppm) of carbon dioxide (CO₂), compared to 387ppm today. If we continue at our current rate, CO₂ levels will increase by 2ppm per year, meaning prolonged increases in temperature. This trend will magnify glacial melting, and sea level rise. Scientists believe that in order to limit the effects of climate change and sustain our well being, we must reduce carbon dioxide levels to a minimum if 350ppm (350.org, 2010).

Municipalities in Nova Scotia must pay close attention to climate change because the province's rate of sea level rise exceeds the global average. In the past century, Nova Scotia's sea level has risen by 30cm and this will only continue to increase (Government of Nova Scotia, 2010). *The mouth of the LaHave River and much of Lunenburg County are located in a high risk area, meaning the Town of Bridgewater will face challenges related to sea level rise since managing coastal risks falls within the mandate of local municipalities* (Natural Resources Canada, 2007).



The risks facing Nova Scotia's heavily populated coast are enhanced by a gradual subsidence of its land by a rate of approximately 20 cm/century. The subsidence - or sinking - is the earth's natural reaction to the effects of the past ice age (Government of Nova Scotia, 2010). Glaciers in northern Canada suppressed land for years, but as they started melting there was a quick period of uplift. Now, the earth's crust is sinking as it returns to equilibrium (DeMont, 2008). In addition to the subsidence, we can expect an additional sea level rise of 70 and 140 cm within the next century (Ecology Action Centre, 2010), however, a rise of up to two meters cannot be ruled out (Public Interest Research Centre, 2008).

Future sea level rise depends on a number of factors, a significant one being the Greenland ice sheet. The ice sheet is the second largest body of ice on the planet, which contains 6% of all the fresh water earth has to offer. Research shows the ice sheet is melting approximately 80 years sooner than anticipated. Scientists estimate that a local temperature increase of 3°C will cause the ice sheet to melt entirely. Once melted, the Greenland ice sheet will lead to an additional sea level rise of seven metres during the upcoming centuries (Public Interest Research Centre, 2008).



We can expect this rise in sea level to have many effects, both on the biological and physical environment, as well as on the human environment. Research shows that Nova Scotia's coast will face other threats like more storm events, storm surges, coastal erosion, and the disruption of water resources. Other local impacts of climate change may include: changes in precipitation patterns and ocean circulation, ocean acidification, salt water intrusion, and even more ice events (Ecology Action Centre, 2010 & Natural Resources Canada, 2007). **The effects of climate change already exist in Nova Scotia and they will worsen in the near future. The most effective way to manage our vulnerability is through good planning and limiting exposure** (Natural Resources Canada, 2007).



Climate Change

Climate Change (cont'd)

The influence that climate change will have on a region is heavily tied to its geological composition. The bedrock and surficial units of the coastline determines its rate of coastal erosion. The majority of Nova Scotia's coastline is composed of soft eroded rocks or glacial till which is highly prone to future erosion and challenges related to coastal development. A small fraction of the coastline is composed of hard granite or basalt that results in limited coastal erosion. These regions tend to have exposed granite along the coastline, like Peggy's Cove. Coastal flooding is also heavily influenced by a combination of other geological factors including elevation, coastal bathymetry, wind direction, and the shape of inlets (DeMont, 2008).

Flood plains, which were once used to support agricultural development, have become popular sites of residential or commercial development. **Flood plains are more likely to be affected by major storm events and snow melt due to their sedimentary geology and low lying nature. Increasing populations in these areas are a recipe for increased property damage** (DeMont, 2008).

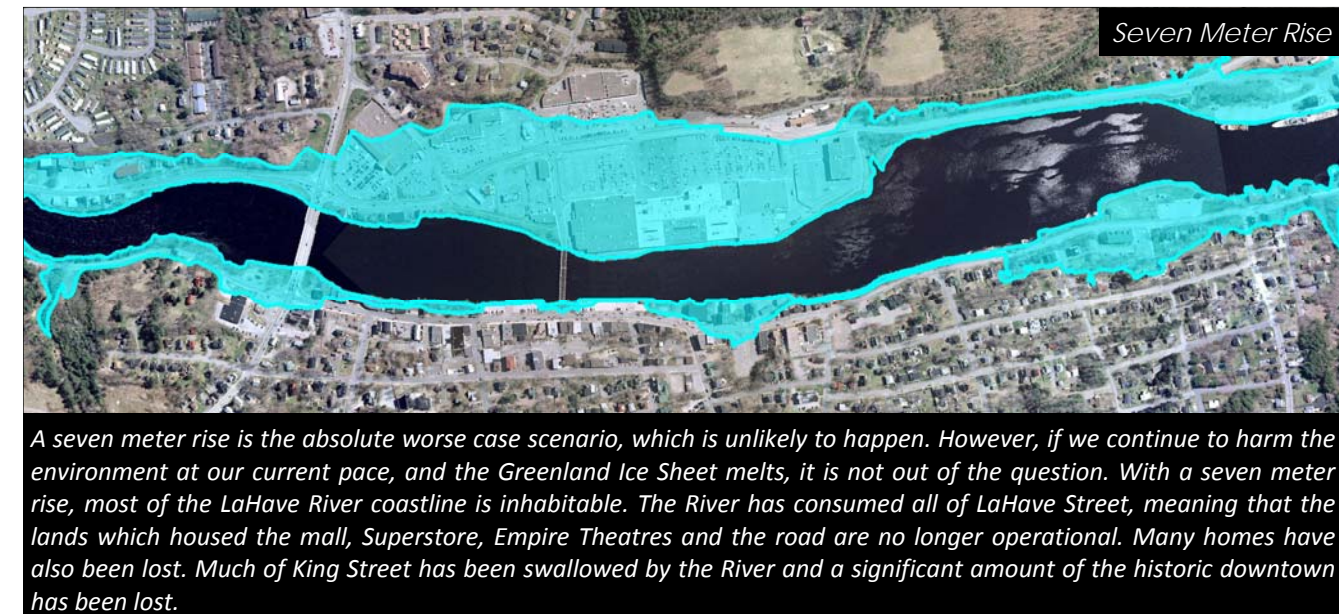
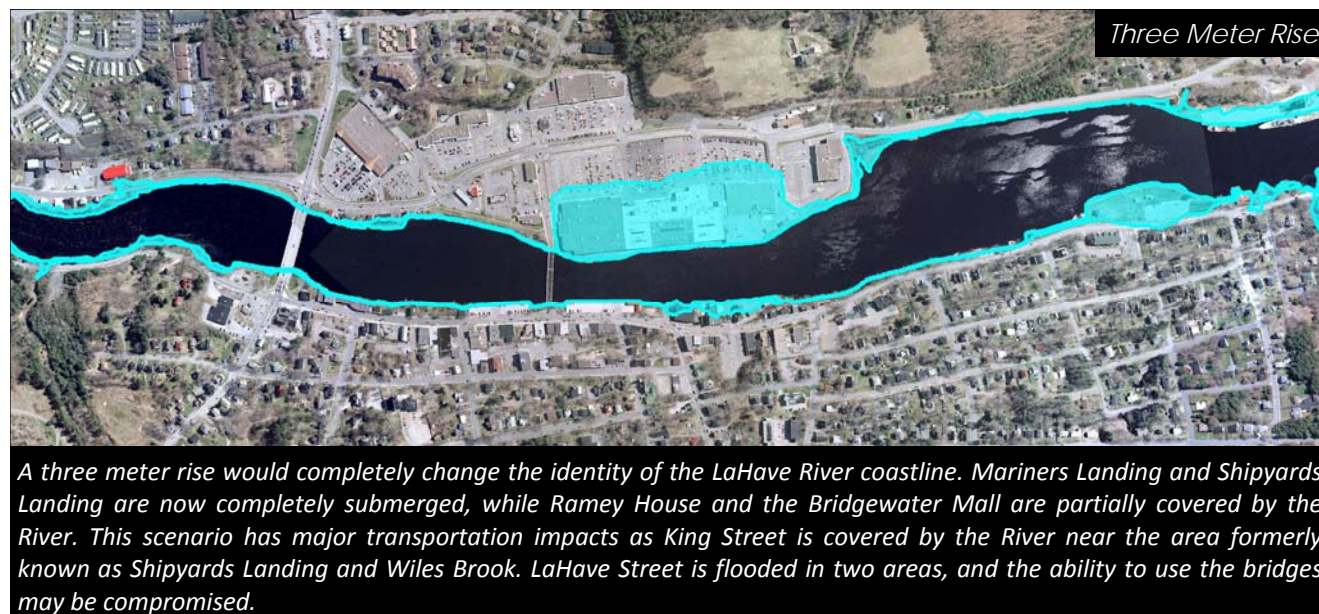
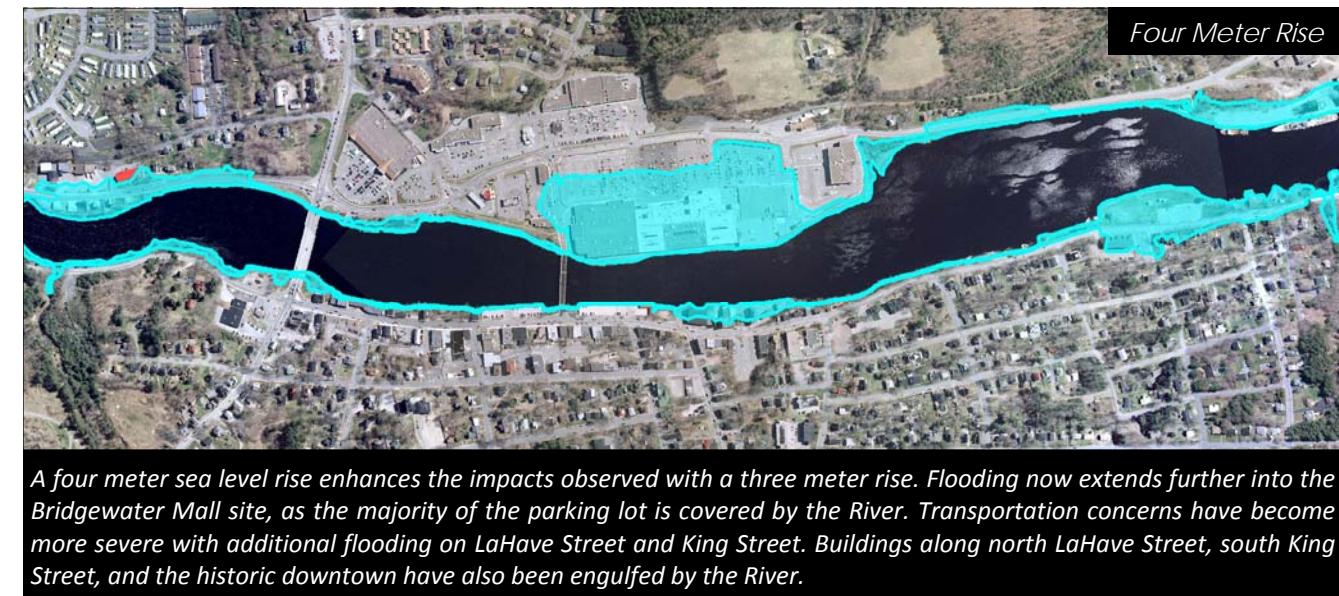


Sea Level Rise in Bridgewater

It is not a question of whether Bridgewater will be affected by sea level rise, it is a matter of how much harm will be done. While it is impossible to predict precisely how high the LaHave River will rise in the coming decades and centuries, we are able to present several possible scenarios. The maps on page 89 use contour information to show how Bridgewater's coastline may be impacted by varying degrees of sea level rise. The first scenario shows a two meter sea level rise, which is expected to occur within the next two centuries. The final scenario, while unlikely, is possible if both of the polar ice caps were to melt.

It should be noted that these scenarios do not consider the rate of coastal erosion, which will likely increase with rising oceans and more frequent storm surges.





Conclusion

Conclusion

The Community Inventory Report is a detailed background planning report about Bridgewater, Nova Scotia, which is intended to inform the Planning Review process over the next several months. It does not discuss every relevant issue to be examined during this planning process, but it does provide some essential information about key physical, natural, economic and social issues in our community. The Report raises good awareness about these issues, but in many cases, leads to important questions which do not yet have answers:

- Bridgewater will likely experience population growth over the next few decades, though almost exclusively in the seniors age groups. **How and where will this growth be accommodated? What kinds of infrastructure and amenities will be required?**
- This region of Nova Scotia experiences alarming rates of obesity, all of which have profound impacts on people's quality of life and the Provincial health care system. **How can community design help to increase physical activity levels and keep people healthy?**
- Bridgewater's downtown area has been impacted by commercial growth in other parts of town and the area over the years. **What can be done to enhance the historic charm and character of Bridgewater's downtown core in an effort to increase commercial and pedestrian activity?**
- As Bridgewater grows, there will be a need to improve accessibility and introduce/expand street connections. **What new key streets and extensions must be required through the development of land?**
- Fragmented, sprawling development contributes to high municipal, social and environmental costs. **What strategies and tools can be used to maximize our precious land and infrastructure and to minimize these costs?**
- Significant portions of Bridgewater are zoned for industrial land use, despite low levels of industrial development. **How will we update our zoning regulations to promote appropriate and efficient land use in all parts of town?**
- Housing affordability continues to be a concern in Bridgewater and Lunenburg County. **How can we encourage a wider range and supply of affordable housing to serve our community's needs?**
- Poorly sited and disconnected open space is often dedicated to the Town through the land subdivision process. **How can we plan comprehensively for existing and future parkland in an effort to maximize its use and benefits, and how must our regulations change?**
- Bridgewater hosts a significant amount of mature vegetation and important hydrological features. **How can we best protect some of these elements for current and future generations, and/or integrate them with development in a sensitive manner?**

- Climate change will impact Bridgewater in a number of ways, including potential infrastructure damage and increased erosion along the LaHave River. **What efforts should be taken now to minimize the impacts of climate change and their resulting costs?**

With a general understanding of these issues, we can begin to discuss and examine them further and seek answers to these and other important questions. The next number of months of the Planning Review process provides us with that opportunity, and also to carefully consult with the community, the Planning Review Advisory Committee (PRAC), and Town Council as we begin to shape new planning objectives, policies and regulations that will serve our community for years to come.

Please visit www.bridgewater.ca/planningreview for regular updates on Bridgewater's Planning Review process.

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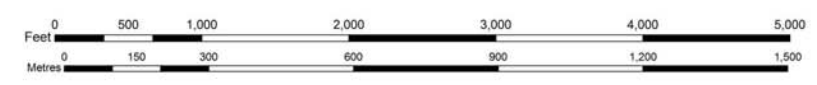
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Appendices

**Town of
Bridgewater
Municipal Planning Strategy
Map 2 - Future Land Use Map**

Source: Nova Scotia Geomatics Centre 1:10000 planimetric data
1:10000 Aerial Photography produced by the Registry of Deeds
in 2001 Basemap produced by the Lunenburg County District
Planning Commission, which was produced from aerial photography
from 1979.



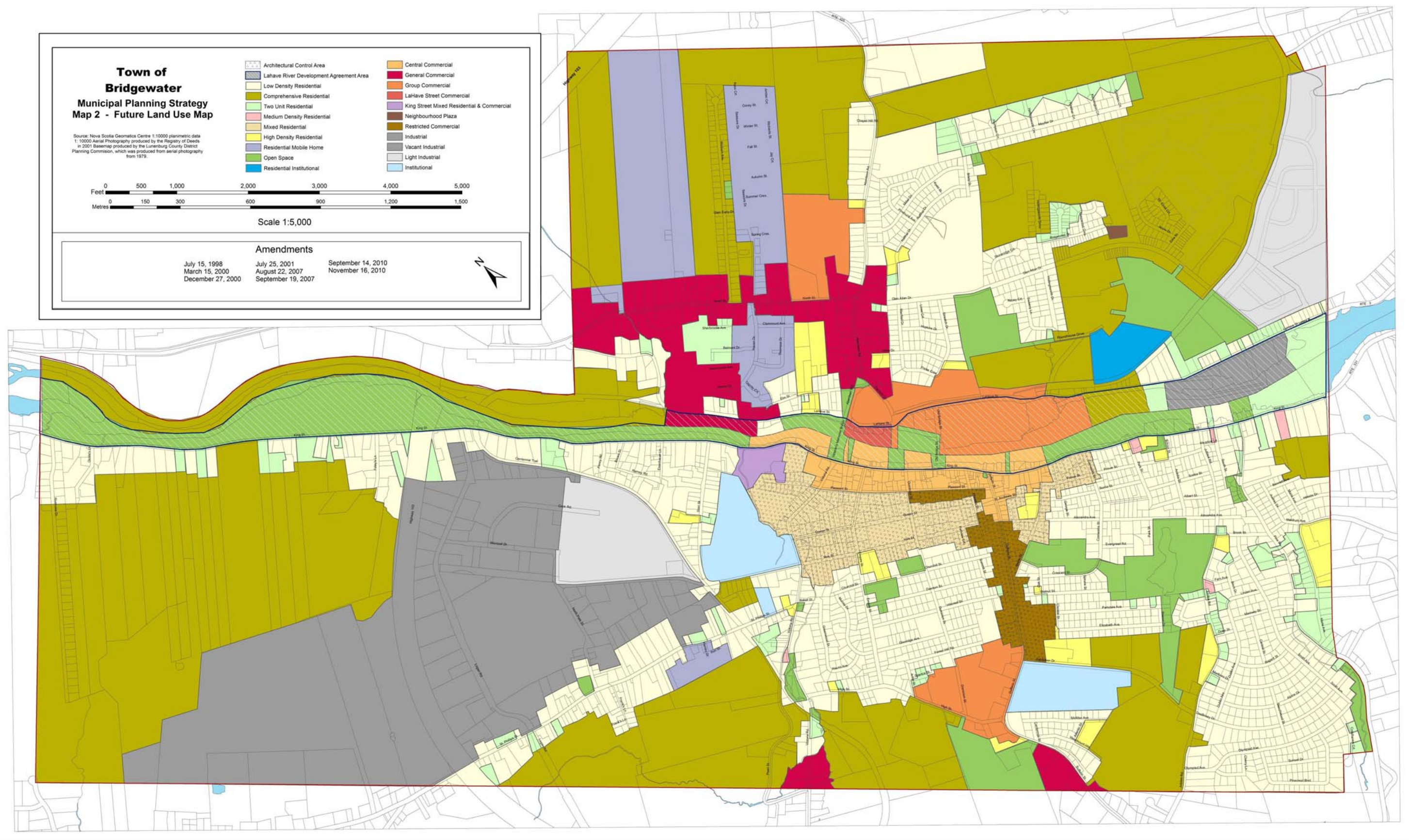
Scale 1:5,000

Amendments

July 15, 1998	July 25, 2001	September 14, 2010
March 15, 2000	August 22, 2007	November 16, 2010
December 27, 2000	September 19, 2007	

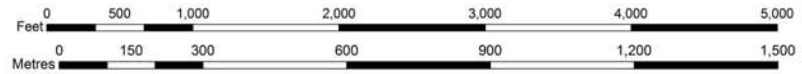


- | | |
|---|--|
| Architectural Control Area | Central Commercial |
| Lahave River Development Agreement Area | General Commercial |
| Low Density Residential | Group Commercial |
| Comprehensive Residential | LaHave Street Commercial |
| Two Unit Residential | King Street Mixed Residential & Commercial |
| Medium Density Residential | Neighbourhood Plaza |
| Mixed Residential | Restricted Commercial |
| High Density Residential | Industrial |
| Residential Mobile Home | Vacant Industrial |
| Open Space | Light Industrial |
| Residential Institutional | Institutional |



**Town of Bridgewater
Land Use By-Law
Schedule A
Zoning Map**

Source: Nova Scotia Geomatics Centre 1:10000 planimetric data
1:10000 Aerial Photography produced by the Registry of Deeds
in 2001 Base map produced by the Lunenburg County District
Planning Commission, which was produced from aerial photography
from 1979



Scale 1:5,000

Amendments

June 25, 1998	March 15, 2000	August 22, 2007
July 15, 1998	December 27, 2000	September 19, 2007
September 10, 1998	June 22, 2001	September 14, 2010
November 5, 1999	July 25, 2001	November 16, 2010

