

**TOWN OF
STEPHANVILLE CROSSING
MUNICIPAL PLAN**

**IMPORTANT: To see if there were any changes to
this plan since it came into effect, please refer to:**

List of Municipal Plan Amendments

**TOWN OF
STEPHENVILLE CROSSING
MUNICIPAL PLAN 2010
&
DEVELOPMENT REGULATIONS 2010**

OFFICIAL COPY

**URBAN AND RURAL PLANNING ACT
RESOLUTION TO ADOPT
TOWN OF STEPHENVILLE CROSSING MUNICIPAL PLAN 2010**

Under the authority of Section 16 of the *Urban and Rural Planning Act 2000*, the Town Council of Stephenville Crossing adopts the Town of Stephenville Crossing Municipal Plan 2010.

Adopted by the Town Council of Stephenville Crossing on the 10th day of March, 2010.

Signed and sealed this 26th day of May, 2010.

Mayor:



Leona Webb



Clerk:

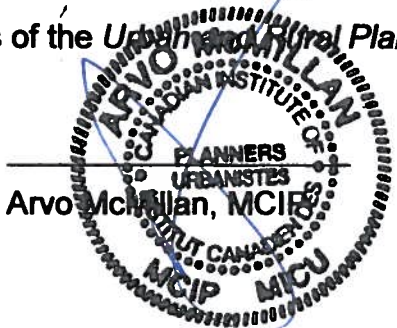


Yvonne Young

CANADIAN INSTITUTE OF PLANNERS CERTIFICATION

I certify that the attached Municipal Plan has been prepared in accordance with the requirements of the *Urban and Rural Planning Act 2000*.

MCIP:



Arvo McMillan, MCIP



**URBAN AND RURAL PLANNING ACT
RESOLUTION TO APPROVE
TOWN OF STEPHENVILLE CROSSING MUNICIPAL PLAN 2010**

Under the authority of Section 16, Section 17 and Section 18 of the *Urban and Rural Planning Act 2000*, the Town Council of Stephenville Crossing

- a) adopted the Town of Stephenville Crossing Municipal Plan 2010 on the 10th day of March 2010.
- b) gave notice of the adoption of the Town of Stephenville Crossing Municipal Plan 2010 by advertisement inserted on the 16th day of March, 2010 and the 6th day of April, 2010 in the Georgian newspaper.
- c) set the 8th day of April, 2010 at 7:30 p.m. at the Town Hall, Stephenville Crossing for the holding of a public hearing to consider objections and submissions.

Now under the authority of section 23 of the *Urban and Rural Planning Act 2000*, on the 26th day of May, 2010 the Town Council of Stephenville Crossing approves the Town of Stephenville Crossing Municipal Plan 2010 as adopted.

SIGNED AND SEALED this 26th day of May, 2010

Mayor:

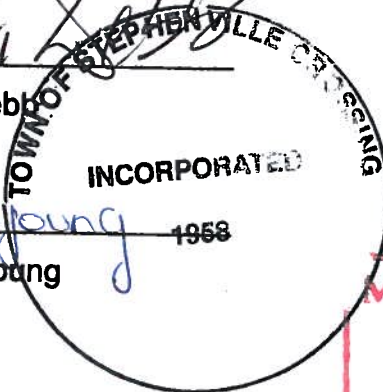


Leona Webb

Clerk:



Yvonne Young



Municipal Plan/Amendment

REGISTERED

Number 4950-2010-001

Date Sept 14, 2010

Signature 

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TOWN OF STEPHENVILLE CROSSING MUNICIPAL PLAN 2010

1 INTRODUCTION

1.1 THE PLAN AND DEVELOPMENT REGULATIONS

This Stephenville Crossing Municipal Plan 2010 replaces the Stephenville Crossing Municipal Plan which was gazetted in 1988.

The Stephenville Crossing Municipal Plan contains goals and land use policies approved by the Town and registered by the Minister of Municipal Affairs. The Municipal Plan is binding upon Council and upon all other persons, corporations and organizations within the Stephenville Crossing Municipal Planning Area.

The Stephenville Crossing Development Regulations 2009 were approved and registered at the same time as the Stephenville Crossing Municipal Plan 2009. These development regulations implement the land use policies of the Municipal Plan with land use regulations. Included with the Stephenville Crossing Development Regulations is Newfoundland Regulation CNLR3/01 - Development Regulations under the Urban and Rural Planning Act 2000.

Policies and regulations under the Municipal Plan and Development Regulations must comply with all applicable Provincial and Federal regulations. Prior to adoption by the Town under the Urban and Rural Planning Act, the Department of Municipal and Provincial Affairs reviews the Plan and Regulations to "to determine provincial and other government agency interests. . . ." (Section 15(3) of the Urban and Rural Planning Act)

Development schemes, design concepts, comprehensive plans, subdivision agreements and concept plans, further implement the Municipal Plan and Development Regulations with more detailed designs, design strategies and policies.

Furthermore, the Municipal Plan is implemented through and in turn, implements in part, the Integrated Sustainability Community Plan as set out.

Section 13 (2) of the Urban and Rural Planning Act 2000 states:

(2) *A plan shall*

- (a) *include a statement of the objectives of the plan;*
- (b) *indicate the policies to be implemented under the plan;*

- (c) *divide land into land use classes and the use that may be made in each class and shall include prohibited uses of land;*
 - (d) *include proposals for land use zoning regulations;*
 - (e) *include proposals for the implementation of the plan;*
 - (f) *provide provisions with respect to non-conforming uses; and*
 - (g) *provide for the development of the planning area for a 10 year period.*
- (3) *A plan may, with respect to a planning area*
- (a) *describe and determine the physical, economic and social environment;*
 - (b) *describe existing and proposed transportation networks and proposed networks of streets;*
 - (c) *establish areas for comprehensive development;*
 - (d) *propose the phasing in of development;*
 - (e) *establish a program of public works;*
 - (f) *provide for the protection, use and development of environmentally sensitive lands;*
 - (g) *provide for storm water control and erosion control;*
 - (h) *provide for the protection, use and development of natural resources and for the prevention of natural resource development with incompatible negative impacts;*
 - (i) *provide for the excavation, filling in or reclamation of land;*
 - (j) *provide for the non-removal of trees and vegetation and for other environmental matters including requiring that environmental studies be carried out prior to undertaking specified developments;*
 - (k) *provide for the height and siting of developments;*
 - (l) *provide for the use and conservation of energy;*
 - (m) *provide for and recommend the attraction, location, development and diversification of economic activity;*
 - (n) *provide for garden suites and back lot development;*
 - (o) *establish locations, provisions for and policies with respect to housing and facilities for senior citizens; and*
 - (p) *make other proposals, that in the opinion of the council or regional authority are necessary.*

1.2 TOWN AND MUNICIPAL PLANNING AREA

The Stephenville Crossing Municipal Planning Area is the area set out under the Urban and Rural Planning Act for planning and regulatory purposes.

The Town of Stephenville Crossing exercises full planning and zoning control within the Stephenville Crossing Planning Area.

The Planning Area of Stephenville Crossing covers approximately 200 square kilometres. It includes the Town of Stephenville Crossing and three Local Service Districts - Barachois Brook, Black Duck, and Mattis Point. It also takes in the Municipal Stewardship Area, the bulk of which lies outside the Town.

The Town itself takes in approximately 31 square kilometres.

More information on the Town and its Planning Area is contained within the Appendix – Background Report.

1.3 MAJOR ISSUES

Stephenville Crossing is unusual in the extent to which environmental issues – the risk of flooding, protection of water supplies, and conservation of waterways and wetlands and wild-life habitat – determine the character and future of the Town.

It means that the Town has to take measures to protect its citizens and their properties from what are likely to be increasingly serious storm and flood events brought about by climate change, protect its water supplies and protect these waterways and wetlands. The previous municipal plan addressed these issues as well.

The challenges are opportunities which will enable the Town to create a more livable and safe community which successfully integrates environmental and developmental issues, which together with other measures will help to create a more sustainable community.

2 GENERAL GOALS AND DEVELOPMENT POLICIES

Goal

The primary goal of this municipal plan is to manage environmental and developmental issues in a way that will enable the Town to maintain a livable, and safe community while accommodating a certain amount of growth and which strives to make the most efficient use of its resources and to minimize its impact on the natural environment.

This means:

- a) protecting the Town's public water supply;
- b) guiding development away from the flood prone and environmentally sensitive areas toward safer and dryer areas;
- c) the Planning Area's waterways and wetlands and the Beach are to be protected and developed as town amenities and for recreational and educational purposes (the Memorial Garden and Prairie Pond Habitat Walking Trail is an example of such a use that combines recreation and education with the conservation of a nature reserve);
- d) the Integrated Community Sustainability Plan is a part of the planning process for the Town of Stephenville Crossing.

The primary goals for the three local service districts are to maintain land use stability and protect the environment.

Development Policies

All development within the Stephenville Crossing Planning Area is managed in accordance with the land use policies and designations set out in the ensuing sections.

2.1 FUTURE LAND USE DESIGNATIONS AND POLICIES

To identify land for the future development needs of Stephenville Crossing, the following land use designations are established in the Plan and designated on Future Land Use Maps:

Town

Rural

Mixed Development Rural

Wellhead Protected Water Supply Areas

Flood Risk Areas

- Designated Floodway

- Floodway Fringe

Environmental Protection and Environmental Protection Management Unit

- Environmental Protection

- Environmental Protection Management Unit

Designated Floodway - Environmental Protection Management Unit

The boundaries between the land use designations set out on the Future Land Use maps are general only and, except in the case of roads or other physical barriers, are not intended to define exact limits. Therefore, minor adjustments may be made to these boundaries for the purpose of implementing the Plan.

2.2 GENERAL DEVELOPMENT POLICY

- (1) In addition to any other considerations under this Municipal Plan, the Town may refuse permission for a development where in its opinion services are inadequate or it is uneconomical to provide and maintain these services.
- (2) In order to ensure that development occurs in an orderly manner and that appropriate development opportunities are maximized, subdivisions and other major developments shall be co-ordinated with other existing and proposed developments and the Planning Area's road system and services. These developments may be required to provide for public access to adjacent undeveloped lands.
- (3) For larger developments in particular, the Town can require that a comprehensive plan of development be prepared and adopted before any

development is permitted. This comprehensive plan would show the details of the development and indicate how the balance of the affected area is to be accessed and developed.

- (4) When reviewing a development proposal, and determining whether to grant a permit or refuse a permit or attach conditions to a permit, the Town shall consider:
- a) whether the property is likely to be affected by flooding or other natural event and/or an event brought about by climate change using the best available information about these events;
 - b) the suitability of a site in terms of steepness of grades, soils and geology, location of waterways and wetlands and shall, when considering approval, ensure that the development has minimal or no negative effects on other properties and bodies of water; and

based on this information the Town may reject the application, approve the application or approve the development proposal subject to conditions.

- (5) If in its opinion, the development of the site having certain characteristics, such as steep or unstable slopes, poor drainage, high water-table and so forth, could create problems for the development of the site or nearby properties, the Town can require the submission of a review of the development proposal by a certified engineer, landscape architect or similar professional.

Among other matters, the review shall evaluate the adequacy of site grading, drainage and landscaping and the potential of the development to cause erosion onto and pollution of adjacent properties and bodies of water.

Based on this information the Town may reject the development application, approve the application or approve the application subject to conditions.

2.3 CONDITIONS – ALL DEVELOPMENT

(1) Services and Access

Services and access must be appropriate to the type and scale of development.

The Town shall ensure that new development makes efficient use of existing roads and infrastructure. The Town shall further ensure that new development will not create unreasonable servicing demands or costs.

Within the area covered by the Limit of Servicing Plan 1991 as amended, development shall be connected to municipal water and sewer services. If deemed feasible by the Town, development adjacent serviced areas may be connected to the Stephenville Crossing municipal water and sewer systems provided that there is sufficient capacity in the existing systems and provided that the developer agrees to pay for the cost of the extension of the services.

Development lacking either municipal water and/or municipal sewer services shall be approved by the Department of Government Services and other relevant agencies before a permit is issued by the Town.

(2) Uses Allowed In All Designations

Subject to certain conditions and approvals, accessory buildings and uses, conservation, public utilities and services, recreational open space and roads and trails can generally be allowed in all designations as either permitted or discretionary uses. However, certain restrictions or prohibitions on these uses may apply within the Well Head Protected Water Supply Areas and Environmental Protection and Management Unit Areas.

(3) Compatibility of Uses, Buffers and Screening

The Town shall ensure as much as possible that new development will not negatively affect existing and proposed land uses by creating a hazard or nuisance such as noise, dust, odour or unsightly appearance. The Town may require a developer to provide appropriate screening and to undertake other measures to minimize negative effects.

2.4 ADVERTISEMENTS AND SIGNS

Signage should facilitate orientation within the Planning Area and help promote its human and physical resources in a way that contributes to the overall attractiveness and distinctiveness of Stephenville Crossing and its environs.

Regulations shall ensure that signs are not hazardous to traffic and are in compliance with Provincial policy.

2.5 AGRICULTURE

The Town's policy is to protect agricultural operations and resources by requiring compliance with applicable Provincial regulations and policies.

Higher intensity livestock and related agricultural uses shall be separated by an adequate buffer between existing and proposed residential developments. These agricultural uses shall conform to Provincial Government policies with respect to such operations.

In general, all agricultural operations shall be approved by the Department of Natural Resources, Agrifoods Development Branch.

2.6 ARCHAEOLOGICAL AND HERITAGE RESOURCES

The Town shall endeavour to conserve and develop its heritage resources. It shall encourage the preservation of buildings and sites of historic interest, through regulation and/or other suitable means, including the designation of selected buildings and sites.

Archaeological sites and discoveries are protected under the Historic Resources Act, 1985. If such a site is discovered, development shall stop and the Provincial Archaeology Office of the Department of Tourism, Culture and Recreation consulted. Also, if any major development is proposed, the Provincial Archaeology Office shall be advised before an approval is granted by the Town. This is to ensure that the necessary research is carried out before construction begins. Special consideration must be paid to development in and around Rothesay Bay and St. George's River.

2.7 COMPREHENSIVE DEVELOPMENT

At the discretion of the Town a major comprehensive development containing two (2) or more individual developments and at least one (1) hectare in area may be permitted as a single comprehensive development on public or private roads and services.

While the use classes and overall density of the comprehensive development must comply with the use zone schedule of the zone in which it is located, other standards can be modified or waived.

The development must be compatible with adjacent development.

The comprehensive development itself must access a publicly owned and maintained road and have municipal water and sewer services.

2.8 DISCRETIONARY POWERS

Under the Urban and Rural Planning Act [Section 35 (1) (e) (viii)] and this Municipal Plan and the Development Regulations, the Town can exercise broad discretionary powers over development to ensure that development occurs in accordance with the other provisions of this municipal plan and in accordance with the applicable legislation while protecting the rights of developers and the community.

Discretionary powers are exercised over a wide range of developments, including discretionary uses, non-conforming uses, variances and developments which under the Act and in the opinion of the Town require the exercise of such powers.

The criteria for exercising discretionary powers under this plan are as follows:

- a) the applicant and the likely affected parties and the general public and other persons or agencies (Provincial, Federal, non-profit) are given adequate notification and opportunity to comment on the application and the decision of the Town;
- b) the discretionary power is exercised in a clear and fair (unbiased) manner;
- c) the exercise of the discretionary power is properly documented.

2.9 DISCRETIONARY USES

Unless it is specifically set out as a discretionary use in the Municipal Plan, the Town may decide that a use be set out as a discretionary use under the Development Regulations, where:

- a) it determines that the use could negatively affect the predominant uses of the zone and that in order to mitigate this impact it is desirable to consult with the public and possible affected parties prior to issuing, issuing subject to conditions, or refusing, a permit; and/or
- b) it is necessary to attach conditions to an approval that differ from the standard conditions under the Development Regulations to ensure that the discretionary use is compatible with nearby uses and the predominant uses of the designation and zone and complies with the Municipal Plan.

2.10 ENVIRONMENT

In reviewing an application for a permit, the impact of a development on the land, marine and air environment of the Planning Area shall be considered and Provincial policies on the environment complied with.

A number of these issues are addressed under separate sections of the Municipal Plan.

2.11 FORESTRY

Before any permit is issued for development, including forestry, within the Rural, Environmental Protection, or Environmental Protection Management Unit designations, the Forest Resources Division of the Department of Natural Resources shall be consulted.

2.12 MINERAL EXPLORATION

- (1) Mineral Exploration is subject to the approval of the Department of Natural Resources, Mineral Lands Division, and other departments and agencies as may be required.

- (2) Subject to the other provisions of this Municipal Plan, mineral exploration which is not classed as development by virtue of drilling, appreciable ground disturbance, construction of access roads, noise, odour and appearance can be permitted anywhere in the Planning Area, provided that adequate notification is provided to the Town.

- (3) Mineral exploration which is classed as development can be permitted as either a permitted or discretionary use in the Rural and other designations, provided that adequate provision is made for buffering/and or other mitigations of impacts on existing or future urban residential, commercial, industrial, institutional and recreational areas and provided that all necessary approvals are obtained.
 - a) Buffering may take the form of a buffer between such mineral exploration and areas set aside for urban purposes within which higher impact mineral exploration is either prohibited outright, or is treated as a discretionary use.

 - b) Higher impact mineral exploration shall be subject to conditions that control noise, appearance, duration of the drilling or excavating program and the control of other impacts that may arise. The precise nature of these controls will depend upon the location of the mineral exploration in respect to built-up areas and uses sensitive to noise and ground disturbance.

 - c) Where there is ground disturbance, the developer shall provide a site restoration surety and/or other satisfactory guarantees of site landscaping to the Town.

2.13 MINERAL WORKINGS

There are a number of continually or intermittently active mineral workings within the Planning Area and in and near the built up part of Stephenville Crossing.

Subject to the approval of the Mineral Lands Division of the Department of Natural Resources, the Town can allow mineral workings in areas where there are known aggregate supplies and where there is not likely to be conflict between mineral workings and other uses. These mineral workings are subject to controls that will minimize environmental damage, conflict with other land uses and ensure that inactive areas are properly landscaped.

2.14 MUNICIPAL STEWARDSHIP PROGRAM

- (1) Under the Stewardship Agreement of April 1995, the Town and its residents became stewards of the wetlands within the Stewardship Zone. When deciding whether or how to allow a new development or endeavour in the Stewardship Zone, the Town shall take into account the value and vulnerability of the potentially affected wetlands. The Town commits to eliminate or minimize the effects of human activity on wetlands within the Stewardship Zone.
- (2) For areas within the Stewardship Zone the Eastern Habitat Joint Venture will provide consultation on wetland habitat enhancement, wetland interpretation, impact assessment and mitigation of wetland development, alternatives to wetland development.
- (3) Management Units
 - a) Management Units are those wetlands defined in consultation with the Eastern Habitat Joint Venture as critical to waterfowl.
 - b) Since the Management Units are areas on which waterfowl depend for nesting, brood rearing or staging, they require more protection than the Stewardship Zone.
 - c) Under the Municipal Plan and Development Regulations these areas are designated and zoned Environmental Protection - Management Unit and development and access by motorized vehicles via trails is carefully controlled or in some instances prohibited.
 - d) Lands designated Environmental Protection which are also Management Units are shown on the Future Land Use Maps as Environmental Protection - Management Unit to signify that additional restrictions on access and development may be required in sensitive areas, including a prohibition on the use of all terrain vehicles (ATVs) on the sand dunes of Rothesay Bay.
 - e) Non-consumptive and non-destructive human activities, like hiking, canoeing and birdwatching are permitted within Management Units.

2.15 NON-CONFORMING USES

In accordance with the provisions of the Urban and Rural Planning Act 2000 and the Development Regulations, existing legal non-conforming uses are allowed to continue and can be expanded or exchanged for another non-conforming use.

2.16 PROTECTED ROAD ZONING REGULATIONS

Highways 460 (Port Au Port Highway) and 490 (St. George's Highway) are both Protected Roads under the Urban and Rural Planning Act 2000, Protected Road Zoning Regulations. Within the Town, development within 100 metres of the centre-lines of these highways is subject to approval of the Government Service Centre. Development outside the Town of Stephenville Crossing, but within the Municipal Planning Area development within 150 metres of the centre-lines of Highways 460 and 490 is subject to the approval of the Government Service Centre.

2.17 TRAILS and NEWFOUNDLAND T'RAILWAY

The Town and Municipal Planning Area contain numerous well-known trails, including the T'Railway and former roads which are used for motorized and non-motorized recreational purposes.

Most of these trails and the T'Railway are protected under the Plan and Development Regulations to ensure that they continue to play an important role in the recreation, health and sustainability of the community.

The Town may require that any development within a specified distance of a significant well established and clearly demarcated trails and the T'Railway to be reviewed to ensure that development does not negatively impact such trails. Where deemed necessary, the Town may require that a buffer be provided by the developer. Wherever possible, this buffer shall extend at least 15 metres from either side of the trail for a corridor width of 30 metres.

In the built-up part of Stephenville Crossing, the T'Railway may only have the minimum right of way as the corridor.

2.18 WATERWAYS AND WETLANDS

- (1) Sound environmental and engineering practice and protection of the Town's amenities make it the general policy of the Town to protect all important waterways and wetlands of the Stephenville Crossing Municipal Planning Area.
- (2) The basic Provincial policy is to protect waterways and wetlands. These policies are set out in statutes, particularly the Water Resources Act, the Environmental Protection Act and various policy directives, including Newfoundland and Labrador and Policy Directives W.R. 91-1 - Infilling Bodies of Water, W.R. 97-1 - Development in Shore Water Zones and W.R.-97-2 - Development In Wetlands. The Lands Act provides for a 15 metre Crown Land reserve along all Crown waterways - which can be reduced to 10 metres in certain cases.
- (3) A protective buffer of undisturbed soil and vegetation shall be preserved along the shoreline of all waterways and wetlands, except very minor ones. The buffer shall be sufficient to prevent erosion, retain natural drainage features, prevent siltation, preserve public access and protect fish habitat.
- (4) Subject to the appropriate approvals and reviews, only trails and accessory uses and uses requiring direct access to a body of water may be permitted in these buffer areas.
- (5) The matter of adequate and usable legal public access to the waterway may be used as a consideration in the review of an application for a structure within a buffer and/or waterway.
- (6) Any activity that has the potential to affect fish habitat, and any development within 100 metres of the Harry's River shall be forwarded to Fisheries and Oceans Canada for review.

The minimum buffer is measured from the high water mark and the Designated Floodway as shown on the Future Land Use Maps of the river, stream, pond, lake or other body of water and wetland. If the embankment is steep as set out in the Development Regulations, then the buffer is measured from the top of the embankment.

If a waterway or wetland is deemed to be minor, wherever possible such waterways and wetlands shall remain undeveloped and protected by a buffer. If a site is to be developed, alternatives to covering over or eliminating such waterways and wetlands shall be explored, including relocation of the waterway or wetland and/or redesign of the development.

2.19 WINDMILLS, WIND TURBINES, ALTERNATE ENERGY SOURCES

Wind mills, wind turbines, wind farms and other energy forms, including solar based and small hydro generating facilities can be entertained as a use within the Planning Area. On a large and small scale alternate energy sources can assist in the environmental and economic sustainability of the community.

Utilities, which include wind mill, wind turbines, wind farms, and other energy generating systems that do not fall under the definition of a public utility, together with access roads and associated facilities, are subject to the approval of relevant provincial and federal departments and agencies and public utilities. The design and location of such utilities shall take into consideration their impact on nearby land uses and persons, the environment and archaeological resources within the Town, along with other matters that the Town may deem to be significant. For example, in order to prevent damage to persons and properties due to the failure of windmill or any of its components or the shedding of ice, the Town shall ensure that there is adequate separation distance between the windmill and nearby structures and properties.

The design, construction and location of a windmill or other utility shall be certified by a competent professional who has consulted with the required agencies.

3 DESIGNATIONS

3.1 TOWN

All development in this designation is reviewed to ensure compliance with the requirements of Section 3.5 – Wellhead Protected Water Supply Areas.

The Town designation is designed to sustain and develop the existing character of Stephenville Crossing. This designation enables the Town to allow an array of compatible residential and non-residential uses as permitted or discretionary uses.

Permitted Uses can include: Antenna, Bed and Breakfast and Boarding House, Child Care, Conservation, Double Dwelling, Family and Group Care Centre, General Service, Medical and Professional, Office, Personal Services, Recreational Open Space and Trails, Row Dwelling, Single Dwelling and Subsidiary Dwelling.

Discretionary Uses can include: Apartment Building, Campground, Catering, Cemetery, Club and Lodge, Collective Residential, Commercial-Residential (eg. hotel, motel, inn), Communications, Convenience Store, Cultural and Civic, Educational, General Assembly, General Industry, Indoor Assembly, Light Industry, Medical Treatment and Special Care, Mineral Exploration, Mobile Home, Outdoor Assembly, Place of Worship, Protection (fire and police stations), Service Station, Shop, Take-out Food Service, Taxi Stand and Transportation.

The Town will carefully regulate uses to ensure that they are located and designed in such a way to as to be compatible with other uses in the area and in predominantly residential areas, only uses compatible with residential development can be allowed.

Family group care centre use is permitted in any dwelling or apartment that is adequate in size to accommodate the number of persons living in the group, inclusive of staff, provided that in the opinion of the Town, the use of the dwelling does not materially differ from, nor adversely affect, the amenities of the adjacent residences, or the neighbourhood in which it is located. The Town may require special access and safety features to be provided for the occupants before occupancy is permitted.

Serviced and Unserviced Development

Development in this designation shall be connected to municipal water and sewer services within areas covered by the Limit of Servicing Plan. Unserviced or partially serviced development can be allowed along a portion of Seal Cove Road that lies outside the area included within the Limit of Servicing Plan subject to the approval of the Department of Environment and Conservation and the Department of Government Services.

3.2 MIXED DEVELOPMENT RURAL

The Mixed Development Rural designation is designed to accommodate a mixture of appropriate uses in the Local Service Districts of Barachois Brook, Black Duck and Mattis Point on properties which may or may not have one or both municipal services.

Permitted uses include: Antenna, Conservation, General Service, Recreational Open Space, Single Dwelling and Transportation.

Discretionary uses include: Bed and Breakfast and Boarding House, Child Care, Campground, Catering, Cemetery, Club and Lodge, Communications, Convenience Store, Cultural and Civic, General Industry, Indoor Assembly, Light Industry, Medical and Professional, Office, Personal Services, Protection, Medical Treatment and Special Care, Mineral Exploration, Mobile Home, Outdoor Assembly, Place of Worship, Shop, Take-out Food Service, Taxi Stand and Utilities.

A Family group care centre use is permitted in any dwelling or apartment that is adequate in size to accommodate the number of persons living in the group, inclusive of staff, provided that in the opinion of the Town, the use of the dwelling does not materially differ from, nor adversely affect, the amenities of the adjacent residences, or the neighbourhood in which it is located. The Town may require special access and safety features to be provided for the occupants before occupancy is permitted.

3.3 RURAL

The Rural designation is designed to allow uses best suited for non-urban locations lacking municipal services.

Permitted Uses include: Agriculture, Antenna, Cemetery, Conservation, Forestry, Mineral Exploration, Recreational Open Space and Transportation.

Discretionary Uses include: Animal, Bed and Breakfast, Campground, General Industry, Mineral Working, Scrap Yard, Single Dwelling and Utilities.

General Industry is limited to a resource-based industrial use.

A single dwelling is only allowed as a use accessory to a resource-based use. In almost all cases it will be accessory to an agricultural use. Activities accessory to a residential use can be allowed in single dwellings under this designation.

3.4 FLOOD RISK AREAS

Pursuant to the Federal- Provincial Flood Damage Reduction Programme and the Department of Environment and Conservation Policy Directive, W.R. 96-1, the Municipal Plan identifies two flood risk areas on Future Land Use Maps 1 and 2. These policies attempt to adhere to the Policy Directive insofar possible. Where there is a conflict between the Municipal Plan policies and the Policy Directive the Policy Directive W.R. 96-1 shall prevail.

Any development within a flood risk area shall be subject to the written approval of the Minister of Environment and Conservation in accordance with the Water Resources Act.

The Flood Risk Areas are Designated Floodway (1:20 year) and Floodway Fringe (1:100 year).

The boundaries of the Flood Risk Areas have been derived from data supplied by the Department of Environment and Conservation. The original data about the Flood Risk Areas boundaries is available from the Department of Environment and Conservation, Water Resources Division.

Due to the convoluted nature of the Flood Risk Areas boundaries, certain pockets of land that would otherwise be incorporated into a Floodway Fringe type of designation or other designation are included within the Designated Floodway designation.

In particular, all of the Black Duck Flood Risk Area is deemed to be Designated Floodway.

Objectives

The objectives of this policy are to:

- prevent loss of human life and avoid personal hardships,
- minimize flood damage to properties and the environment
- restrict activities which would degrade water resources,
- maintain the natural capability of waterways to convey flood flows
- minimize disruption of transportation, social and business activity.

Structures in a Flood Risk Area

A structure in a Flood Risk Area can only be permitted where:

- the ground floor elevation of the structure is higher than the 1 in 100 year flood level;
- the structure will not interfere with the flow of water or displace water such that it creates a worse flooding situation for other properties;
- the structure and the associated utilities have been designed and constructed in accordance with the approved flood proofing guidelines of the Department of Environment and Conservation and entrances and exits from the building can be safely used without hindrance in the event of a flood;
- the proposed use of the facility and site will not involve any storage of pollutants such as fuels, chemicals, pesticides and so forth.

Additional conditions may be set out for specific projects and included in a permit issued under section 48 of the Water Resources Act.

Additions and Modifications to Existing Development

Additions, modifications, enhancements and improvements to existing structures where there is an increase in the floor area within the flood plain, will be assessed for suitability in the same way as the project category as a whole.

3.4.1 Designated Floodway Designation

Within this designation only the following uses can be considered for approval: antenna, conservation, docks and wharves, hydraulic structures, recreational open space and trails and structures related to the use of water resources. See also Section 3.7 – Designated Floodway- Environmental Protection Management Unit.

3.4.2 Floodway Fringe Designation

Within the Floodway Fringe designation, permitted uses include: antenna, conservation, double dwelling, mobile home, recreational open space and trails, single dwelling and structures related to the use of water resources including hydraulic structures.

Discretionary uses include: office, public utilities, roads and services, transportation and uses requiring direct access to a body of water.

3.5 WELLHEAD PROTECTED WATER SUPPLY AREAS

Except for Wellhead Protected Water Supply Area - A which is a standalone designation, the Wellhead Protected Water Supply Areas are shown Future Land Use Maps 1 and 2 as an overlay to other designations. There are four such areas which overlay the other designations:

- Wellhead Protected Water Supply Area - B – beyond 100 metres up to 250 metres from the well-heads;
- Wellhead Protected Water Supply Area - C – beyond 250 metres up to 500 metres beyond from the well-heads;
- Wellhead Protected Water Supply Area - D – beyond 500 metres and the remainder of the overall Wellhead Protected Water Supply Area; and,
- Barachois Brook Wellhead Protected Water Supply Area has a buffer of 300 metres from the wellhead. .

3.5.1. General Conditions

- (1) Any development except renovations to an existing structure, fences and minor landscaping shall be referred to the Department of Environment and Conservation for approval before a permit is issued by the Town.
- (2) In addition to the protections offered under the Municipal Plan and Development Regulations municipal water supplies are protected by the

Province. The provisions of the Development Regulations concerning the well head protection areas shall comply with provincial policy.

No development shall or may be permitted within this designation that could contaminate the water supply.

- (3) Within any of the Well-Head Protection Area overlay designations, the following chemicals/activities are prohibited unless it has been proven to the satisfaction of the Minister of Environment and Conservation that such uses will not cause deterioration of the quality of the water supply over the long term and that measures satisfactory to the Minister have been undertaken to prevent leaks or contamination from tanks and other storage facilities into the aquifer of the well:

- a) petroleum fuels in excess of 25 L;
- b) petroleum solvents in excess of 10 L;
- c) chlorinated solvents in excess of 10 L;
- d) pesticides and preservatives in excess of 10 L;
- e) new sewerage systems
- f) manure storage;
- g) manure application;
- h) mining and aggregate removal;
- l) inorganic fertilizers (no bulk storage);
- j) forestry (salvage cutting permitted);
- k) sawmill operations;
- l) groundwater extraction (non private wells);
- m) groundwater heat pumps;
- n) road salt (no bulk storage);
- o) waste disposal.

- (4) Tanks and other material containment facilities shall be inspected at least once a year to ensure their soundness in accordance with the standards established by the Minister of Environment and Conservation.

3.5.2. Permitted and/or Discretionary Uses

- (1) Wellhead Protected Water Supply Area - A or within 100 metres of the Barachois Brook wellhead – The only use permitted is conservation.
- (2) Wellhead Protected Water Supply Area - B – The only permitted uses are antenna, conservation, medical treatment and special care (homes for the aged only), public utilities and public services, recreational open space and

trails, and single dwellings and uses accessory to single dwellings, subsidiary apartments and subsidiary dwellings.

- (3) Wellhead Protected Water Supply Area - C – The only permitted uses shall be antenna, conservation, medical treatment and special care (homes for the aged only), public utilities and public services, recreational open space and trails, and single dwellings and uses accessory to single dwellings, subsidiary apartments and subsidiary dwellings.
- (4) Wellhead Protected Water Supply Area - D – The only uses permitted in the remainder of the buffer area are conservation, public utilities and services and recreational open space and trails. Residential and other non-contaminating uses can be allowed along existing roads or in accordance with a plan approved by the Town and the Department of Environment and Conservation.
- (5) Barchois Brook Wellhead Protected Water Supply Area – within 100 metres of the wellhead only conservation is permitted. Between 100 and 200 metres of the wellhead, other uses may only be permitted with the approval of the Department of Environment and Conservation.

3.6 ENVIRONMENTAL PROTECTION AND ENVIRONMENTAL PROTECTION MANAGEMENT UNIT

All development under the Environmental Protection and Environmental Protection Management Units designations is subject to the approval of the Minister of Environment and Conservation before a permit is issued by the Town.

3.6.1 Environmental Protection Designation

The Environmental Protection designation is designed to protect environmentally sensitive areas, including major wetlands and waterways, the beach and the tuckamore wind-break.

The only permitted use in the Environmental Protection designation is conservation. The only discretionary uses in the Environmental Protection Designation are agriculture, public services and public utilities, roads and driveways and recreational open space and trails and structures related to the use of water resources, uses requiring direct access to a body of water, such as a wharf or a hydraulic structure. Agriculture is limited to cranberry farms.

3.6.2 Environmental Protection Management Unit Designation

The only permitted use in the Environmental Protection Management Unit designation is conservation. The only discretionary uses in the Environmental Protection Management Unit Designation are public services and public utilities, roads and driveways and recreational open space and trails.

Where necessary to protect wild-fowl habitat, trails for motorized vehicles can be limited or even prohibited within the Environmental Protection - Management Unit as described under Section 2.13 (3) of this Municipal Plan.

3.7 DESIGNATED FLOODWAY - ENVIRONMENTAL PROTECTION - MANAGEMENT UNIT

Because of the overlap of the Designated Floodway and Environmental Protection Management Unit designations in Black Duck, and because both designations have equal effect, in order to secure compliance with the Department of Municipal Affairs a separate designation was created.

Within this designation the approval of the Department of Environment and Conservation for a development shall be obtained before any permit is issued by the Town.

Development in this designation is subject to the requirements set forth in Designated Floodway and Environmental Protection Management Unit designations.

APPENDIX BACKGROUND REPORT

The Town of Stephenville Crossing is located at the easternmost limit of St. George's Bay. It derives its name from the Newfoundland Railway, which ran through the community on its way from Port aux Basques to Corner Brook.

The Towns of Stephenville and St. George's are its immediate neighbours. The 2006 population of the Town of Stephenville Crossing is 1,960 which in 2001 was 1,993. The 2006 populations of Stephenville and St. Georges are 6,588 and 1,246 respectively showing declines of 7.3% and 8% respectively from 2001. Stephenville Crossing's population dropped by 1.7% in the same period.

When the original municipal plan was completed in 1986, the Town's population had been estimated at 2,764 (1981 Census). There is a total of 810 private dwellings (Statistics Canada). The Town occupies a land area of 31.20 square kilometres. While on average the number of new home permits issued has been about five per year, due to declining household size, the Town's population is not expected to increase.

Stephenville is a significant urban centre, with an airport, and major medical, educational, shopping, a major regional library, an arena and other services and facilities which serve the entire Southwest of the Island.

Highways 460 (Hansen Highway), 461 (White's Road) and 490 (Stephenville Access Road) provide access to Stephenville Crossing. Stephenville Crossing is an hour's drive from Corner Brook and two hours from Channel Port Aux Basques, the Marine Atlantic Ferry Terminal. Deer Lake Airport is two hours away.

The Town contains a limited array of commercial services – including a pharmacy, post office, a bank, a service station, a small supermarket and a building supplies company, but a fair base of non-commercial services – a clinic, a long term care centre, an elementary school, and a campus of the College of the North Atlantic (the main campus and provincial head office is located in Stephenville). High school students go to St. George's.

New housing construction has occurred mainly in the higher areas away from Rothesay Bay and St. George's Bay. The average number of new dwelling permits has averaged five to six per year over the past five years.

FLOOD RISK AND WATERWAYS AND WETLANDS

The "core area" – Main Street, Seal Cove Road and West Street, and the roads running between Seal Cove Road, Main Street, West Street and the Stephenville Access Road

which parallels the beach to the trestle, is a beach affected by tidal movements, storm surges and flooding from George's River. Periodically, there have been disastrous floods, including those of 1951 and 1977.

Lesser flooding events have occurred from time to time, once which in the Spring of 2003 caused flooding in the lower lying areas and affected 45 dwellings. This 2003 event took place because of heavy rain combined with a frozen Harry's River and Rothesay Bay.

The most current flood risk mapping which was published in 1989 places a good deal of this area in a flood risk area.

Tidal movements cause water to enter this core area because of the high porosity of the soils and the proximity of this area ("The Beach") to sea level, with elevations ranging from slightly below sea level to 1.6 metres above mean sea level in the core area. This is a recurrent problem that is compounded during periods of high onshore winds and heavy rainfall.

Climate change is increasing the likelihood more flood events due to increased sea levels, more frequent storms and greater precipitation. This renders the current flood risk mapping somewhat out of date, and indicates that emphasis must be placed on emergency planning, and land use and other policies which keep development away from hazardous areas, protects the natural storm barriers – the beach dunes and the stands of tuckamore along the landward side of the beach and Highway 490.

Fortunately, the major roads have always remained open – principally Highway 490 and White's Road to Highway 460 (Hansen Highway).

Another factor to consider in development is the major wetlands and waterways surrounding the community on all sides. Wetlands associated with St. George's River are a significant bird and other wild-life habitat, and much of it is taken up with the Stewardship Agreement and Zone under the Eastern Joint Habitat Venture of the Department of Environment and Conservation. The original agreement was signed in April 1995.

NEWFOUNDLAND T'RAILWAY

The former railway bed is part of the Newfoundland T'Railway, which extends from St. John's through the Town and on to St. George's, Flat Bay and other communities toward Channel Port Aux Basques.

WATER AND SEWER SERVICES, SOLID WASTE DISPOSAL

The Town is almost fully serviced with municipal water and sewer, and almost all of the Town's dwellings and businesses are served by municipal water and sewer services.

Water is supplied from a seven wells in a well field located north east of Seal Cove Road. This well-field is protected by buffers that extend up to 500 metres from the well-heads. Development is severely limited within 100 m of the well heads to conservation uses, and then single and other non-polluting uses within between 100 and 250 metres of the well-heads, and then, certain other uses in the built-up area between 250 and 500 metres of the well-heads. Uses which can contaminate the water supplies are not allowed under any circumstances, and attempts are to be made to remove existing pollution sources.

However, a leak-detection assessment of the Town's water system during October and November 2008 indicated that the system was wasting slightly more than three times the water it should have been using if there were no leaks. The daily drawn down from the wells was 520,265 gallons per day, when it should have been 168,000. A further analysis and recommendations for solutions is to be carried out. A ball-park estimate for carrying out this work is \$6,000,000 if the Town is to have a brand new distribution system including laterals and reinstatement of roads.

Piped sewage is taken out into Rothesay Bay and short term goal is to have the outfalls extended to achieve better dispersal. In the long term, the Town intends to have its sewage treated.

Stephenville Crossing garbage is taken to a site in the St. George's area shared by the communities of Barachois Brook, St. Teresa's, Black Duck and Mattis Point.

HOSPITALS AND PERSONAL CARE FACILITIES

Sir Thomas Roddick Hospital is a 56 bed acute care center with a comprehensive range of inpatient and outpatient services. The wide range of services are provided, primarily, for the population of the Bay St. George area. The catchment area serviced by Sir Thomas Roddick Hospital is between Lourdes east to Gallants and south to the Jeffrey's/St. Fintan's area.

The hospital has five nursing units: Medical nursing unit which includes medicine, pediatrics and palliative care; OBS/Gyn/Mental Health Unit includes new born nursery, birthing rooms, post-partum, ophthalmology, gynecology and mental health; Medical/Surgical unit which includes, general surgery, acute medicine and intensive care; Outpatient/Emergency department which is staffed with nursing and medical services twenty-four hours per day. Outpatient services offered include chemotherapy administration program (adult only), visiting consultants (internal medicine, pediatrics and orthopaedics), endoscopy/colonoscopy, and clinics which include internal medicine, surgery (general and gynecology) and obstetrics.

Western Memorial Regional Hospital, located in Corner Brook, is the core of Western Health Care Corporation. With a staff of 1,200 people, Western Memorial is the referral

centre for the Western Region, providing the majority of secondary care services for the Health Region's population base.

Other related services include the Stephenville Crossing Medical Clinic, Public Health Nurse, Bay St. George Long Term Care Center, Crossing Dental Clinic, Tender Loving Care Home Care, Meals on Wheels and a private ambulance service.

LIBRARY

The Western Newfoundland – Labrador Library Board operates the Stephenville Crossing Library located above the Stephenville Crossing Town Office. The Town supports the library by providing the space free of charge. This will be moved to the St. Michael's Elementary School with its own entrance and facilities. The library is also a CAPS site where persons of all ages can access the internet.

This one of a number of libraries within the Region, including one in St. George's and the major Kindale Library in Stephenville.

This library, and many others like it in communities throughout the region and province provide a vital space for young and old people to acquire literacy skills, read, relax, and learn, and also, are a vital resource in preserving the heritage of these communities by providing an archival service for materials that otherwise would be lost.

EMERGENCY SERVICES

Emergency services are provided through the Stephenville Crossing Volunteer Fire Department located in the Town Hall, and, ambulance services supplied from the Hospital located in Stephenville. The fire hall is to be relocated to an expanded Search and Rescue (SAR) facility located on West Street.

The Fire Department serves a number of local communities within the immediate area, including Barachois Brook, Black Duck and Mattis Point.

DEVELOPMENT POTENTIAL

For the purpose of this plan, the Town's population is not expected to appreciably change from its 2006 population of 1960, and the rate of development is expected to be modest.

New development is most likely to occur along Brook Street (Highway 461) toward the Hansen Highway (Highway 260) and along and off Seal Cove Road due to availability of suitable land, and reduced exposure to flooding.

LOCAL SERVICE DISTRICTS

There are three local service districts within the Stephenville Crossing Municipal Planning Area. Only the Black Duck Local Service District has a legally defined boundary.

Black Duck derives its water supply from two unprotected wells which serve in total 54 households. A significant portion of Black Duck lies within a Flood Risk zone as identified on the flood risk mapping.

Mattis Point obtains water from an unprotected well, and in addition there is a watershed which appears to have set aside for a future water supply. However, due to problems with the system, residents are increasingly relying upon private wells.

Barachois Brook is served by a protected well, and is partially serviced.

The unprotected wells and potential water supply area are not regulated under the Municipal Plan and Development Regulations.

HISTORY

The Hanson Memorial Highway was constructed by the United States Army Air Force to link the railway line at Stephenville Crossing with Harmon Field, under construction on the other side of a hill to the north in Stephenville. Later, the USAF built its own railway line from Stephenville Crossing to Stephenville. (Wikipedia, April 4, 2008)

When the railway came to Stephenville Crossing in 1896 less than 100 people were living here. The first settlers included the Benois, Lucas', Alexanders and Youngs. The main employment other than farming, was logging, the cutting of railway ties, and railroad construction for the Reid Company.

In the fall of 1896 the bridging of the Gut was completed, when an elaborate new Lift bridge, which could open to allow the passage of ships, was finished. Early in 1898 the bridge was washed out and had to be repaired to allow for the first crossing of

Newfoundland by a train in 1898. Locals recount that the lift was only used once and in 1901 use of the lift was discontinued. When the rail line was completed to Port au Basques, Stephenville Crossing became a regional headquarters for sectionmen.

A mill opened in Corner Brook in 1925 and the railway became closely tied to the logging activity in the Crossing area. Thousands of logs were floated down through the bay area, bundled, then loaded on flat cars for shipping to various points in Newfoundland including Stephenville to help in the construction of Harmon Air Base in 1941.

The building of the railway encouraged growth and the community had increased in size to a population of 156 by 1911 and to 512 by 1935. A general business, owned by Charles McFatridge of Sandy Point, a lumber mill owned by Antonio Nardini, and a large dairy farm owned by Charles White, were built around this time. The farm was expanded during the first World War and began to manufacture butter and oleo margarine. Mr. White's name is commemorated at nearby White's Road (Highway 461), which was the head of the spur to Stephenville.

A new steel bridge was constructed in 1940 with a side piece built on to accommodate vehicles. There was only one lane traffic on the bridge and cars had to take turns crossing.

A Canadian National Railway Station was built around 1945. The first station agent in Stephenville Crossing was Joseph O'Keefe who came from Placentia, to help put the railway through to Port au Basques. The Crossing became the regional camp for sectionmen, and the railhead for nearby Stephenville and the Port au Port Peninsula. The community was very busy during the war years and for some time after due to the handling of freight for Harmon Field. There were several spurs, a siding for passing trains and some freight sheds.

The demand for materials and equipment was great and a rail line was built around Indian Head to connect Stephenville with the Newfoundland Railway at White's Road. The line was named the Gull Lake Railway but locals referred to it as the "Loose Moose Line". Harmon Base ran its own trains to and from White's Road using its own small diesel locomotives. Beginning in the late 40's and extending beyond the 50's the daily routine of the Gull Line was to drop off loads and pick up empties at the White's Road spur.

Use of the steel bridge stopped in the late 1980's, when a new two lane bridge constructed of concrete and steel was built at the Gut, which is in use today. The old bridge and the new, stand side by side, as reminders of what the railway meant to Stephenville Crossing.

Newfoundland's 547-mile railway was the longest narrow gauge railway in North America, providing regular trans-island passenger service for 71 years. Beginning in 1898 and ending in 1988 it will forever remain an intrinsic part of the history of Stephenville Crossing.

(Source: "Stephenville Crossing – A Town for All Seasons" website)

PHYSICAL IMPACTS OF CLIMATE CHANGE, STEPHENVILLE CROSSING

The document below was prepared by Dr. Norman Catto of Memorial University of Newfoundland and Labrador. No date was given on this report.

Stephenville Crossing

The major physical impacts of ongoing climate change, both human-induced and natural in combination, include rising sea level, coastal erosion and storm surge activity, and flooding.

1. Sea Level Change

Sea level changes are driven by a combination of local, regional, hemispheric, or global factors. Each coastal area responds differently to a different combination of factors. Longer-term sea level rise is indicated by archaeological sites at Burgeo and Port-au-Choix. Evidence of enhanced erosion along many Newfoundland and Labrador beaches, and inundation of terrestrial peat deposits and trees, indicates that transgression is currently occurring. Currently, sea level throughout all of Atlantic Canada, with the exception of the shoreline of Lake Melville, Labrador, is rising.

At Stephenville Crossing, as elsewhere in Atlantic Canada, the observed changes in sea level result from the interplay of climate change, involving melting of the polar glaciers and consequent increase in the water volume in the oceans, with isostatic response to glaciation. The amount of melting and the consequent rise in sea level attributed to climate change alone, as estimated from GCMs (climate models), varies widely. The Intergovernmental Panel on Climate Change (IPCC, 2001, 2007) has published estimates of mean global sea level rise ranging from 9 cm to >80 cm over the next 100 years. A median value is 30-40 cm per 100 years (3-4 mm per year). This value, however, is a global average, and does not predict what could happen at Stephenville Crossing. The observed sea level rise, and the projected rise for the future, depends upon the interaction between the changing volume of the oceans and glacio-isostatic activity.

Glacio-isostatic depression due to the ca. 800-1000 m thickness of ice which covered Stephenville Crossing was sufficient to depress the Earth's crust. As glacial melting commenced, ca. 15,000 years ago, sea level rose in response. As the glaciers began to ablate, the newly exposed land was still isostatically depressed, and the sea flooded the adjacent coastal terrain. The maximum water level reached 27 m above modern sea level in St. Georges Bay.

When the coastal areas were deglaciated, the underlying land isostatically rebounded, causing the sea to begin to recede. In the Lake Melville area, adjacent to the major Laurentide ice mass centred in western Labrador, this process is still ongoing. Throughout coastal Newfoundland, however, glacio-isostatic rebound has proceeded beyond the original pre-glacial elevation of the coastal terrain. These areas are now subsiding, resulting in relative sea level rise.

Exact quantification of rates of sea level rise over short periods (decades to hundreds of years) is complicated by many factors, including local subsidence, confusion of storm and tsunami deposits with those associated with modal marine conditions, erosion induced above mean high water, and landward migration of coastal gravel barrier beaches. Assessing rates of sea level change is possible over long time scales (hundreds or thousands of years) through techniques such as carbon (^{14}C) dating, investigation of archaeological sites and infrastructure, and inspection of maps and bathymetric charts (assuming that they were accurately prepared). Assessment over intermediate time scales (decades) may be possible through study of tide gauge records. Assessment of aerial photographs, satellite imagery, and other remotely sensed data can be used to indicate vulnerable areas to coastal erosion and storm surges, and may locally indicate areas where beaches have retreated landward, although they do not directly indicate sea level rise.

Natural oscillation in sea level is related to astronomical (and tidal) factors, and variations occur from day to day due to storms. Recognition that the overall relative sea level is rising in a particular area is based on long-term and intermediate-term analyses, and the astronomical component must be accounted for ('filtered out') before a general increase in sea level can be recognized.

No definitive studies of the current rate of sea level rise have been conducted at Stephenville Crossing. However, tide gauge records at Port-aux-Basques, combined with previous investigations elsewhere along St. Georges Bay, and at Corner Brook, Port au Choix, and other locations along the Gulf of St. Lawrence, allow an estimate to be made. At Port-aux-Basques, the current rate of sea level rise is approximately 3.3 mm/a, based on the tide gauge record from 1960 through 2005. This rate is comparable to rates observed at Charlottetown, Halifax, and eastern Newfoundland. The rate of rise declines northward along the west coast of Newfoundland, reflecting increasing proximity to the former larger ice mass in Labrador. At St. Anthony, the current rate of sea level rise is ca. 1 mm/a. As the rates of sea level rise systematically decrease from south to north, Stephenville Crossing's position would suggest that an approximate rate of rise of 3 mm/a would be an appropriate estimate.

2. Sensitivity to Sea Level Rise

Adaptation is required regardless of the cause of relative sea level rise, if land is eroding, buildings are being damaged, and lives are at risk. Consideration of the geological factors, rate of sea level rise, amount of coastal erosion, wave climate, and tidal regime allow calculation of the sensitivity to sea-level rise of shoreline segments. This assessment has been completed for Atlantic Canada as a whole on a broad regional scale (Shaw *et al.*, 1998), and more detailed assessments have been conducted for the Newfoundland coastline extending from McCallum east and northeast to Cape Bonavista, using a common methodology. Seven critical parameters are considered:

1. relief,
2. rock and/or sediment type exposed along the shore,
3. landform type (e.g. cliff, beach, salt marsh),

4. tendency of sea-level change (amount of rise or fall per 100 years),
5. shoreline displacement (laterally, expressed in m / a);
6. tidal range, and
7. mean annual maximum significant wave height

Each parameter is assigned an equal weight, and ranked variations within each from 1 (very low sensitivity) to 5 (very high sensitivity). By combining the scores for each parameter, sensitivity indices (SI) can be calculated as:

$$SI = \sqrt{(\text{product of scores of all 7 parameters} / 7)}$$

Thus, a shore with the least sensitivity to coastal erosion would have a SI of $\sqrt{(1/7)}$, or ~ 0.38 , whereas the greatest value possible is $\sqrt{(5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5 / 7)}$, or ~ 108 .

Shorelines with high relief above sea level are relatively insensitive to erosion. In contrast, shorelines with relief less than the mean significant wave height are susceptible to periodic inundation, increasing the potential for erosion. Offshore of eastern Newfoundland, the mean annual significant wave height is estimated at 7 m - 8 m, with the 10-year and 100-year values estimated at 11 m and 15 m respectively. These values can be compared with the recorded 15 m height at the offshore wave-rider buoy and 18 m inundation level associated with the January 2000 event offshore of Port-aux-Basques. Estimates of significant wave heights based on modeling tend to under-predict extreme storm wave heights, and wave heights in excess of 30 m have been recorded offshore of the south coast of Newfoundland during storm events. Shorelines with relief less than 7 m, such as at Stephenville Crossing, are considered to have a very high risk relief factor (5).

The primary difference related to rock and sediment type along the coastline distinguishes areas with relatively resistant bedrock from areas of coastal barachoix deposits (such as Stephenville Crossing). The material comprising a mixed sand-and-gravel beach is sensitive to erosion (with a sensitivity factor of 3-4, depending upon the relative proportions of sand {higher} and gravel {lower}). As a landform type, the low-slung barachoix open to the direction of prevailing winds (southwesterly at Stephenville Crossing) is also sensitive to erosion (sensitivity factor 4).

The tendency of sea-level change (amount of rise or fall per 100 years) also controls coastal erosion. Coastlines with sea level rising between 21 and 40 cm/100a are assigned a sensitivity factor of 4 by Shaw *et al.* (1998). For Stephenville Crossing, sea level is currently rising at approximately 3 mm/a, ca. 30 cm per 100 years.

Sensitivity factors for shoreline displacement vary from very low (1) for accreting shorelines, through low (2) for shorelines showing no net displacement, to very high (5) for shorelines receding at rates in excess of 1 m/a. No detailed measurements have been undertaken of the rate of coastal erosion at Stephenville Crossing, and therefore a definitive value cannot be assigned for this parameter. If erosion is assumed to be relatively slow (in comparison to the rapid erosion expected for a sandy, dune-backed beach), this parameter can be assigned a value of 2 or 3.

Tidal ranges in western Newfoundland lie within the microtidal and very lowest mesotidal limits. Microtidal regimes are assigned a sensitivity factor of low (2).

The mean annual maximum significant wave height is also important in assessment of the sensitivity index. Along the Newfoundland coastline, the significant wave height establishes this parameter as having a very high sensitivity ranking (5).

By combining the values for all seven sensitivity factors, an overall coastal sensitivity index can be calculated. For Stephenville Crossing, a tentative estimate of the Coastal Sensitivity Index is:

$$CSI = \sqrt{(5 \times 3.5 \times 4 \times 4 \times 2.5 \times 2 \times 5) / 7} = 31.6$$

This value indicates a coastline sensitive to erosion due to sea level rise.

3. Storm Surge

Newfoundland, including the southwest coast, has been subjected to many significant storms, resulting in property destruction. The effectiveness of any particular storm at a location depends upon the angle of wave attack, the number of previous events during the season, and other local factors. Adjacent beaches can exhibit very different responses to a particular storm, as was evident on southwestern Newfoundland beaches impacted by Hurricanes Gustav (2002) and Frances (2004).

The northern Atlantic Ocean has been undergoing an increase in hurricane frequency and magnitude since 1995. However, the relationship between changes in hurricane frequency and magnitude, and increases in air temperature or sea surface temperature (SST), is not clear at present, and consensus does not exist as of July 2008. Although causal links between SST changes and hurricane frequency and strength have been suggested, other researchers have expressed reservations and recognized uncertainties. Regardless of the uncertainty of future changes in hurricane frequency and magnitude in response to climate change, the North Atlantic is currently undergoing a period of increased hurricane activity.

A storm surge is defined as the elevation of the water resulting from meteorological effects on sea-level. The storm surge elevation is the difference between the observed water level during the storm and the level that the astronomical high tide would normally rise to in the absence of storm activity. Although no studies have been undertaken focused particularly on Stephenville Crossing, data from the Port-aux-Basques indicates that the return time of a surge that exceeds 1 m is approximately 10 years, and every 50 years a surge will occur that exceeds 1.5 to 2 m (Charles O'Reilly, *personal communication*). The full effect of a surge may not be experienced unless it coincides with high tide, particular a high spring tide. Storm surges are associated with both winter storms (e.g. January 2000) and summer tropical storm systems (e.g. Hurricane Gustav, 2002). Rising sea level allows waves and storm surges to penetrate further inland, modifying beach morphology and sedimentology and resulting in both coastal erosion and damage to infrastructure. Storm surges can penetrate through the inlet, causing flooding along the margins of the estuaries of Harry's Brook and St. Georges River.

The coastline of southwestern Newfoundland has been subject to at least 6 storm surge events between January 2000 and June 2008. The largest of these was the storm surge of 21-22 January 2000, associated with the same event that caused substantial damage in Prince Edward Island and New Brunswick. Unfortunately, the precise magnitude of the surge cannot be determined in Port aux Basques Harbour, as the tide gauge was out of service at the time. Throughout southwestern Newfoundland, the total economic damage figure was estimated at more than \$1 million (Len LeRiche, Public Safety and Emergency Preparedness Canada, *personal communication*). Among others, lesser surge events resulted from Hurricane Gustav (12 September 2002) and Hurricane Frances (2 September 2004).

The actual monetary costs of disasters are always greater than the quoted values. Reported figures are commonly the direct cost of the buildings, property, and public infrastructure. Discrepancies between insured values, personal expenses covered by government compensation, and the actual or replacement value of the property lost can be significant. Hickman (2006) conducted an assessment of costs resulting from flood damage in selected Newfoundland communities, and noted that indirect costs substantially outweigh those resulting solely from damage to infrastructure.

The actual costs of the flooding events studied in Newfoundland were more than twice the reported figures in all instances. Applying a similar standard would suggest that the actual financial impact of the 21-22 January 2000 storm surge event would approach \$ 3 million. This figure does not account for any losses resulting in disruption to transportation between the area and the remainder of Newfoundland.

The relative timing of storm surge events with respect to astronomical high tide is critical. Hurricane Gustav (September 2002) did little damage in Charlottetown PEI, primarily because the storm surge coincided with a lower tidal position, approximately 4 hours before astronomical high tide. If the storm surge had coincided with high tide, water levels would have been comparable to those recorded during the January 2000 event, which brought widespread flooding. Storm surges induced by storm activity with southwesterly winds thus are potentially significant at Stephenville Crossing.

4. Coastal Erosion

The sensitivity of a coastline to erosion is governed by the energy and frequency of wave action, and by the physiography and geological composition of the coastal zone. Rates vary significantly in adjacent areas. As no detailed study has been conducted of Stephenville Crossing, definitive conclusions are not possible at present.

Elsewhere along the Gulf of St. Lawrence coastline of southwestern Newfoundland, erosion has affected sand-dominated and mixed sand-and-gravel beaches, notably at Grand Bay West and JT Cheeseman Provincial Park, northwest of Port aux Basques, and Sandbanks Provincial Park, near Burgeo. Along the Gulf of St. Lawrence coast of Newfoundland, the combination of rising sea level, increased human utilization of the coast for tourism purposes, and limited offshore winter ice conditions have resulted in accelerated erosion and degradation of the dunes and coastline. The beaches of southwestern Newfoundland are subject to reworking and modification throughout most or all of the year. The coastline typically remains entirely ice-free until February, and during some years, it may remain ice-free throughout the winter.

5. River Flooding

Flooding resulting from precipitation upslope could result along the west bank of Harry's Brook. However, most structures are sufficiently set back from the river to alleviate potential damage. Future building along the floodplain should be discouraged. In contrast to Stephenville, a

detailed (river-induced) flood sensitivity study has not been conducted for Stephenville Crossing. Flooding and resulting erosion could impact the bridge at Rapid Pool (Black Duck).