

## **The Sir Ambrose Shea Lift Bridge**

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### **ABSTRACT**

The Sir Ambrose Shea Lift Bridge is located in Placentia, a community located on the western side of the Avalon Peninsula, Newfoundland. The bridge was constructed in 1961 and is at the end of its lifecycle. Construction of a replacement of the bridge is planned to begin in the spring 2013.

The Sir Ambrose Shea Lift Bridge is one of a kind. The rare construction of a lift bridge was necessary to allow fishing boats to enter and leave Placentia gut, while allowing vehicles to drive between Jerseyside and Placentia. The difficult environmental conditions of wind, waves and tide created a challenging design for the bridge.

Planning the replacement bridge has led to a variety of problems. Initial estimates to complete the project were double of what was originally planned. The designs had to be revised to reduce costs. Also, to keep the bridge viable, short term repairs were necessary for the 51 year old bridge which considerably slowed down traffic in the community. Weight restrictions were placed on the bridge, banning heavy commercial vehicles from using it.

The following case study will highlight the history of crossing the Placentia gut, challenges with building and maintaining the Sir Ambrose Shea, damages and repairs to the bridge, and a description of the new bridge to be constructed in 2013.

### **1 INTRODUCTION**

The Sir Ambrose Shea Lift Bridge (figure 1&2) is a vertical lift bridge located in the town of Placentia, Newfoundland. The bridge was built in 1961 to allow vehicles to cross the Placentia gut while still allowing fishing vessels to pass underneath. The Sir Ambrose Shea is said to be unique not only to Canada but all of North America. Prior to the construction of the lift bridge, there were several other methods of crossing the gut with varying success. Over the past decade there has been a growing concern of the safety and structure of the bridge, due to its deteriorating condition as it surpassed its life expectancy in the community. The following information will focus on the history of crossing the gut, the design of the bridge, current state of the bridge and the future possibilities of a new bridge for the residents of Placentia.



**Figure 1: Aerial photograph of Placentia gut.**  
(Source: Google Earth)



**Figure 2: Sir Ambrose Shea Lift Bridge**  
(Source: Google Earth)

## 2 HISTORY

Crossing the Placentia Gut has always posed many concerns for the individuals living in the amalgamated town of Placentia. Reports suggest the issue of crossing the gut can be dated back to the first French settlers in the community during the 1800's. The French relied on a chaloupe for transportation for many years, or during the winter it was possible for ice to form a natural bridge. Privately owned fishing boats were used as a means of transportation for crossing the gut continued well into the mid 1930's. This allowed members whom didn't own a vessel to cross the gut of the community. As the community began to develop into a modern society their reliance on boats to cross the gut became more of a concern. During the construction of the railway the concern became for significant importance. There needed to be a more efficient way to deliver the goods to Placentia that were supplied by the train in Jerseyside. [1]

A motorized ferry became available on Sundays, holidays and for funeral processions and a smaller boat was used for daily crossings. However, this was not the answer as this service became discontinued and individuals preferred to use privately owned dories to cross the gut. It was apparent a more consistent structure needed to be built. Finally in 1941 a member of the Newfoundland constabulary expressed their concern for a safer more effective way to cross the gut. During this period, the U.S Military had a base set up in a nearby town, Argentia. They built the first and only pontoon bridge in September 1941 (Figure 3). However, due to the strong tide, ice conditions, and currents the bridge was destroyed in December 1941. [2]



**Figure 3- Placentia Pontoon Bridge, 1941**  
(Source: <http://www.nlgeotourism.com>[F])



**Figure 4- M.V Sir Ambrose Shea**  
(Source: <http://www.nlgeotourism.com>[F])

After the pontoon bridge was destroyed, many individuals of the community with motorized boats set up a business to cross the guts once again. As vehicles became more and more widespread, a new more reliable service was needed. It was in 1954 that the M.V Sir Ambrose Shea became the first proper ferry to transport people and cars across the gut (Figure 4). From here more good news was released for members of the community. It was confirmed that the Placentia area will be provided with a lift bridge, the only one in Newfoundland and said to be unique to Canada and North America at the time. [2] This structure would be reliable for crossing, allowed boats to travel through the gut, allowed transportation 365 days a year, 24 hours a day, and was a safe for pedestrians and vehicles. On August 29<sup>th</sup>, 1959, work commenced for a lift bridge for the community. It was the following year in December 1960 the abutments, piers, and approach spans where complete. However, due to the winter season and abnormal ice conditions there was a delayed resumption of work until May of the following year. This allowed the shipment of steel for the centre span to be delivered at the site. It was August 29, 1961 the bridge first became available for the residents of the Placentia area. [2]



**Figure 5: The Matthew entering the harbour in 1997 celebrating the 500<sup>th</sup> anniversary of the discovery of Newfoundland. (Source: Google Earth)**

### **3 DESIGN OF BRIDGE**

The bridge needed to accommodate both vehicles crossing over it and fishing vessels underneath it. The selection of a vertical lift bridge accomplished both these requirements. The Sir Ambrose Shea lift bridge consists of two stationary approach spans and one centre vertical lift span. All three spans are 100 feet in length. The clearance under the centre span is 10 feet when the bridge is down and 70 feet when fully lifted. The centre span weights 100 tonnes and can be fully lifted in 90 seconds. The bridge was designed to have a lifespan of 50 years. [8] The maximum vehicle load allowed on the bridge is 25 tonnes for tandem axle trucks and 37 tonnes for combination units. [3]

There were many challenges in the design of the Sir Ambrose Shea Lift Bridge. By building a vertical lift bridge, the initial capital costs were high. This made it essential for the bridge to have a long lifespan, to make it worth the initial investment. In order to have a long lifespan, a precise understanding of the different loadings on the bridge was vital.

The bridge is located in an exposed location with the potential for high wave, tidal and wind loads. The maximum estimated wave height in Placentia is 7 meters and the tide runs under the bridge at 4 knots (7.4 km/hr). [4] Wind gusts can reach up to 140 km/hr at peak times. [5]

Although ice does not form every year in and around Placentia Bay, in some years a substantial amount of ice can form. Depending on the winter conditions, ice loading can become a significant factor on the bridge. The area around the bridge can form a bottleneck where ice can build up. The

strong tides under the bridge can provide high driving forces, pushing the ice against the bridge. This could lead to high loads on the bridge piers depending on the crushing strength of the ice.



**Figure 6: Ice loading on Ambrose Shea Lift Bridge.**  
(Source: Google Earth)

The greatest challenge for longevity of the bridge is corrosion. The bridge's close proximity to salt water makes it susceptible to rust especially at the piers and near the foundations.

## **4 BRIDGE DAMAGES AND REPAIRS**

### **4.1 Damages**

While routine maintenance was continuously performed on the bridge since its opening in 1961, major issues became of concern when a full structural analysis was completed in 2011. It was known and expected that some corrosion would be found, however the damage was much more than expected. The main counter weight ropes were corroded far beyond acceptable limits, accident damage was never repaired on the beams, failure of the steel platform at the rope connection to the main grinder and the structural steel coating system failed leading to corrosion and failure of several members.



**Figure 7: Failure of structural steel coating system**  
(Source: Delcan Inspection Report, 2011)



**Figure 8: Deformation due to accident damage**  
(Source: Delcan Inspection Report, 2011)



**Figure 9: Failure of steel platform**  
Source: (Delcan Inspection Report, 2011)



**Figure 10: Typical severe corrosion at main girder**  
Source: (Delcan Inspection Report, 2011)

## 4.2 Bridge Repairs

The government's initial estimate for the cost of a replacement bridge was 24 million dollars. But when the project was put to tenders, the only bid came back at nearly 44 million dollars. [7] The government instead decided to spend 1.7 million dollars on short term repairs to extend the life of the bridge up to 5 years until costs of a new bridge could be reduced.

In February, 2012 a weight restriction of 13 tonnes was placed on the bridge, roughly half its normal capacity. This was after a structural analysis determined the bridge had significantly weakened and deteriorated. The weight restriction and repairs had major effects on the town. A traffic light was installed and the bridge was reduced to one lane. Repair work occurred on one side of the bridge while traffic flowed on the other. This slowed traffic considerably making driving over the bridge take up to 20 minutes during peak hours. Trucks weighing over 13 tonnes were forced to take a 30 minute alternate route around a dirt road. This road can be in poor condition particularly during the spring thaw. Some trucks refused to take the alternate route due to its poor condition. In addition to this over a million dollars was invested to upgrade the dirt road, but still some drivers refused to take the longer, rougher route.

This led to periodic shortages at the local grocery store located in the heart of Placentia. Fresh produce such as fruits, vegetables, and meat became limited to the residents of the Placentia area. It was not only the grocery stores that were affected but the hardware store, local restaurants and convince stores and bars. Some residents who had the capabilities would drive to Bay Roberts or St. John's simply to buy the necessities of life.

After the summer of 2012, the weight restriction was removed from the bridge and it was back to normal operations with two lane traffic during the day. In the fall of 2012 and winter of 2013, repairs continued during the night. Most weeks the bridge would close from Sunday to Thursday from 10pm to 6am, pending weather conditions. This had a negative effect on many of the businesses in the Placentia area such as the local bars and convinces stores.

## 5 NEW CONTRACT

The Provincial Government announced on March 5, 2013 the Department of Transportation and Works awarded a 40.6 million dollar contract to HJ O'Connell Construction Limited. [9] The contract

includes the construction of a new vertical lift bridge, road approaches from Jersey side and Placentia and the removal of the Sir Ambrose Shea lift bridge. [9] The construction is scheduled to start in the spring of 2013 taking 3 years to complete. The new bridge will be built alongside of the existing Sir Ambrose Shea. The successful bid by HJ O'Connell is roughly 2.5 million dollars lower than the only bid received initially in 2012.

## **6 CONCLUSION**

The Sir Ambrose Shea Lift Bridge has certainly been a benefit to the residents of the Placentia area during its life. However, during the past decade it has caused major concerns to the residents of the Placentia area, affected the local economy, and certainly was a major expense to the town and provincial government. Currently, a wave of excitement for a newer, more effective, and safer bridge is the vision of many within the Placentia population. While the Sir Ambrose Shea lift bridge was a historic landmark for the town and province, it has completed its lifespan and the time has come for replacement.

## **7 REFERENCES**

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