One Mile House Interchange

Saint John, New Brunswick CANADA

Client

New Brunswick Department of Transportation & Infrastructure
Heather Pugh
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Timeline

Completed: 2013
Project Duration: 1999-2013

Project Phase

- Concept
- Planning
- Design
- Construction
- Operation

Services

- Bridge Design
- Transportation Planning
- Transportation
- Geotechnical
- Water and Wastewater

Total Installed Cost

$70,000,000

Project Managers

Don Good, P.Eng., FEC
Dave Hallden, P.Eng.

Technical Team

Tim Holyoke, P.Eng.
Brian Dorcas, P.Eng.
Peter Allaby, P.Eng.
Al Brokopp, P.Eng.
Grant Buote
Charles Goguen, P. Eng.
Angus MacKenzie, P. Eng.

Project Overview

This project began in 1999 as a Transportation Study for the City of Saint John. The study included the development of a traffic simulation model and a comprehensive analysis of the traffic impacts of 23 proposed road network improvements located throughout the City with a recommendations for eight network improvements to be implemented over a 20 year time frame. Central to these recommendations was a new East Saint John Throughway interchange located at One Mile House. The prime purpose of the Interchange is to divert truck traffic from the downtown core to the east end industrial parks. Several interchange options were investigated for functionality, cost and traffic impacts. The recommended option for the interchange at One Mile House included a 600 m long, 4 lane bridge that spans the 4 lanes of Route 1, the CN Rail marshalling yard, Marsh Creek and a major 4 lane arterial city street. Also included are elevated exit and entrance ramps, access roads and upgrading of four pre-existing intersections.

Exp's Role

This assignment for **exp** began as a traffic study and grew into a multi discipline design effort which included several teams of **exp** specialists. The transportation study referenced previously was led by Don Good, P. Eng. and included transportation planners, traffic engineers and civil engineering specialists from **exp**'s Fredericton and Saint John NB Offices.

Upon completion of the traffic study, the New Brunswick Department of Transportation and Infrastructure (NBDTI) engaged **exp** to move forward with the design of the interchange as well as offsite upgrades to intersections within the City of Saint John which were identified in the traffic study. The design activities included; topographic surveying, ROW identification, geotechnical investigations, above and below ground utility relocation, superstructure design, geometric design of all roadway components of the interchange, intersection upgrade design and relocation and upgrading of existing water, sanitary and storm sewer piping at the upgraded intersection locations. In addition to design, **exp** also offered construction support to the NBDTI Resident Construction Team for the project. This support included; shop drawing reviews, periodic site visits during construction and response to contractor requests for clarifications.

In addition to study, design and construction services **exp** was also engaged to offer expert testimony in expropriation hearings for the acquired lands.

Project Complexity and/or Use of Innovation

Several utilities, both above and below ground, as well as municipal services (water, storm and sanitary) had to be relocated within the project limits. One in particular, a sanitary force main approximately 5 m deep, had to be relocated to accommodate the new footprint of the proposed interchange assets. In addition to the depth, the work area was located within a major arterial street with heavy traffic. To minimize the disruption to traffic as well as adjacent subsurface utilities, rock boring methodology was incorporated.

The **varying soils conditions**, from solid rock to unstable soil, presented several challenges for both the superstructure support and approach roadway design. The poor and varied soil conditions, contaminated soils and confined spaces all required various geotechnical solutions such as staged construction, surcharging, soils monitoring equipment, rammed aggregate piers, mechanically stabilized earth walls and wire reinforced fill slopes. NBDTI staff partnered with our design team in the development of the innovative geotechnical solutions. One such innovation was the use of rammed aggregate piers.

Four intersections required improvements including the addition of lanes, retaining walls, improved signalization, pavement markings and accommodation of long combination vehicles at one of the intersections. A major challenge at one of the intersections was accommodating railroad signals that had to span the increased traffic lanes within a restrictive ROW. An innovative 3 signal arm system was designed and approved by NB Southern, CN Rail and Transport Canada. The signal system also required pre-emption due to the railroads close proximity to the intersection.

The **bridge** component of the interchange consists of five distinct structures. This includes a two lane, five span structure that will carry traffic over Rte. #1; two single lane structures that will serve as ramps for traffic entering and exiting the bridge from Rte. #1 (4 and 6 spans respectively); a two span variable width structure that transitions traffic to the on and off-ramps; and a four lane, four span structure that will carry traffic over the CN Rail marshalling yard, Marsh Creek, and Rothesay Avenue. In addition to designing these structures to accommodate the loading and traffic conditions, they also had to follow a curvilinear geometric alignment due to existing constraints within the prescribed location.

The two and four lane structure has superstructures consisting of steel plate girders with a composite concrete deck. The two ramps and the transition structure have precast pre-stressed concrete girders with a composite concrete deck. Piers were cast in place concrete circular shafts and footings or structural tremies. The nature of the subsurface bedrock profile is such that bedrock is relatively shallow or out cropping in some areas of the site while the depth to bedrock is approximately 35 m in other areas.

The four lane East approach to the bridge is located in a confined space between a major City street and a CN rail line. This component of the elevated approach was constructed of earth fill retained on either side by mechanically stabilized earth retaining wall systems.

Given the magnitude of the project, impact to the transportation users in the Region and proximity to existing development, there were many **stakeholders** interests in the project requiring several interactions of the **exp** and NBDTI team. These included; City of Saint John, NB Southern, CN Rail, Saint John Energy, Bell Aliant, Enbridge, business owners, trucking industry, and residents. All of these stakeholders had interests important to them which were generally identified and addressed through public information and formal review opportunities. The challenge was to balance the interests of the various stakeholder groups against the primary objectives of the project.

Project Social and Economic Benefits

The interchange was opened in December of 2013. The user benefits of the interchange are very high, reflecting the reduction in travel times and vehicle operating costs due to shorter distances and/or reduced traffic congestion and travel times. In addition, the expected reduced accident rates on the divided Route 1 and the new interchange and the reduced traffic on the City streets will result in accident reductions leading to accident cost savings as well as reduced injuries or fatalities.

The interchange also diverts traffic from the west that travelled through the commercial centre of the Saint John Uptown area. This not only will reduce traffic congestion but will also enhance pedestrian and vehicular safety in that area. The interchange also enhances access to adjacent industrial and commercial areas adjacent to Route 1.

Environmental Benefits

The estimated reduction of fuel consumption is 220.21 million litres over the 25 year planning period. By applying NRCan GHG emission gasoline and diesel factors in proportion to the automobile and truck traffic the project will potentially result in a reduction of GHG emmissions of 547,595.8 tonnes over the 25 planning period. Gas and diesel powered motor vehicles emit carbon dixide, carbon monoxide, sulfourous oxides and nitous oxides as well as various suspended particulates that contribute to smog. It is expected that the reduction of all vehicular smog emissions will be proportional to the fuel consumption reduction.

Awards

The One Mile House Interchange project received the Association of Consulting Engineering Companies New Brunswick (ACEC-NB) 2014 Showcase Award - *Recognition for Engineering Excellence Award in Transportation*.

One Mile House Interchange

Saint John, NB

The project includes a 600m long, curved 4 lane bridge, plus ramps over the 4 lanes of Route 1, a small river, the CN Rail marshalling yard, and a major 4 lane arterial city street.

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