

Route 1 Gateway Project
New Brunswick's Latest Challenge

Harry Varjabedian, Eng.
Project Director
Route 1 Gateway Project
Dexter Development General Partnership
Dexter Construction

Duane Clowater, P. Eng.
Project Manager
Route 1 Gateway Project
Projects Group
New Brunswick Department of Transportation

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ABSTRACT

In 2009, NBDOT started the process for the submissions of the Design, Build, and Finance, Operation, Maintenance and Rehabilitation of Route 1 from the US Border at St. Stephen to Petitcodiac, along the south coast of New Brunswick. Route 1 is an arterial highway which links New Brunswick to the New England States and is a major trade corridor. The economic benefits of upgrading Route 1 are significant to the Province of New Brunswick as well as the other Maritime Provinces. Dexter Development General Partnership (DDGP) was awarded the contract to complete the design and build of upgrading the remaining 55 kilometres of Route 1 to a 4-lane highway, and to rehabilitate another 180 kilometres of existing 4-lane highway infrastructure including roads, bridges, and safety improvements. The Project also includes an operation, maintenance and rehabilitation agreement for the same corridor until 2040. The construction and rehabilitation phases of the project are to be completed within a three year period (completion date of July 2013).

This paper will provide overview of the project, the management structure, design process, construction phase, and environmental issues encountered during the Project including an aggressive construction schedule, difficult soil conditions, significant river crossings, managing large storm events, and re-alignment around a previously unknown archaeological site with significant artifacts.

The Route 1 Gateway Project crosses through three groundwater/wellfield sources, involved over 180 watercourses crossings, 105 Site Specific Environmental Protection Plans, and 8 NWPA applications for major river crossings. It also includes construction of 35 structures crossing rivers and highways.

After the start of construction, an area near Pennfield was identified to contain significant artifacts from the oldest known First Nation encampments in the Province of New Brunswick. The Department of Transportation and Infrastructure and the Developer worked with representatives of First Nations groups and the Archaeological Services Unit of the Heritage Branch, Department of Culture, Tourism and Healthy Living to investigate the site and to minimize the impact on the site by realigning the main highway to avoid the most significant part of the overall finding site.

This paper will provide additional details of this project from all aspects including construction, environmental, quality, safety and overall project management of the Project from an Owner's and a Developer's perspective.

A. INTRODUCTION

The Route 1 Gateway Project is a Private Public Partnership (P3) between Dexter Developer General Partnership (DDGP) and the Province of New Brunswick. The Project includes the Design, Build, and Finance, Operation, Maintenance and Rehabilitation of Route 1 from the US Border at St. Stephen to River Glade in Southern New Brunswick.

In early 2009, the New Brunswick Highway Corporation (NBHC), on behalf of the New Brunswick Department of Transportation (NBDOT), issued a Request for Qualifications (RFQ) inviting respondents to submit their qualifications to:

- design, construct and finance 55 kilometres of new four-lane divided highway between Waweig and Lepreau on Route 1;
- design, construct and finance certain upgrades to the existing four-lane sections of Route 1 between St. Stephen and River Glade; and
- operate, maintain and rehabilitate the entire Highway between St. Stephen and River Glade (west of the intersection of Routes 1 and 2).

Route 1 extends from Calais, Maine, at the western end of the Project, to meet the Trans Canada Highway (Route 2) at River Glade near Petitcodiac, at the eastern end of the Project, while crossing through the City of Saint John and a number of communities along the 233 kilometre corridor. This project is commonly known as the Route 1 Gateway Project.

This is the third major highway P3 project by the Province of New Brunswick, through the NBHC. The two other highway projects, both on Route 2 of the Trans Canada Highway, include the Fredericton-Moncton Highway Project, completed in 2001, and the Quebec Border to Fredericton Project, completed in 2007.

Three responses to the RFQ were received and after an evaluation, NBHC announced on June 8, 2009 that the three parties that responded to the RFQ would proceed to the Request for Proposal (RFP) stage.

Three submissions were again received by NBHC for the RFP and after an extensive technical and financial evaluation, Dexter Developer General Partnership (DDGP) was named the preferred proponent for the project and the contract was awarded on March 31, 2010.

The Operations, Maintenance, and Rehabilitation component of the Project is being undertaken by Transfield Dexter Gateway Services Ltd., with the Operations phase having commenced on June 1, 2011 and extends to 2040.

B. PROJECT OBJECTIVES

Similar to the other major projects in New Brunswick and in other jurisdictions, the

Route 1 Gateway Project has a number of primary objectives.

These include:

- that optimal value for money be obtained;
- that a safe highway be provided for the use of the travelling public;
- that a safe workplace be provided throughout the Project;
- that reliable and high quality highway service be provided to highway users;
- that benefits of the Project to New Brunswick citizens, businesses and First Nations communities be realized;
- that appropriate risks associated with the Project be borne by the Successful Proponent;
- that the Highway be designed, constructed, upgraded, operated, maintained and rehabilitated so as to meet or exceed all applicable provincial and national standards and guidelines; and
- that the Highway be designed, constructed, upgraded, operated, maintained and rehabilitated in an environmentally responsible manner and in accordance with all environmental requirements, including provincial and federal environmental laws and regulations.

The objectives also include a number of Project Deadlines to be achieved including:

- that all the DB Sections be substantially completed on or before June 30, 2013;
- that the Existing Sections work be substantially completed on or before June 30, 2013;
- that all work under the DB Agreement be totally completed on or before July 31, 2013.

C. SCOPE OF WORK

The Successful Proponent is responsible for the following work:

- the design, construction and financing of the DB Sections, which includes Section 2 and Section 3;
- the design, construction and financing of the Existing Sections Work consisting of Sections 1, 4, 6, 7 and 8; and
- the operation, maintenance and rehabilitation of the entire Highway consisting of Sections 1, 2, 3, 4, 6, 7 and 8, until June 30, 2040.

In Section 6, NBDOT is constructing the One Mile House Interchange which will become part of the Route 1 Gateway Project upon completion.

The Saint John Harbour Bridge, identified as Section 5, does not form part of the Project.

Figure I (page 4) shows the Project Area and **Table I** (page 5) provides a description of the individual sections of the Project.

Figure I: Route 1 Gateway Project

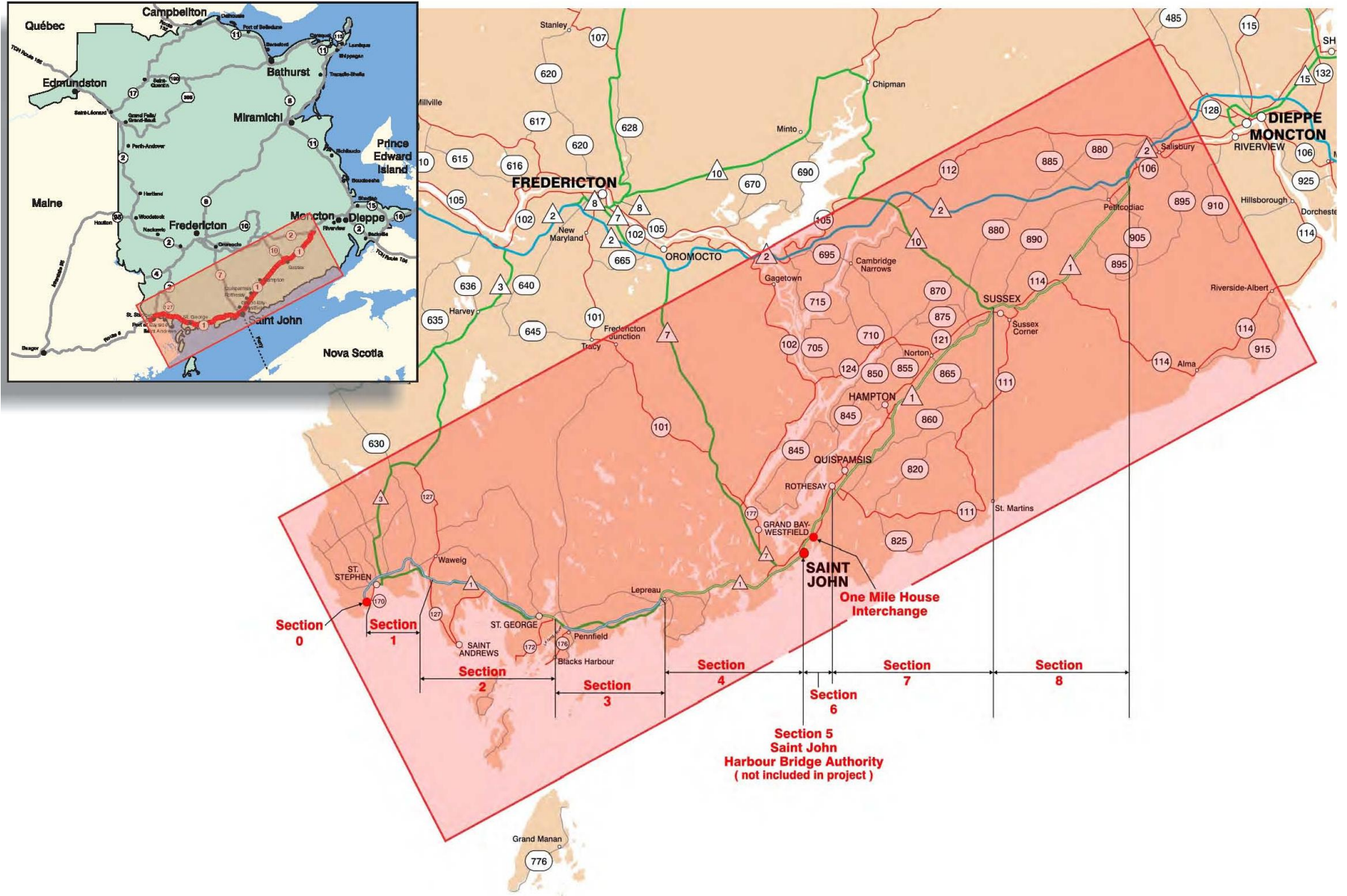


Table I:
Route 1 Gateway Project – Sections

Section	Type	Limit-Start	Limit-End	Length (km)
1	Existing	Canada Border Services Agency	Route 127 (west Junction)	23.0
2	DB	Route 127 (west Junction)	Route 172 (Letang)	30.0
3	DB	Route 172 (Letang)	Connection to existing 4-lanes west of Lepreau Interchange	29.0
4	Existing	Connection to existing 4-lanes west of Lepreau Interchange	West Limit of Saint John Harbour Bridge	34.5
6	Existing	East Limit of Saint John Harbour Bridge	Route 111	14.0
7	Existing	Route 111	Kennebecasis River Bridge No. 6.5 (Sussex)	56.5
8	Existing	Kennebecasis River Bridge No. 6.5 (Sussex)	Route 106 – Limit of Fredericton-Moncton Highway	46.0

D. DETAILED PROJECT DESCRIPTION

The Route 1 Gateway Project includes a corridor of approximately 233 kilometres in length. The main objective of the Project is to provide a 4-lane facility for the entire Route 1 corridor from the US Border to the west, to River Glade to the east.

Beginning at the west end, the first 23.5 kilometres, including Section 1, is already a 4-lane divided highway. The next 59 kilometres, including Sections 2 and 3 (also called the DB Sections) are generally 2-lane highway with at-grade intersections except for short 4-lanes sections which require improvements. Most of Section 2 could generally be referred to as twinning with short by-pass sections, and Section 3 is generally a long green field section.

The NBDOT has been gradually conducting improvements to Route 1 as funding became available but similar to the other large highway projects in New Brunswick, a P3 format for the Route 1 Gateway Project was the logical method to complete the entire Project in the shortest period of time.

E. PROJECT MANAGEMENT STRUCTURES

For each P3 Project, the New Brunswick Highway Corporation (NBHC) establishes an operating company to manage the DB Project on behalf of the NBHC. For the Route 1 Gateway Project, NBHC established the “Route 1 Gateway Project Company”, also commonly referred to as Project Co.

For the Route 1 Gateway Project, both the Route 1 Gateway Project Company (Project Co.) and Dexter Development General Partnership (DDGP) established a Project Management structure. As DDGP is the Developer for the project, their management structure has more components than Project Co’s management structure.

The DDGP Integrated Management System (IMS) is comprised of Quality (QMS), Environmental (EMS) and Safety (SMS) Management Systems. The managers of the three systems operate as a management committee to eliminate redundancy and improve communication and efficiency by exploiting the common features of the three systems.

The component systems of the IMS were independently certified to external standards; the SMS by NBCSA within 180 days of signing the Project Agreements, and the QMS and EMS to ISO 9001:2008 and 14001:2004, respectively, by Intertek within 365 days. The certifications have been maintained in force throughout the Design Build phase of the Project.

Table II provides an overview of the Management Structure for the Key Positions for Project Co. and DDGP on the Route 1 Gateway Project.

Table II: Route 1 Gateway Project - Key Management Positions		
Component	Route 1 Gateway Project Company	Dexter Development General Partnership
Project Lead	Project Manager	Project Director
Construction	Construction Manager	Construction Manager
Design	Technical Manager	Design Manager
Environment	Environmental Engineer	Environmental Manager
Quality	Quality Manager	Quality Manager
Safety		Safety Manager
Communications		Communications Manager

F. DESIGN PHASE

The design process started as soon as the agreements were signed. Using the information prepared as part of the Request for Proposals, the design concentrated on the design of culverts and preliminary grading and clearing document preparation.

At the same time as the design of the major culverts was on-going, the structural engineers were reviewing General Arrangements for the numerous bridge structures. Again the long lead time for the procurement of steel and concrete girders required an accelerated schedule from the suppliers and from the contractors in the preparation of foundations and access to a number of green field sites for both culverts and bridges in Sections 2 and 3.

The Route 1 Gateway Project includes the design of 55 kilometres of main lanes, five new or modifications to existing interchanges and associated crossing roads and numerous access roads. The design standard for the main lanes is RAD120, and for most crossing roads the design speed is 80 km/hr.

Road design included over 250 culverts of various shapes and sizes, over 100 kilometres of wildlife fencing, over 100 kilometres of guide rail, 34 new bridges which included 11 river crossings and 23 grade separations.

Structural components accounted for over 3,000 tonnes of structural steel, 30,000 cubic metres of concrete, 6,800 m of concrete girders and 2,000 tonnes of reinforcing steel.

Design drawings issued through Document Control amounted to over 6,000 original design drawings (not including revisions), and over 2,000 vendor shop drawings.

The work in Existing Sections included mainly the following items and was completed during 2011 and 2012:

- replacement of two bridge structures;
- widening of one bridge structure in Rothesay;
- barrier upgrades;
- extension of guide rail;
- acceleration and deceleration ramp extensions;
- upgrading of signage; and
- upgrading of median crossovers.

Major improvements at the Route 7 and Route 1 interchange in West Saint John, and the widening from 4-lanes to 6-lanes east of Saint John were eliminated from the DB Agreement through a Change Order.

Independent Structural Engineer

As part of the structural design requirements, an Independent Structural Engineer (ISE) reviewed the designs to ensure compliance with the Project requirements. All material related to the design of structures, including drawings and calculations, were reviewed by the ISE, stamped with a specific stamp and returned to DDGP before being issued for construction (IFC).

Road Safety Auditors

As part of the review process, a Road Safety Audit Team (RSA) was required to review grading, paving, structural general arrangement drawings and highway sign drawings. There were a minimum of three reviews for each of the drawing packages before a final pre-opening audit, including RFP drawings, preliminary design and final design drawings. The RSA Team provided recommendations and the designers were responsible to review recommendations and to see if improvements could be made to the design. Responses to the design and pre-opening audits were submitted to the Project Co..

G. MODIFICATIONS TO THE DB AGREEMENT

Modifications to the scope of work identified in the DB Agreement can only be changed using DB Change Requests or Change Orders. Change Requests are usually initiated by DDGP and Change Orders are usually initiated by Project Co.

During the design process, DDGP submitted a number of DB Change Requests to modify the design put forward in the RFP document. This included revisions for large metal arch culverts used as combined watercourse/wildlife crossings to one drainage culvert and a large box culvert for the wildlife crossing. This scenario was applied at a number of locations throughout the project as it minimized geotechnical concerns and facilitated the project schedule to place two components rather than one large metal culvert.

Other DB Change Requests included changing the type of girders from steel to concrete, from box culverts to round pipe, etc. The Developer is responsible to identify the reasons for the Change Request and to estimate the value of the Change Request. The Project Co. reviews the Change Request within their project team and it is then submitted to the Technical Committee for final approval. When Change Requests are accepted, Project Co. and DDGP share in the savings if any. DB Change Requests may not identify any savings but are requested as modifications to the DB Agreement and are still subject to Project Co. approval.

A number of Change Orders were also issued by Project Co. to DDGP. Change Orders are normally issued to reduce the scope of work within the Project and to provide a reduction in the Guaranteed Maximum Price (GMP). The identified value of the Change Order is not shared between Project Co and DDGP.

In 2011, Project Co. issued a major Change Order to DDGP. This Change Order eliminated a portion of the scope of work in the Project area by removing the additional lanes originally requested for the MacKay Highway and the work at the Route 7 and Route 1 interchange. A number of bridge structures were eliminated as part of the scope change which amounted in a reduction of approximately \$38.5M to the GMP.

A number of other smaller Change Orders were also received by DDGP for certain work which resulted in an additional reduction of the GMP.

H. CONSTRUCTION PHASE

A construction site office was established in the Pennfield area between Sections 2 and 3. Each section has an Area Manager who was supported by a Road Manager, Structure Manager, field engineers, construction superintendents and construction forces. There was also one Area Manager for Existing Sections work.

A large portion of the construction work was self performed by DDGP. The construction team spent considerable time recruiting from the local labour pool and training these individuals to perform the work. Subcontracts were established for items such as drill and blast, wick drains, concrete supply, reinforcing steel (rebar), concrete form work, testing services, guide rail, wildlife fence, steel and concrete bridge beams, lighting and highway signage. Several of the major river structures were contracted to New Brunswick bridge contractors.

As design was completed, permits were in place, and material was available through procurement, construction started. In 2010, the construction work was concentrated in the DB Sections as these sections included most of the work to be completed by 2013. Initial work included providing access to culvert sites, bridge sites, and geotechnical sensitive areas.

Fish bearing streams and compressible soil areas were critical path as the window for placing of culverts extends only from June to the end of September and the compressible soils needed wick drains and surcharges for considerable durations. In some instances, DDGP was granted permit extensions.

In December 2010, the Project Area was subject to some of the highest rainfall storms which exceeded any previous events. Heavy rainfall, as much as 185 mm in some areas, caused severe flooding in Bonny River, St. George and St. Stephen, as well as in central New Brunswick. The Bonny River area, located near the mid-point of Section 2, was among the hardest hit in the province.

A study of a local dam by a consulting firm confirmed that the December 2010 storm was 30% greater than the historical maximum storm event - approximately a one in 195 years storm event. Record rainfall levels centered on the area resulted in Lake Utopia rising approximately 4.0 m.

The project area under construction with grading and associated work did not sustain any significant damage except for the loss of some equipment and time due to flooding. The installation of culverts was delayed until the water receded to normal levels.

The major structures were the most challenging in Section 2, which includes Digdeguash River bridge (2-S06) and Magaguadavic River bridge (2-S12). The new Digdeguash River crossing on the westbound lanes includes a two-span structure with an overall length of approximately 160 metres. The foundations include twin 2m diameter steel caissons driven from a trestle located approximately 6 metres above the low tide of the Bay of Fundy. The highest tide at the bridge site saw the water level rise to the deck of the trestle. The erection of the girders was also a challenge for the crane equipment providers as the size and weight of the girders were near the limit of the lifts and reach for the operators, but the workers completed the task without any problems.

The Magaguadavic River bridge, which again is a two-span structure with an overall length of 100 metres, is located on very difficult soil conditions. The structure proposed in the RFP included a two lane structure with a pedestrian sidewalk to twin the existing bridge structure. A DB Change Request was submitted to the Project Co. and once approved allowed DDGP to complete a 4-lane structure with a sidewalk but with a concrete barrier for the narrow median cross section. The foundation design required three 2 m diameter steel caissons to be driven to bedrock. The main issue was that bedrock is located approximately 60 m below the riverbed.

The center pier is located in the river channel. A number of alternatives were considered including a trestle but the weight and size of the equipment which included a rotary drilling rig, oscillator and crane, made the construction of the trestle very difficult and near impossible on the poor soil conditions in the riverbed. A request was made and granted by the Department of Fisheries and Ocean, and the Department of the Environment which allowed DDGP to construct a temporary causeway near the west approach during the summer and fall season of 2011. The main stipulation was that the

causeway be removed before winter to minimize concerns about a repeat of the flooding which occurred in December 2010.

The construction and installation of the reinforcing steel within the piles was also a challenge as each reinforcing cage extended the entire length of the steel caisson plus the rock socket and was over 70 metres in length and weighed over 50 tonnes. Each concrete pour was over 150 cubic metres in each pile. This type of work had not been previously completed in New Brunswick. The work was completed on time and without any incidents.

Work on other minor bridges, including overpasses and underpasses, continued over the winter of 2011 with foundation preparations and abutment construction. Before the weight restrictions were in place in February 2011, girders for a number of these bridges were in place waiting for the deck crews.

Excavation also proceeded for parts of Section 2 and Section 3, which included bedrock. By April 2011, over 3 million cubic metres of excavation had been completed and approximately 0.5 million tonnes of rock crushing had been completed.

Construction continued on all components of the project and in the summer of 2011, work started on the Existing Sections, with the barrier upgrades as well as signing and lighting upgrades.

By July 2011, the first 6 kilometres of the twinning in Section 2 was completed for Section 2A-3. Two-way traffic was temporarily routed to the westbound lanes to allow work to progress on the eastbound lanes, including culvert replacement, substandard alignment corrections and resurfacing. By late fall of 2011, another 6 kilometres of new alignment was opened on the westbound lanes. None of the interchanges were yet in operation nor were they required to allow these sections to operate.

For the remainder of 2011, work continued in all sections. Approximate 50% of the culverts were installed and work concentrated on bridge structures and grading. By December 2011, over 9.3 million cubic metres of material had been moved, and over 2.2 million tonnes had been crushed for base, sub-base and asphalt aggregates, and nearly 19,000 cubic metres of concrete had been placed, and 66,000 tonnes of asphalt placed.

Year 2012 started with highly abnormal weather with temperatures soaring in the low to high 20's in March. This warm and dry weather allowed DDGP to continue with mass excavation as another million cubic metres of excavation was completed by the end of February 2012.

Year 2012 will be very busy for the Route 1 Gateway Project. Based on the latest schedule and project requirements, a number of milestones must be met.

The geology of the area allowed DDGP to generate most of the aggregates used for the subbase, base and asphalt from within the cut sections and or close to the highway corridor. Portable asphalt plants were located at strategic locations to minimize the haul distance.

The first milestone for the Route 1 Gateway Project for DDGP to receive payment from Project Co was the area of Route 1 and Route 7 interchange which was completed by April 12, 2012.

As of the first quarter of 2012, work is on-going in all sections including the Existing Sections. The existing signs and lighting fixtures are presently being rehabilitated by either an overlay over the sign or a new sign including overhead sign structures.

The next milestone is scheduled for the June/July 2012 period for part of Section 8 and the MacKay Highway in Section 6. The remainder of Sections 4, 6 and 7 are due in the September/October period and the rest of the Project, including part of Section 2 and Section 3 are at the end of November 2012. It is anticipated that the overall Project will be completed by year end, including all deliverables to Project Co. This timeline would remove over 7 months off the initial schedule proposed by Project Co. in the RFP documents.

I. SURVEY AND MACHINE CONTROL

All road construction projects require a large survey component which is important to the project's success. For the Route 1 Gateway Project, DDGP's Survey Department has utilized advanced survey technologies while incorporating survey best practices to achieve desired accuracies and quality assurance.

One of the main technologies utilized on this project was real time kinematic (RTK) GPS. This is survey grade corrected GPS that will achieve accuracies of better than 20 mm. RTK GPS was utilized on the ground with our survey field crews for staking and grading and quantities. The system DDGP incorporated with the survey crew has the advantage of having all the design information loaded on their controllers. This allowed grades and locations for any station, line feature, or surface grade to be provided quickly and efficiently.

DDGP is unique as it is at the forefront of machine control technology. In laymen terms, machines moving material also utilize RTK GPS for grading the road. The machines on the Route 1 Gateway Project were equipped with a computer and sensors which adjust the RTK position at the antennae to the point of interest on the machine. The onboard computer program accepts data surfaces which allow the operator to grade the road by monitoring the position of the blade or bucket with respect to the grading surface. This methodology is referred to as a grade control system. This technology was utilized to help the efficiency of moving material which resulted in building it right the first time.

Approximately 40 pieces of equipment (graders, bulldozers, excavators) of varying sizes were equipped with the machine control technology and numerous equipment operators were trained in the use of the technology. Final grading operations, ditch construction, and a wide range of other activities were efficiently completed with the use of this technology.

J. ENVIRONMENTAL

The Route 1 Gateway Project has numerous environmental challenges including crossing through three public groundwater/wellfield sources (involving both Watershed Protected Areas and Wellfield Protected Areas), approximately 100 watercourses (several with multiple crossings) and about 85 wetlands, several locations with species of special concern, known heritage resource (archaeological) locations, and numerous other environmental aspects as identified in the environmental assessment documents. The aggressive construction schedule for the project, difficult soil conditions, significant river crossings, abnormally large rainfall events, and a re-alignment around a previously unknown archaeological site were among the many challenges encountered during the construction phase.

A wide range of environmental permits were required for the project including Watercourse and Wetland Alteration (WAWA) Permits, 105 Site Specific Environmental Protection Plans (SSEPP), 44 Fisheries Act Authorizations (HADD) and 8 NWPAs applications for major river crossings. Preconstruction site meetings with federal and provincial regulatory agencies were completed in conjunction with each of the 105 SSEPPs. Regular meetings with regulators were held to facilitate the permitting process, provide updates on construction schedules, and review numerous other issues.

An Environmental Management System (EMS) was a Project requirement. An outline of the EMS was submitted with the Design Builder's proposal and the complete ISO 14001-compliant EMS was documented and implemented within 90 days of execution of the agreements, before the start of any substantial work on the project.

The EMS addresses the environmental requirements for all design and construction activities associated with existing and new infrastructure and adjoining and affected areas, in both urban and rural environments with varied, complex geology and influences of existing and previous land use. It addresses identification and preservation of archaeological artifacts, management of contamination, both pre-existing and current, and interaction with navigable waters, marine habitat and human and industrial water supplies.

The compressed schedule for the project limited the ability to complete the construction of some watercourse crossing within the usual June 1st to September 30th time period. Permission was obtained to conduct 'late season' work at several watercourses. The authorizations to complete this late season work included stringent conditions for environmental protection, and sediment and erosion control. In addition to DDGP's

environmental inspection team, regulators required regular inspection of late season work by an independent third party monitor

Management of large volumes of waste materials such as grubblings (tree stumps, etc.), unsuitable materials such as clay soils and organics, and large boulders represented a more difficult environmental challenge than had been anticipated. Whenever possible, waste material was deposited within the highway right of way. Berms were constructed at the top of backslopes, at the bottom of fills outside the toe of slope, and in the medians where there was sufficient space available. Setbacks (30m minimum) from watercourses and regulated wetlands were needed and existing vegetation and trees were to be maintained where possible. In a few cases, areas with sparse trees were cleared in the median and used for material disposal. A contractual Change Request from the Province was needed, and included conditions such as the slope on the sides of the berms. Wherever possible within the constraints of median width and berm slope, the berms were constructed to a height above the final grade of the road to provide a barrier to headlights from the opposing lanes. Other methods included the flattening of steep fill forelopes (e.g. going from a design foreslope of 2:1 to 6:1).

Disposal of material outside the right of way was still necessary in some locations. Thick layers (up to 5-6 m) of organics (peat) and poor quality marine clays were encountered in some areas, particularly in the eastern portion of the project. Over 25 ancillary (off right of way) locations were approved through an environmental review process. Since the environmental assessments for the project did not extend a significant distance beyond the right of way, regulatory agencies required a field assessment of watercourses and wetlands, archaeological resources, species of conservation concern, migratory birds, and other resources. DDPG conducted assessments of the various properties once landowner agreements had been reached. In cases where environmental features were encountered, avoidance of the feature was used to identify the portions of the property acceptable for material disposal. Buffer zones were delineated around each feature where applicable. Avoidance of the environmental constraint or feature was the preferred option in the majority of cases and this approach was felt to have streamlined the regulatory review process.

The previously unknown archaeological site is located in the Pennfield area (Section 3) of the Route 1 alignment and was identified after the start of construction. From a contractual perspective, this meant that the investigation and resolution of the issues associated with the site were the responsibility of the Province, rather than the Developer, since the site was unknown at the time of contract award. The archaeological site was determined to be Paleoindian age (approximately 11,000 years old) and is one of the oldest sites in Northeastern North America. Given the significance of the find and the length of time that would be required to adequately investigate and mitigate impacts to the site, avoidance was recommended and alternative alignments were considered. It was determined that bypassing the site was possible if the new properties needed met environmental assessment requirements and could be acquired in a timely manner to prevent delays to the completion of the project.

The Developer and the Department of Transportation worked with representatives of First Nations groups and the Archaeological Services Unit of the Heritage Branch, Department of Wellness, Culture and Sport to investigate the site and to minimize the impact by realigning about 3 km of the highway to avoid the most significant part of the archaeological site. The proposed re-alignment was approximately 200m north of the original alignment. Detailed archaeological investigations were conducted on areas that remained within the footprint. The Developer was delayed several months by the investigations and needed to adjust construction schedules to maintain the original project completion date.

Re-design of the alignment, environmental assessment, land purchase, full assessment of the archaeological site including field work and First Nations consultation were all required prior to receiving approval from the Regulators to proceed. It was imperative that timely approval be received to achieve the aggressive schedule adopted by the Developer to meet the Project completion date.

K. SAFETY

Route 1 Gateway Safety Management System (SMS) is based on Hazard Control by identification and mitigation. This is achieved by a system of training, communication, documented procedures, monitoring and feedback.

Hazard identification and control strategies on the Project include hazard assessments, field level risk assessments (FLRA), and job hazard analysis (JHA). This process is complemented by the use of safe work practices and safe job procedures.

A hazard assessment or a high level risk evaluation of the Project Area is conducted prior to set up of new work. The Safety Manager and the Construction team conduct a hazard assessment of their designated worksite to identify, assess and control existing risks or potential risks to people, property or the environment.

Prior to the start of work each day, every foreman, assisted by work crew members, completes a Field Level Risk Assessment (FLRA). The FLRA is performed at the work site to ensure the proper assessment of work site conditions.

The JHA process uses the detailed knowledge of those personnel most familiar with the job procedure to identify the hazards associated with each task or step of the procedure and the controls required to eliminate or mitigate each hazard. A JHA is performed for high risk procedures.

Training ensures competent personnel are informed of the potential safety and health hazards that may be encountered in the performance of their job duties on the project. Communication with stakeholders in developing the Hazard Control Plan is fundamental to the SMS. Participation in the workers own safety is achieved through the Joint Health and Safety Committee, toolbox meetings and daily FLRA meetings. Documented

Procedures are administrative controls. They provide step by step instructions on how to perform high-risk tasks.

Monitoring ensures compliance with the SMS, rules and legislation. Feedback from the overall effectiveness of the SMS as well as its elements is necessary for continual improvements and prevention of incident reoccurrence. Management is informed on leading and lagging indicators that may signify trends causing program adjustment.

The Safety Management System is an audited program certified at the start of the project and reviewed annually by the New Brunswick Construction Safety Association.

L. QUALITY

Preparation of the Quality Management System (QMS) began with an outline submitted with the RFP. The complete ISO 9001 compliant system was documented and implemented within 90 days of execution of the Project Agreement and before the start of any substantial work. The QMS (ISO 9001:2008) and EMS (ISO 14001:2004) were certified in a combined audit by Intertek within 365 days of execution of the agreement and the SMS by NBCSA within 180 days of execution. These certifications have been maintained in force throughout the Design Build phase of the Project.

The QMS addresses the quality requirements for new and existing infrastructure in both urban and rural environments with varied, complex geology and influences of existing and previous land use. Concrete and steel structural components are manufactured by several external suppliers in three provinces and constructed and assembled by DDGP's own employees or by subcontractors as appropriate. As the work is executed by a mixture of direct employees, consultants, subcontractors and suppliers, the QMS has been designed to hold each participating individual and organization responsible and accountable for the quality of their own work, including quality control and record keeping.

The QMS is documented in a Manual and Procedures as required by ISO 9001 with annexes addressing policy, processes, organization, quality plans and other specific issues. The Quality Manual is aligned closely with ISO 9001 for ease of verifying compliance. The manual references documented procedures, which apply to the entire IMS, addressing Document Control, Record Control, Auditing, Control of Nonconformities, Corrective Action, Preventive Action and Back-up and Disaster Recovery. It also includes annexes addressing Process Interaction, Quality Policy, Quality Objectives, Management Review, Quality Plans (ITPs), Audit Checklists, Utilities Work, Organization Structure, Survey Methodologies and Design Review. All other documented procedures needed to control work are maintained by the responsible disciplines and organizations.

The QMS documentation is accessible to the Province and to all managers, suppliers and subcontractors on the project. Immediately with its publication, an orientation

program was implemented to inform all participants of the nature and requirements of the IMS. The program is a half-day in duration and recorded attendance is required of all personnel before they are admitted to any project work site.

Suppliers, designers and subcontractors are required to prepare and submit quality plans for review by the QA department showing controls appropriate to the risk associated with their work. DDGP determines the degree of auditing and surveillance of each supplier and subcontractor based on the completeness and effectiveness of their QMS and their performance, past and present. While ISO 9001 certification is not a requirement, all suppliers and subcontractors have been encouraged to follow the standard. The supplier of steel beams is in fact certified to ISO 9001.

i. Inspection and Test Plans

The QA department maintains Inspection and Test Plans (ITP) which identify and record the significant technical requirements for the Project. Day-to-day quality control is the direct responsibility of Project Engineers and Field Engineers who are responsible for ensuring and recording all the quality requirements on the ITPs.

Materials testing is subcontracted to qualified, local engineering firms for soils, aggregates and concrete with all test results submitted electronically for QA review and acceptance. Conformance to design geometry is verified and recorded by surveys.

The QA program is monitored at multiple levels to ensure compliance with ISO 9001 and with the project agreements. Internal audits are conducted by the QA department on management systems, suppliers and construction with rectification of nonconformities required in all cases. Corrective action aimed at the root causes of problems is required in proportion to the risk entailed to the project.

ii. Risk Management

Nonconformities and problems are analyzed according to the risk their occurrence or recurrence would impose on the project if left unresolved. Risk entails both likelihood (frequency) of occurrence and impact (safety, physical, legal or financial) on the project. High risk problems are treated with greater urgency and are addressed with more resources than low risk ones. The lowest risk problems are classed as "opportunities for improvement" to be addressed at the discretion of the responsible manager.

iii. Self Control

Quality is managed by the Quality Manager and a staff of Quality Auditors who review submittals by the suppliers, subcontractors and Field Engineers, and directly audit their work on a sampling basis dictated by performance and risk to the project. The direct responsibility for quality rests always with the person or organization performing the work or supplying the material or component. Besides the orientation of all personnel to the Quality requirements of the project, all subcontractors and suppliers participate in

pre-bid, pre-award and pre-start meetings which include a presentation and discussion of the quality aspects of the work and any requirements for quality control, testing, record keeping and submittals.

iv. Continual Improvement

Continual improvement is driven by two processes; first, the cycle of corrective or preventive action to eliminate the root causes of problems identified or anticipated on the project; second, improvements identified in the series of review meetings that constitute Management Review. Rather than an occasional Management Review of the QMS, Quality, Environment and Safety are reviewed and addressed bi-weekly in meetings of the IMS managers and in Project Coordination meetings involving all managers.

M. QUALITY AUDITS BY THE PROJECT COMPANY

The role of Project Company is to manage the Route 1 Gateway Project on behalf of the New Brunswick Highway Corporation and to ensure compliance with the DB Agreement. To ensure compliance to the project requirements, the staff from Project Co. completed an extensive series of audits on the design, processes and procedures used by DDGP for the development of the Project.

By the first quarter of 2012, these audits included over 180 audits on design, 21 audits on the management system, 350 field audits on construction and environmental methods. Audits were also conducted on suppliers to DDGP, including steel and concrete girders, precast retaining walls, concrete and steel pipe, sign trusses and laminating material.

As a result of the audits, Non-Conforming Notices (NCNs) or observations notices were issues to DDGP. A maximum of 30 NCNs were allowed to remain active at any one time before financial penalties would be enforced. No financial penalties were paid by DDGP.

N. OPERATIONS, MAINTENANCE AND REHABILITATION

The operations, maintenance and rehabilitation (OMR) phase includes the entire Route 1 corridor between the easterly boundary of the Canada Border Services Agency at St. Stephen (kilometre 0) and Route 106 (kilometre 233).

Four maintenance depots were strategically located and associated facilities constructed at the following exits:

- Waweig Depot located off Exit 25
- Musquash Depot located off Exit 96
- Hampton Depot (Main Office) located off Exit 158

- Springdale Depot located off Exit 211

OMR generally includes the following key services:

Summer Maintenance:

- Bridge cleaning and washing
- Vegetation control
- Emergency response with traffic control services
- Routine pavement/drainage/structures maintenance
- Routine road side and traffic services maintenance
- Detailed asset inspections
- Daily road patrolling during day light hours and night time road patrol scheduled weekly
- Road patrollers on call 24/7

Winter Maintenance:

- Snow & ice control services including anti-icing, de-icing and snow removal operations
- Road patrolling 24/7
- Emergency response complete with traffic control services

The rehabilitation schedule for the Route 1 Gateway Project includes pavements and all structural assets including overpasses, underpasses, bridges, retaining walls, roadside and overhead signs and drainage structures which will receive various rehabilitation treatments based on the results of the annual or biennial condition reporting and will be maintained to the contracted level of services.

During the first year of operation, Transfield-Dexter completed paving operations at various locations between the east end of Saint John Harbour Bridge and at Petitcodiac in both east and west bound lanes – approximately 120 lane km of asphalt surface replacement.

Micro-surfacing operations were also completed at various locations between Hampton and Sussex in both east and west bound lanes – includes approximately 100 lane km of road resurfacing.

The work program for the OMR group is scheduled to continue until 2040.

O. CONCLUDING STATEMENTS

The Route 1 Gateway Project is the third highway DB Project completed by the Province of New Brunswick (through NBHC). Again, the Project was collaboration between a private developer and the Province of New Brunswick.

The main objective of the highway is to provide a safe and efficient highway corridor for the residents of New Brunswick, but also to the visitors to New Brunswick. It is also an economic development engine which promotes growth and job creation within the Province.

The design, procurement and construction were all fast tracked in the shortest possible time to meet the Project deadlines.

DDGP and Project Co. each worked hard to accomplish the task at hand, each with their own responsibilities but both with a common goal.

DB projects require a substantial effort from each party to be successful. There are times when all parties do not agree but overall, in our opinion, this was another successful project. The two parties worked together to complete the project within the time limits and to the standards and expectations of all.

The roads and bridges are now being handed progressively over to Transfield-Dexter who will be responsible for the maintenance of the highway until 2040.