Chapter 3
Department of Transportation and Infrastructure
Provincial Bridges

Contents

Department of Transportation and Infrastructure Provincial Bridges

Background

3.1 The road and highway system in New Brunswick plays a significant role in terms of connecting municipalities, airports, ports and railways. It is vital to the economic development in the Province. Provincial bridges are an integral part of the road and highway system. Properly maintained bridges are essential to the integrity of the transportation system and the safety of New Brunswickers. The provincial bridges account for a significant part of the Province's infrastructure investments. Bridge structures totalling $895 million (excluding bridge structures under construction) were recorded on the Province's Financial Statements as of March 31, 2012.

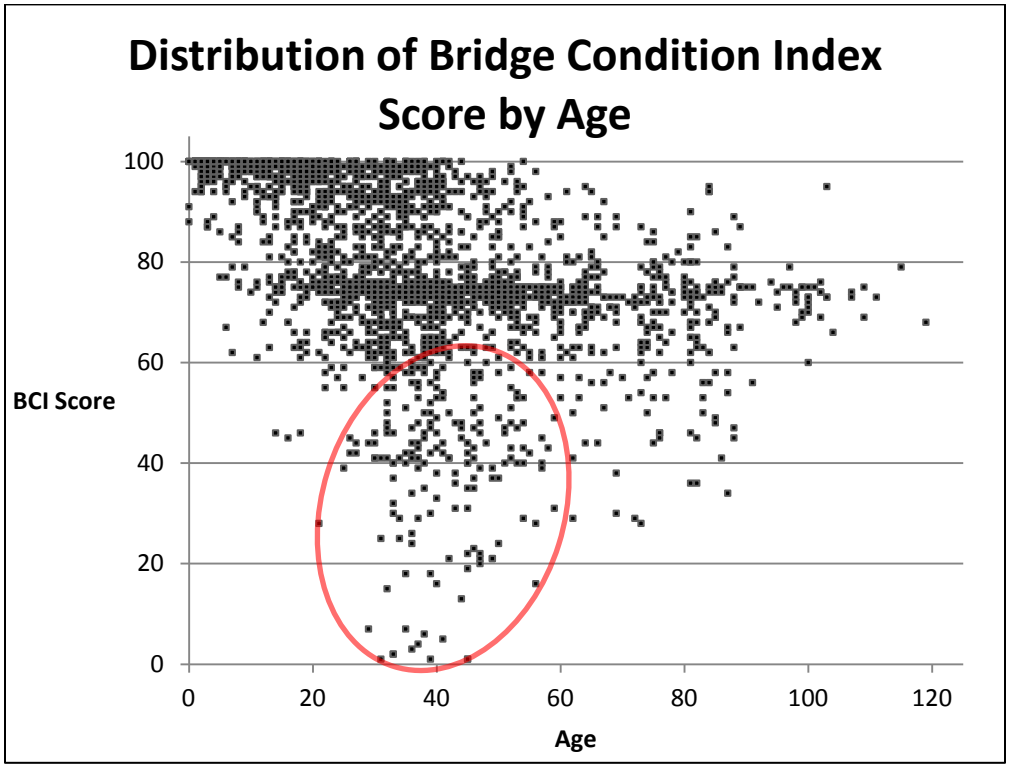
3.2 The Department of Transportation and Infrastructure (the Department) is responsible for the maintenance of 2,608 bridge structures including seawalls and retaining walls on provincially designated highways in New Brunswick. The inspection and maintenance responsibility for the 519 bridges located on Rte. 2 from Moncton to the Quebec border, Rte. 95, and Route 1 from St. Stephen to River Glade are contracted out to the private sector under the respective public-private partnership agreements. The Province of New Brunswick also shares ownership of ten International bridges with the State of Maine.

3.3 The Department uses the Ontario Structures Inspection Manual (OSIM) as a reference in terms of its inspection activities. All structures under the responsibility of the Department are inspected on a one, two, or four year inspection frequency based on condition, age and structure type. The three main components of a bridge that are assessed during a bridge inspection are described in Appendix I.

3.4 In 2005, the Department implemented a bridge rating system as per the OSIM called the Bridge Condition Index (BCI). Appendix II gives more details regarding BCI.

3.5 As shown in the Exhibit 3.1, 293 bridges (listed in Appendix IV) are at or below a BCI of 60 which is considered a poor rating. This rating is not an indicator of an unsafe bridge. It is an indication that significant maintenance work is required on that bridge in the near term in order to keep the bridge in service. Ontario for example will usually schedule maintenance within a year for bridges with a lower than 60 BCI. The area circled is the highest concentration of poor bridges and corresponds to the "wave" of bridges entering the latter half of their useful life. This can be seen in Exhibit 3.5 in the report.

Exhibit 3.1 – Distribution of Bridge Condition Index Score by Age



Source: Graph created by the Office of the Auditor General of New Brunswick with data and information provided by the Department of Transportation and Infrastructure (unaudited).

3.6 The Bridge Maintenance Unit under the Maintenance and Traffic Branch of the Department is directly responsible for the inspection and maintenance of all provincial designated bridges. Its mandate is:

To inspect and maintain the structural integrity of bridges on provincially designated highways in a safe, efficient and cost effective manner.

To inspect, operate and maintain ferries operating within the provincial transportation system in a safe, efficient and cost effective manner.

To operate and maintain the buildings and grounds under the care and control of the Department of Transportation in a safe, efficient and cost effective manner.

Results in brief

Inspections are generally in line with accepted professional standards

3.7 The Department performs regular detailed visual inspections on bridge structures. In general, the inspections are performed to the standard prescribed by the Department and in accordance with accepted professional standards. The Department has a draft Bridge Inspection Procedure document which provides some guidelines for the bridge inspection process. The Department has not yet developed its own comprehensive inspection manual.

3.8 With certain exceptions, as noted in paragraph 3.51, the frequency of inspections for the sampled reports was in agreement with the inspection cycle guidelines established by the Department.

Inspection reports are generally complete, accurate and consistent

3.9 The information contained within the inspection reports we tested is generally complete, accurate and consistent.

3.10 The bridge condition comments and observations found in the narratives of the reports are comprehensive and amply depict the field observations collected for damaged and degraded bridge components. The information in the reports sampled was thorough enough to permit an adequate assessment of the service level of a bridge structure at a point in time and the required remedial actions.

3.11 The material ratings given to each component were consistent with the OSIM procedure and the reports adequately depict the general condition of the bridge components.

3.12 However, we believe the information recorded in the report was insufficient to follow the evolution of the defects over time due to a lack of quantitative information.

3.13 The reported information was found to be consistent

between inspections over consecutive years for the same structure. Inspection reports between different structures were all completed to the same standard, as were the reports done by different inspectors.

Lack of quality assurance and control regarding bridge inspection

3.14 The Department does not have a formal quality assurance and control process in place. A professional engineer is not required to sign off on any inspection reports and there is no evidence in the reports sampled of review by a professional engineer. Trained engineering technicians carry out the work which meets accepted standards but only if properly supervised by a professional engineer.

Unsystematic process for maintenance and capital planning

3.15 The Department has an informal, unsystematic and undocumented process for developing and managing bridge intervention priorities.

3.16 Inspection reports and the bridge conditions form the basis for which bridges should be placed on the priority list. However the maintenance and capital program can be heavily influenced by other non-condition related factors. We believe there should be guidelines established to govern the inclusion of the factors used for maintenance and capital project selection. There should be a clear link between projects chosen based on these factors and the Department's overall goals and objectives.

3.17 Bridges in need of major repair or replacement which are not included in the Capital Program are remediated through short term measures such as temporary bracing and through posting weight restrictions. There were 163 bridges as of January 2013 with posted weight restrictions.

3.18 We believe the Department should clearly identify, document, and communicate to the senior officials and Cabinet Ministers the implications or opportunity cost associated with the selected capital program. Such implications to be communicated should include the increased cost of capital maintenance by deferring major repairs.

3.19 We also found repair work was not being done on a timely basis. For example, in cases where defects did not directly compromise the use of the bridge, (e.g. abutment settlement) no short-term follow-up work was performed. This means recommended maintenance identified during the inspection is not being done in a timely manner. No record of or tally of the deferred maintenance work other than what

can be found in the body of the inspection reports is maintained.

The bridge asset management system is in the early stages of development

3.20 The Department defined its strategic bridge infrastructure objectives in its *Bridges and Culverts Asset Management Plan*:

a) Adopting a least life cycle cost approach to rehabilitation and replacement programming; and
b) Ensuring the condition profile does not decline over the planning period.

3.21 However, bridge management is only in the early stages of moving towards these goals.

Long term least life cycle cost approach is not adopted

3.22 The Department does not currently use the least life cycle cost approach to maintain the service level of its bridge inventory. The Department has not fully developed nor implemented the Bridge Asset Management System. This limits the Department's ability to select the appropriate treatments at the optimal timing for a bridge at the operational level. Further, the Department does not have an action plan to move forward on the Bridge Asset Management System.

Lack of public reporting on the condition of bridges and the effectiveness of its bridge inspection activities

3.23 The Department currently does not publicly report the conditions of bridges it maintains. The information is only available internally. The internal rating system the Department is using (i.e. the Bridge Condition Index or BCI) is the same as that used by the Ministry of Transportation of Ontario.

3.24 By contrast, the Ministry of Transportation of Ontario and Transport Quebec publish sufficient information to allow the public to assess the overall condition of individual bridges in their respective jurisdictions.

3.25 Although the Department did report the number of inspections completed during the year, it did not publicly report any performance targets for this activity (e.g. how many inspections it planned to perform during the year). Therefore, it is impossible, based on the publicly available information, to assess the Department's actual performance for the year.

3.26 Without clear public reporting of results in relation to comparable targets, the public cannot assess the Department's performance relating to its bridge inspection

activities.

Reduced funding leads to deferred maintenance and deterioration of the provincial bridges

3.27 The investment in regular maintenance and bridge rehabilitation in recent years has been steadily decreasing.

3.28 As a result, there will be a significant increase in the funding requirement for regular and capital maintenance for provincial bridges in the coming years. Unless funding allocations to bridge maintenance are increased in future years, the Department will not be able to maintain the existing service level of its bridges (ie the bridges' ability to support the weight and volume of the traffic relying on them).

3.29 To address its own growing deferred maintenance issue, the Province of Quebec passed legislation to ensure adequate investment in infrastructure maintenance. This legislation followed the De la Concorde overpass collapse in Montreal in 2006.

Exhibit 3.2 – Summary of recommendations

Recommendation	Department's response	Target date for implementation
Objective 1: Inspection standards, results, and maintenance and capital planning		
3.46 We recommend the Department document its bridge inspection processes in a single comprehensive manual.	*The Department will consolidate the existing practices and procedures which currently utilizes procedures from the Ontario Structures Inspection Manual into a single New Brunswick Bridge Inspection Manual.*	*June 2015*
3.47 We recommend the Department have readily accessible to all staff the most current and complete copy of any manual or other documentation referenced in the inspection process.	*The Department agrees and will make the necessary current manuals available to all staff.*	*Immediate*
3.62 We recommend the Department follow the Ontario Structures Inspection Manual guidelines for reporting bridge component deterioration and record the quantitative information such as the width and extent of cracks in the inspection reports. The recording of actual quantities of the defects leads to a better estimation of rehabilitation needs.	*The Department will carry out a review of its own inspection Procedures with respect to reporting deterioration and quantitative information. The Ontario Structures Inspection Manual will be referenced.*	*June 2015*
3.63 We recommend the Department include suggested completion dates within the maintenance recommendations in the inspection reports. This will provide additional detailed information for use by senior department officials and members of the Legislative Assembly, inventory data analysis and performance reporting.	*The Department will develop criteria for suggesting completion time frames for maintenance recommendations, which will be incorporated in the Inspection Manual.*	*June 2015*
3.69 We recommend the Department add a severity rating component to their material rating process similar to the Ontario Structures Inspection Manual. Standardized material ratings should be used.	*The Department will carry out a review of the existing rating system in the development of its own Inspection Manual.*	*June 2015*
3.75 We recommend the Department standardize the use of priority codes within the inspection reporting process.	*The Department will carry out a review of the existing priority codes in the development of its own Inspection Manual.*	*June 2015*
3.79 We recommend the Department implement and document a formal quality control and assurance procedure for inspections and reporting. In conjunction with this, the Department should formalize supervision of the inspection team by a qualified structural engineer. This could include, but not be limited to: • documented review by a professional engineer of a random sample of completed bridge inspection reports and photo files; • direct observation; and • re-performance of field inspections.	*Currently a professional engineer experienced in maintenance, construction, and human and financial management supervises this team, with access to structural engineers where required for technical assistance on an as needed basis.* *The Department will develop a documentation procedure for this reporting.*	*May 2014*

Exhibit 3.2 – Summary of recommendations - continued

Recommendation	Department's response	Target date for implementation
Objective 1: Inspection standards, results, and maintenance and capital planning (continued)		
3.88 We recommend the Department establish guidelines for bridge repair and replacement project selection and document the rationale for the projects selected.	*The Department has a process for developing capital and ordinary projects and will formally document the rationale for project selection.*	*May 2014*
Objective 2: Long term least life cycle cost approach		
3.104 We recommend the Department clearly define the least life cycle cost for a bridge and adopt this approach in prioritizing all capital bridge work, as stated in the Department's Bridges and Culverts Asset Management Plan.	*The Bridge and Culvert Asset Management Plan is being developed to establish future capital bridge priorities. The Department will continue its efforts in the implementation of these Asset Management Plans in regard to bridges.*	*2015 testing 2016 Implementation*
Objective 3: Public reporting on the condition of bridges and the effectiveness of its bridge inspection activities		
3.115 We recommend the Department publicly report the Bridge Condition Index of all designated Provincial bridges on an annual basis.	*The Department will assess the value of providing this information to the public.*	*May 2014*
3.116 We recommend the Department have measurable objectives relating to the condition of Provincial bridges. Such objectives might include setting a target Bridge Condition Index.	*With the continued development and implementation of the Bridge and Culvert Asset Management Plan the Department will identify objectives for the condition of Provincial bridges.*	*2016*
3.124 We recommend the Department set targets for its bridge inspection program and publicly report the targets, actual results and the rationale for variances in its annual report.	*The Department does have targets for inspections and will provide this information to the public in the future.*	*2014*
Other observation: funding requirements to maintain the service level of bridges		
3.136 The Department should develop and implement a long term plan to address current and expected future funding shortfalls in ordinary and capital bridge maintenance. This plan should be communicated annually during the capital budget process in order to appropriately inform senior officials and Cabinet Ministers.	*Currently, ordinary and capital budget plans are communicated to senior officials and Cabinet Ministers on an annual basis.*	*March 2015*

Audit objectives and scope

3.30 The objectives of our audit were:

1. *To determine whether the Department performs bridge inspections in accordance with accepted professional standards and uses the inspection results to identify and prioritize necessary capital maintenance and other remedial measures.*

2. *To determine whether the Department maintains the service level of its bridge inventory based on a long term least life cycle cost approach*

3. *To determine whether the Department publicly reports on the condition of designated Provincial bridges and the effectiveness of its bridge inspection activities*

3.31 The audit criteria we used for each objective were listed in Appendix V.

3.32 The scope of our audit included 2,553 of the 2,608 provincially designated bridge structures. Sea walls and retaining walls were excluded, as majority of them are not part of the major transportation network. The ten international bridges were also excluded, because the inspection and maintenance responsibility is shared with the State of Maine.

3.33 Our audit work included:

- performing walkthroughs on the Department's bridge inventory system;
- examining inspection reports and other documentation regarding bridge inspection procedures, the bridge asset management plan and annual reports;
- interviewing the staff members of the Department; and
- researching the bridge management practices in other jurisdictions.

3.34 The Department performs four types of inspections on bridges:

- detailed visual inspections;
- special inspections;
- emergency inspections; and

- additional inspections.

3.35 We tested the inspection reports generated from detailed visual inspection which we believe is the most comprehensive one of all the different types of inspections.

3.36 We did not re-perform any bridge inspections nor test the Department's bridge inventory system.

3.37 During our audit, we engaged an out-of-province engineering expert to:

- verify the accuracy, completeness, and consistence of a sample of inspection reports;
- validate that the element ratings are reasonable and consistent with inspector's observations based on available physical evidence from inspection photographs; and
- provide general commentary on the effectiveness of the bridge inspection process, its conduct and documentation.

3.38 Our audit was performed in accordance with standards for assurance engagements, encompassing value-for-money and compliance, established by the Chartered Professional Accountants of Canada, and accordingly included such tests and other procedures as we considered necessary in the circumstances.

3.39 Certain financial and statistical information presented in this chapter was compiled from information provided by the Department of Transportation and Infrastructure. It has not been audited or otherwise verified. Readers are cautioned that this financial and statistical information may not be appropriate for their purposes.

Objective I

3.40 Our first objective was:

To determine whether the Department performs bridge inspections in accordance with accepted professional standards and uses the inspection results to identify and prioritize necessary capital maintenance and other remedial measures.

Inspection Standards

3.41 Unlike Ontario and other jurisdictions, the Department has not yet developed its own comprehensive inspection manual. The Department has a draft Bridge Inspection Procedure document which provides some guidelines for the bridge inspection process. It provides inspectors with instructions regarding the preparation of inspections, the field work and the post-inspection operations. It states that bridges are to be inspected with reference to the Ontario Structures Inspection Manual (OSIM) and the U.S. Federal Highway Administration's Bridge Inspector's Training Manual.

3.42 Any rigorous inspection system should meet a number of minimum requirements:

- Detailed visual inspections should be performed on a regular basis;
- The entire history of the bridge should be properly documented and easily accessible to inspectors;
- A quality assurance system should be put in place to verify the reliability of the data generated during the visual inspections; and
- Inspectors should be qualified and properly trained.

3.43 The OSIM published by the Ontario Ministry of Transportation (MTO) sets standards for the visual inspection and condition rating of bridges and their components. It covers the complete inspection process, pre and post inspection operations; inspector's qualifications, inspection frequency; inspection descriptions and technical information to clearly identify structural elements, material defects and performance deficiencies.

Incomplete Manual

3.44 We believe it is critical the Department ensure the most recent and complete versions of referenced standards and manuals (ex. OSIM) are in use. We found the Department referenced an abbreviated copy of the most current version of the OSIM. The abbreviated copy came from the Ontario Good Roads Association, a trade body and not directly from MTO. In the conduct of our audit we were able to download the full version of the most recent OSIM directly from the MTO website. The copy referenced by the Department was missing all but one section of Part 1-Technical information along with the parts on "Additional Investigations and Material condition surveys". It is important to note that in the conduct of our further examination of inspection results this did not appear to have a detrimental impact on the overall effectiveness of the inspections.

Outdated Manual

3.45 The second document referenced in the Department's Bridge Inspection Procedure is the U.S. Federal Highway Administration's Bridge Inspector's Training Manual. This manual is not officially in use anymore. The document referenced by the Department is the 1990 edition, which was issued to update the manual initially issued in 1970. The most recent document available from the US Federal Highway Administration (FHWA) refers directly to the National Bridge Inspection Standards (NBIS). The latest version of the NBIS was published in December 2004. The US FHWA manual covered all of the basic techniques used in conducting detailed visual bridge inspections, which are still pertinent to inspections today. However, the Department should ensure it is referencing the most current version of other jurisdictions manuals to avoid any confusion or ambiguity in their own inspection procedures.

Recommendations

3.46 We recommend the Department document its bridge inspection processes in a single comprehensive manual.

3.47 We recommend the Department have readily accessible to all staff the most current and complete copy of any manual or other documentation referenced in the inspection process.

Inspection frequency

3.48 Accepted professional standards require a prescribed inspection frequency for all bridges. Actual inspection cycles should adhere to this standard. In Ontario, in accordance with the *Public Transportation and Highway Improvement Act*, provincial bridges undergo a legislated "detailed bridge inspection every two years" (Ontario Regulation 104/97, s.2. paragraph 3). The Ontario Structures Inspection Manual (OSIM) provides additional guidance by specifying that further enhanced visual inspection must be performed at least every 6th year on bridges over 30 years old with components in poor condition. It allows for bridge size culverts with three to six metre spans to be inspected every four years provided the structure is in good condition. The OSIM allows for the frequency of inspections to be increased as directed by the Engineer based on the type of structure, construction details, problems or restrictions.

3.49 The Department's draft Bridge Inspection Procedure (BIP) specifies that bridges are to be inspected on a 1, 2 or 4 year basis dependent on age, type and condition. The BIP does not give any details about the criteria used to determine which inspection interval should be observed. A separate informal internal document/memorandum entitled "Bridge Inspection Cycle 1…2…&….4 Year Criteria" gives some specific guidance about what factors and criteria to follow in determining which inspection frequency level to use.

3.50 The bridge inspection frequency for each bridge is recorded within the Bridge Inventory Data base at the Department. An analysis of the bridge inventory was conducted using last inspection date and inspection cycle frequency.

Majority of Inspections are on Time

3.51 Of the over 1,000 bridges that were scheduled to be inspected during the 2012 inspection season, there were 17 that were not completed and out of date.

3.52 This does not constitute a significant discrepancy and there is no indication of systemic problem in keeping up with inspection cycle frequencies. The inspection frequency, last inspection and next planned inspection dates are well documented and tracked within the database. Inspections missed are rescheduled and completed during the next inspection cycle.

3.53 With the noted exceptions, the frequency of inspections for the reviewed reports was in agreement with the inspection cycle guidelines established by the Department.

3.54 We also found that there is a difference between the Department's BIP and the OSIM. The Department's BIP supplemented by the informal criteria clearly specifies that some bridges should be on a one year cycle.

3.55 We believe if reference is to be made to the procedures from other jurisdictions (OSIM), it should explicitly state which operations or specific sections to use instead of referring to the entire document. Ambiguity between reference manuals and informal or draft internal documents such as was found in inspection frequencies would be eliminated with a single departmental inspection manual.

Completeness, accuracy and consistency of inspection reports

3.56 Inspection is one of the key elements of any bridge management system. The effectiveness of the system relies on the quality of the source information being fed into it. Management at head office and in the districts relies on the information found in the inspection reports. It is essential that the inspection report tells the full story of the service level (i.e. physical condition) of that bridge. It is critical that bridge inspection reports be complete, accurate, and consistent.

3.57 We selected a sample of 31 bridges to test the inspection reports. The exceptions are listed in Exhibit 3.3. The detailed sample selection methodology can be found in Appendix VI.

Completeness of inspection reports

3.58 Completeness of inspection reports would imply:

- sufficient, appropriate information in all required fields; and
- sufficient and required photographic evidence of report observations and findings to allow a reviewer to conclude on the condition of the bridge.

3.59 In the 31 items tested, we found the bridge comments and observations in the narratives of the report to be comprehensive. They amply depicted the field observations collected for damaged and degraded bridge components. The information in the reports sampled was thorough enough to permit an adequate assessment of the

service level of a bridge structure at a point in time and the required remedial actions.

3.60 However, we believe the information recorded was insufficient to follow the evolution of the defects over time due to a lack of quantitative information. For instance knowledge of the width and extent of cracks in various locations, which was not captured, can be important in determining the type of deterioration occurring in the concrete and is necessary information for estimating the breadth of required repair work. No timeframe was provided within the reports for the maintenance and future work recommendations as is required by the OSIM.

3.61 There were also 19 instances of incomplete photographic information. In these 19 instances at least one of the required pictures was missing in the picture report. In four of the instances the component ratings could not be assessed from the associated photographs.

Recommendations

3.62 We recommend the Department follow the Ontario Structures Inspection Manual guidelines for reporting bridge component deterioration and record the quantitative information such as the width and extent of cracks in the inspection reports. The recording of actual quantities of the defects leads to a better estimation of rehabilitation needs.

3.63 We recommend the Department include suggested completion dates within the maintenance recommendations in the inspection reports. This will provide additional detailed information for use by senior department officials and the members of the Legislative Assembly, inventory data analysis and performance reporting.

Accuracy

3.64 Accuracy of information within the report refers to:

- the condition assessment;
- the narrative observations;
- priority code; and,
- recommendations made.

3.65 In other words, do the component ratings of poor, fair, good, or excellent reflect the actual condition of the bridge component based on expert review of bridge inspection photographs? Further, are the ratings consistent

with the rating guidelines found in the OSIM?

Accurate ratings and Appropriate recommended repair

3.66 In our testing, we found the material ratings given to each component to be consistent with the OSIM procedure and from our review of photographic evidence the reports accurately depicted the general condition of the bridge components. The component defect descriptions in the report accurately reflected the actual condition seen in the respective component photographs. When major defects were reported, the recommended repair work included in the inspection report was appropriate.

3.67 However, we did find that when a severity assessment was included in the narrative it did not systematically follow the OSIM or BIP guidelines. There were instances where a rating of very poor or severely poor was given. The OSIM prescribes four specific ratings: excellent, good, fair, and poor. There are predefined defect levels and measurements associated with each of the four ratings. The addition of an extra descriptive word in front of the standard rating adds a subjective element to the condition rating and induces a bias in the evaluation. Consideration may be given to some structures over others in the same condition based on the non-standardized rating description. This could be avoided with the use of a separate field within the inspection report where one of the four pre-set ratings must be chosen.

Lack of severity rating

3.68 The OSIM requires a severity rating in addition to the material rating. This is not followed in the NB inspection process. The degree of severity of a component in the OSIM is based on specific quantitative observations and measurements of the size and exact nature of the defect. For example, cracks are evaluated as either hairline, narrow, medium or wide. Verification requires the defect measurements to be recorded in the inspection report. Although the ratings appear to be reasonably accurate, the only available information to follow the progression and rate of degradation is limited to the “Comments” and “Observations “sections and thus relies on the information the inspector deems necessary to report.

Recommendation

3.69 We recommend the Department add a severity rating component to their material rating process similar to the Ontario Structures Inspection Manual.

Standardized material ratings should be used.

Consistency

3.70 Consistency was looked at three different ways:

- The degree of concurrence between the bridge information and condition throughout the report and the related photographic evidence. Narrative descriptions should match the pictures and the component lists;
- There should be consistency between reports prepared by different inspectors. All inspection reports should be prepared to the same standard from year to year; and
- There should be consistency in inspection reports regardless of the type of bridge being inspected. Simple single span bridges should be completed to the same standard and in the same manner as larger more complex structures.

Consistent inspection reports

3.71 From our testing, information included in inspection reports was found to be consistent for consecutive inspections of the same structure and between reports for different structures. Information and data reported by different inspectors was also found to be consistent. The Department's processes and inspection applications lend themselves well to maintaining consistency within and between the inspection reports. Information recorded in the observations tab from previous inspections is readily accessible and reviewed by the inspectors prior to inspections. The small number of in-house inspectors working as a team out of the head office also contributes to uniformity in inspection standards and reports. The presence of specific fields of information in the bridge inspection software application, has also contributed to the level of consistency found in the reports.

Benefits of using standard checklists

3.72 However, we believe the Department's manual should be supplemented with a detailed field inspection form or checklist to minimize the subjectivity in inspection documentation. This would also aid the collection of detailed information that would allow for improved planning for future maintenance and intervention activities. Additional information that should be routinely collected by inspection personnel on cracks and damaged areas includes:

- crack widths (typical interval);
- cracked area/location;
- crack pattern;
- scaled/damaged surface;
- corrosion symptoms;
- delaminated area/location;
- spalled area/location;
- exposed rebar's location/extent/section loss; and
- moisture/deposits/discoloration.

Non-standardized priority code

3.73 The priority code is a set of pre-determined text fields, selected from a drop down list within the inspection application. It is meant to provide a standardized and searchable field within the bridge data base to aid in maintenance and remediation planning. The standard priority or urgency codes are numbered and relate to the urgency of deck rehab, small or large bridge, or pipe replacement.

3.74 The priority code is not currently attributed to the observed degradation of the bridge elements on a systematic basis. It should at least be provided for any defect for which an intervention is required in the "Recommendations" section, regardless of the rating or the component type.

Recommendation

3.75 We recommend the Department standardize the use of priority codes within the inspection reporting process.

Exhibit 3.3 - Listing of exceptions

Results of Bridge Inventory Inspection Frequency Test	Number of exceptions
Inspections not completed as planned in current year	17 or 1.5% of 1,155 planned
Results of bridge inspection testing Listing of exceptions found in sample of 62 inspection reports for 31 bridges	**Number of exceptions**
Inspection Frequency	
Documented inspection frequency is not in compliance with internal New Brunswick Department of Transportation and Infrastructure cycle criteria	3
Accuracy	
Ratings could not be verified due to incomplete or lack of sufficient photographic evidence	4
Rating did not follow the prescribed guidelines –additional rating was given	2
Recommended maintenance work was not completed prior to the next inspection	5
Completeness	
Inspection photographs not in accordance with Bridge Inspection Procedure	19
Insufficient deterioration details and measurements	all
Lack of time frame on repair recommendations	all

Quality control over inspections

3.76 A quality assurance system should be in place to verify the reliability of the data generated during the visual inspections. Inspectors should have current qualifications and training. The US National Bridge Inspection Standards include a requirement for appropriate quality control (QC) and quality assurance (QA) steps to be taken. Specifically it states: *Assure that systematic quality control (QC) and quality assurance (QA) procedures are used to maintain a high degree of accuracy and consistency in the inspection program. Include periodic field review of inspection teams,*

periodic bridge inspection training for program managers and team leaders, and independent review of inspection reports and computations.

3.77 The New Brunswick Bridge Inspection Procedure specifies that inspectors should be engineering technicians who have attended an approved bridge inspection course(s). These requirements are different from those stated by other bridge inspection systems, such as the OSIM. The OSIM requires inspectors to be professional engineers with a background in inspections or trained bridge inspectors reporting or under the supervision of a Professional Engineer. All New Brunswick inspectors were qualified engineering technicians, experienced in performing inspections and had bridge inspection training.

3.78 The Department does not have a formal quality control or quality assurance process in place. For example, a professional engineer is not required to sign off on any inspection reports. During the inspection season, inspectors meet at least once a week with the bridge maintenance engineer to discuss any issues which were discovered during the previous week of inspecting (e.g. significant deterioration of a bridge which is not critical but should be investigated or repaired in the near future). This is an informal process and results are not typically documented and nothing guarantees that all issues will be addressed in a timely manner by a professional engineer. There is no evidence in the reports we tested of review.

Recommendation

3.79 We recommend the Department implement and document a formal quality control and assurance procedure for inspections and reporting. In conjunction with this, the Department should formalize supervision of the inspection team by a qualified structural engineer. This could include, but not be limited to:

- **documented review by a professional engineer of a random sample of completed bridge inspection reports and photo files;**
- **direct observation; and**
- **re-performance of field inspections.**

Maintenance and capital planning

3.80 An effective inspection process with reliable bridge information allows the Department to make short-term decisions where an inspection has shown the safety of a bridge to be a concern. Inspections also provide the Department decision makers with information they can use to prioritize bridge maintenance and capital repairs. In an environment of scarce resources and ever increasing demands on those resources, it is critical to have processes in place that can be used to assist management in making the critical decision of what work to do and when.

Maintenance planning

3.81 Performing and keeping up with regular maintenance on any type of capital asset is important for getting the most out of its useful life and reducing the chance of needing more extensive work later on. Different types of bridges in different locations react and deteriorate differently. Not all bridges are the same. The treatments for a bridge must be in some part tailored to the needs of that particular bridge. Inspections are the main tool for learning how a particular bridge is behaving. Therefore maintenance and repair plans should stem from or in large part reflect the findings and recommended maintenance coming from the inspections. This should be apparent from a review of consecutive bridge inspection reports on the same structure.

3.82 This review was conducted for the bridge reports we tested. We found repair work was not being done on a timely basis. In cases for which defects that did not directly compromise the use of the bridge, (e.g. abutment settlement) no short-term follow-up work was performed. This means recommended maintenance identified during the inspection is not being done on a timely basis. No record of, or tally of the deferred maintenance work other than what can be found in the body of the inspection reports is maintained.

3.83 The non-systematic application of the maintenance and repair recommendations adversely affects the size and manageability of the “deferred” maintenance deficit. It also draws concerns that:

- It can promote application of the recommendations based on subjective interpretation of the inspection reports; and
- Comments and observations entered within text

blocks may be overlooked because they are not highlighted or sufficiently emphasized in the inspection report.

Capital project selection

3.84 A capital replacement priority list is developed and maintained by Maintenance and Traffic branch with collaborative input from the district offices. This list is derived primarily from the results of the bridge inspections and internal discussions among the Department's engineers. The priority list is further rationalized down to a proposed capital program after considering other factors such as:

- safety concerns;
- traffic volume and available detours;
- anticipated funding levels;
- availability of completed design and prep work; and,
- District priorities.

3.85 The proposed capital program is forwarded to the Department's senior management for executive review and approval. The result of that review determines the final capital program to be carried out on bridges in the Province. During this process additional non-condition related variables such as economic and social development, industry considerations, and political activism may further influence the final selection of capital projects.

3.86 There is no evidence of a cost-benefit analysis or that least life cycle cost was considered when determining the selection of capital bridge rehabilitation and replacement projects. The Department indicated during the final approval phase of the capital program there is a risk that non-optimal considerations may influence the choice of capital maintenance projects.

3.87 We believe there should be guidelines established to govern the inclusion of non-bridge condition based factors to ensure there is a clear link between the selected projects and the Department's overall goals and objectives.

Recommendation

3.88 We recommend the Department establish guidelines for bridge repair and replacement project selection and document the rationale for the projects

selected.

Conclusion on Objective I

3.89 The Department performs regular detailed visual inspections on bridge structures. In general the inspections are performed to the standard prescribed by the Department and in accordance with accepted professional standards. The information contained within the reports is complete, accurate and consistent. However, we noted weaknesses in documenting a comprehensive set of inspection procedures, collecting quantitative information within the inspection reports, and attributing priority codes on a systematic basis.

3.90 The Department relies on and incorporates the inspection results in its maintenance planning and in the initial establishment of its capital priority lists. However, the Department does not have a formal documented and systematic process for prioritizing maintenance and capital work for bridges.

Objective II

3.91 Our second objective was:

To determine whether the Department maintains the service level of its bridge inventory based on a long term least life cycle cost approach.

3.92 Levels of service describe the quality of service that the Department has decided are to be provided by bridges for the benefit of road users, such as weight and speed limits, bridge width and traffic volume.

3.93 Life cycle cost refers to the total cost of ownership over the life of an asset. Least life cycle cost approach for maintaining a bridge means selecting the preservation treatments with lowest cost over the life of a bridge. In other words, it means to perform the right treatment to a bridge at the right time to minimize the overall costs of maintaining the asset in appropriate conditions for it to provide the required level of service.

3.94 The Department's Asset Management Business Framework (AMBF) initiative was introduced in 2008 to provide a more strategic approach to long term, sustainable investment planning and program management. This will enable better decision-making by identifying the appropriate timing for the most effective and economical treatment based on long term, least life cycle costs taking into consideration the entire bridge and

culvert stock to achieve optimal performance within annual budgets.

3.95 In fact, the Department defined its strategic bridge infrastructure objectives in the *Bridges and Culverts Asset Management Plan* (AMP) prepared by the Department in 2010:

> *The 2010-14 rehabilitation programming was guided by several key strategic infrastructure objectives for bridges and culverts. This included: a) Adopting a least life cycle cost approach to rehabilitation and replacement programming; and b) Ensuring the condition profile does not decline over the planning period.*

3.96 However, bridge asset management is only in the early stages of moving towards these goals.

3.97 Additionally, the parameters affecting life cycle cost are not clearly defined in the AMP. For example, large bridge rehabilitation projects tend to generate significant costs associated with traffic delays. Without clearly defining what should be included in the calculation of life cycle cost, it is difficult to use this approach to set priorities.

3.98 The AMP states:

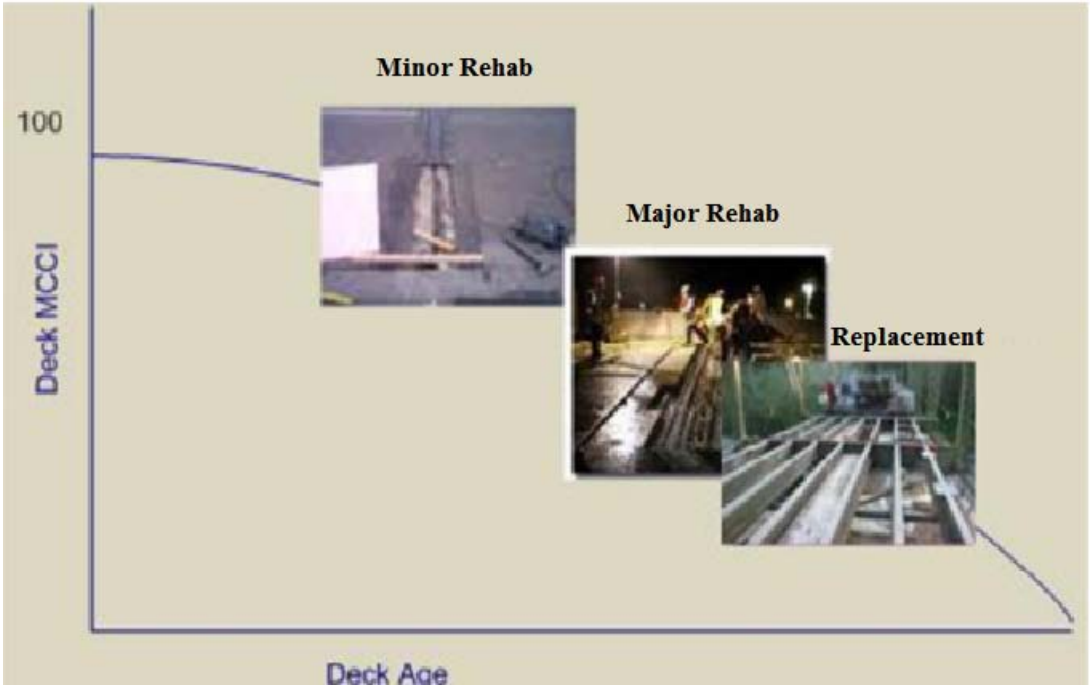
> *"Asset management planning and programming for bridges is in the early stages of development" and "management of the bridges has historically been focused on safety and preservation on a bridge by bridge reactive basis. The Department inspects, monitors, repairs and replaces bridges and culverts to ensure that they remain in a structurally sound and safe condition and continue to provide the service for which they were originally designed."*

3.99 One of the key components of the AMP is the life cycle management which includes *"long term deterioration modeling to determine future needs to identify the gap between current and desired performance, applying operational windows to identify the most cost effective timing for rehabilitation and integration with maintenance."*

3.100 A bridge, just like road or building, deteriorates over

time. Exhibit 3.4 illustrates how the conditions of a deck on a bridge typically change over the life of the bridge. It is critical to identify the right treatments at the right time to avoid more costly repair in the future.

Exhibit 3.4 – Bridge deck deterioration cure



Source: the Department of Transportation and Infrastructure

3.101 Typically an asset management system would be used to:

- predict and justify the need for funding;
- set priorities; and
- optimize decision making.

3.102 The Department is not using the Bridge Asset Management System to set priorities. Departmental representatives indicated, the system is not sophisticated enough to precisely suggest the proper timing and treatments for a particular bridge, although it is relatively accurate to predict the future funding required for capital maintenance for all the bridges as a group However, it is not being used for this purpose either.

Conclusion on objective II

3.103 The Department does not currently use the least life cycle cost approach to maintain the service level of its bridge inventory. The Department has not fully developed and implemented a bridge asset management

system. This limits the Department's ability to clearly define and articulate its funding requirements and related opportunity costs for future years. It also limits its ability to select the optimal timing of appropriate bridge treatments at the operational level. Further, the Department does not have an action plan to move forward its bridge asset management system.

Recommendation

3.104 We recommend the Department clearly define the least life cycle cost for a bridge and adopt this approach in prioritizing all capital bridge work, as stated in the Department's *Bridges and Culverts Asset Management Plan*.

Objective III

3.105 Our third objective was:

To determine whether the Department publicly reports on the condition of designated Provincial bridges and the effectiveness of its bridge inspection activities.

Public reporting on bridge condition

3.106 The Department currently does not publicly report the conditions of bridges it maintains. The information is only available internally. The internal rating system the Department is using (i.e. the Bridge Condition Index or BCI) is the same as that used by the Ministry of Transportation of Ontario.

3.107 The BCI was developed as a means of combining component inspection information and its respective replacement cost into a single value that can be used to assist in managing a bridge inventory. BCI is not an indicator of bridge safety. It is commonly used as a rough proxy for the overall condition of a bridge for comparative purposes.

3.108 The Ministry of Transportation of Ontario publishes the following information on its website:

- general information regarding bridge inspection (which bridge components are inspected and how are bridge inspected);
- general information regarding Bridge Condition Index (BCI) (i.e. what does a BCI represent); and
- lists of BCI of all bridges by region.

3.109 Transports Quebec publishes, for its bridges and roads, information on its website, including:

- status of each of the structures of the road network

under the responsibility of the Ministry of Transport;
- the nature of the work; and
- the timing of interventions and inspections.

3.110 This interactive section of its website also shows the type, condition, location, intervention planned and inspection report of each individual bridge under the responsibility of the Ministry of Transport.

3.111 The information published allows the public to monitor the status of bridges and the implementation of the projects of the Department.

3.112 Both examples of public reporting on bridge conditions from Ontario and Quebec are shown in Appendix VIII.

3.113 Moreover, Transports Quebec has a clear and measurable objective regarding the conditions of bridges. It committed to reduce the number of structures considered deficient to 20%. This strategic vision has a direct implication on future decisions. It allows Transports Quebec to establish what should be done in priority to accomplish the goal.

3.114 Publishing information on New Brunswick's bridge status and condition, such as BCI, would help the public assess the overall condition of bridges in the Province.

Recommendations

3.115 We recommend the Department publicly report the Bridge Condition Index of all designated Provincial bridges on an annual basis.

3.116 We recommend the Department have measurable objectives relating to the condition of Provincial bridges. Such objectives might include setting a target Bridge Condition Index.

Public effectiveness reporting related to bridge inspection activities

3.117 We believe the annual report of the Department should include the following relating to bridge inspection activities:

- performance indicators relating to the quality and quantity of bridge inspections;
- targets;
- actual results; and
- the rationale for variances between performance targets and actual results.

3.118 This would allow legislators and the public to assess the performance of the Department relating to its bridge inspection activities and hold the Department to account for that performance.

3.119 We reviewed the 2011-12 Annual Report of the Department and found the following statement relating to bridge inspections:

> *"The Bridge Maintenance section is responsible for the inspection and the administration of the Bridge Maintenance Program, which includes approximately 2,600 bridges and 1,947 large culverts …. Inspections were conducted on 1,254 bridges and 500 large culverts."*

3.120 Although the Department did report the number of inspections completed during the year, it did not publicly report any performance targets for this activity (e.g. how many inspections it planned to perform during the year). Therefore, it is impossible, based on the publicly available information, to assess the Department's actual performance for the year.

3.121 We believe a performance target for inspections would be easily determined. The Department's inspection manual specifies each bridge should be inspected every one, two or four years depending on the bridge's age and/or condition. It is fairly straightforward to calculate the number of regular inspections which should be conducted during a year. In our opinion, that number should be the minimum target, with which the Department compares its actual results.

3.122 Without clear public reporting of results in relation to comparable targets, the public cannot assess the Department's performance relating to its bridge inspection activities.

Conclusion on objective III

3.123 The Department does not publicly report the condition of designated Provincial bridges or its effectiveness with regards to its bridge inspection activities.

Recommendation

3.124 We recommend the Department set targets for its bridge inspection program and publicly report the targets, actual results and the rationale for variances

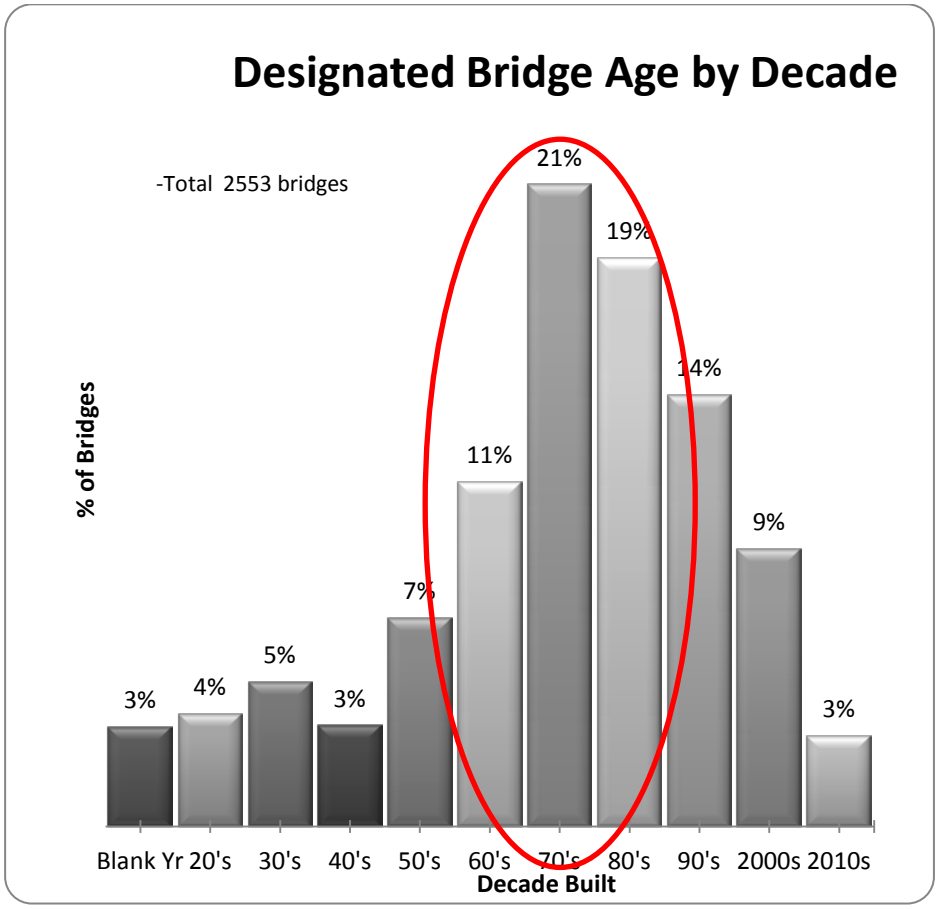
in its annual report.

Other observations

3.125 As illustrated by Exhibit 3.5, 1,396 bridges or 55% are over 30 years old. Most of the bridges constructed prior to 1970 were designed with a life expectancy of less than 50 years. Their service life has been extended through capital repair and imposed weight restrictions. Typical deterioration patterns of major bridge components suggest their conditions deteriorate at a faster rate after 30 to 40 years without timely and appropriate treatments.

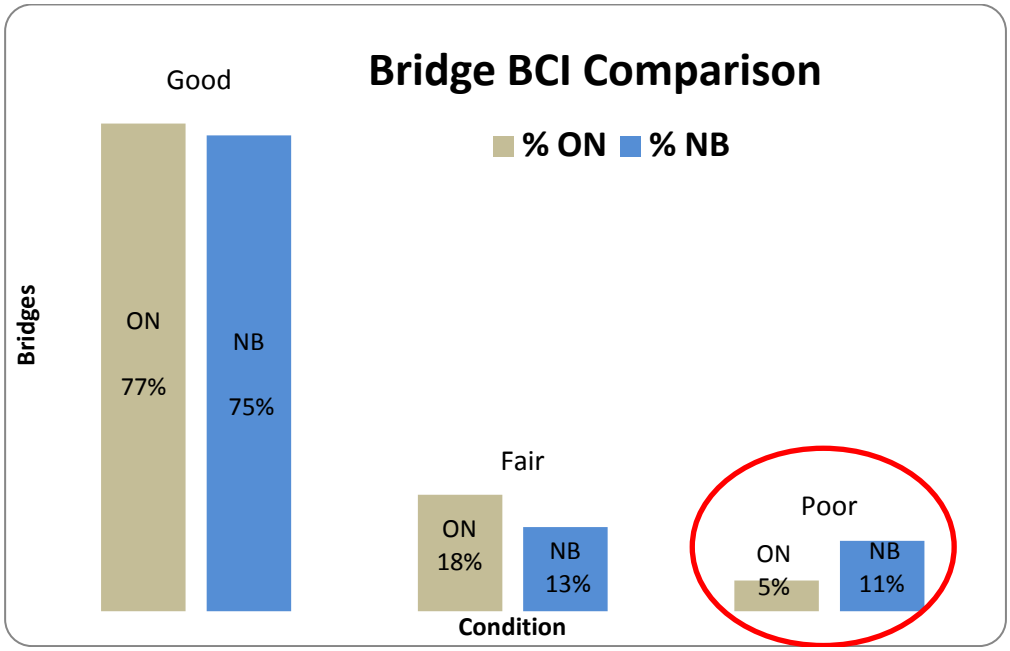
3.126 Exhibit 3.6 shows the current condition of the bridges in New Brunswick, in comparison to those in Ontario. There is a much higher percentage of poor rated bridges in New Brunswick (11% in NB vs. 5% in ON). Those bridges with good to fair rating will require significant investment in maintenance in the near future. The Department projected the annual funding requirements for bridge treatments and replacement will increase from $10 million in 2011 to $50 million in 2039.

Exhibit 3.5 - Designated Bridge Age by Decade



Source: Graph created by the Office of the Auditor General of New Brunswick with data and information provided by the Department of Transportation and Infrastructure (unaudited).
Note: Most of the bridges constructed prior to 1970 were designed with a life expectancy of less than 50 years. Some bridges have had their service life extended by doing preventative maintenance, major upgrade work, and by imposing weight restrictions. Just over 6% of DTI maintained bridges have an imposed weight restriction.

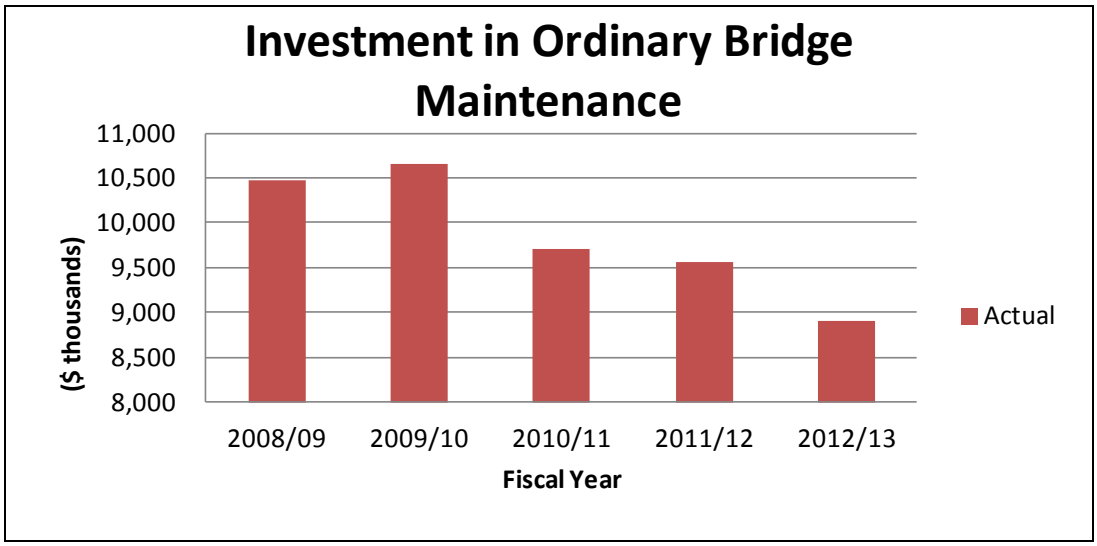
Exhibit 3.6 - Bridge BCI Comparison



Source: Graph created by the Office of the Auditor General of New Brunswick with data and information provided by the Department of Transportation and Infrastructure (unaudited).

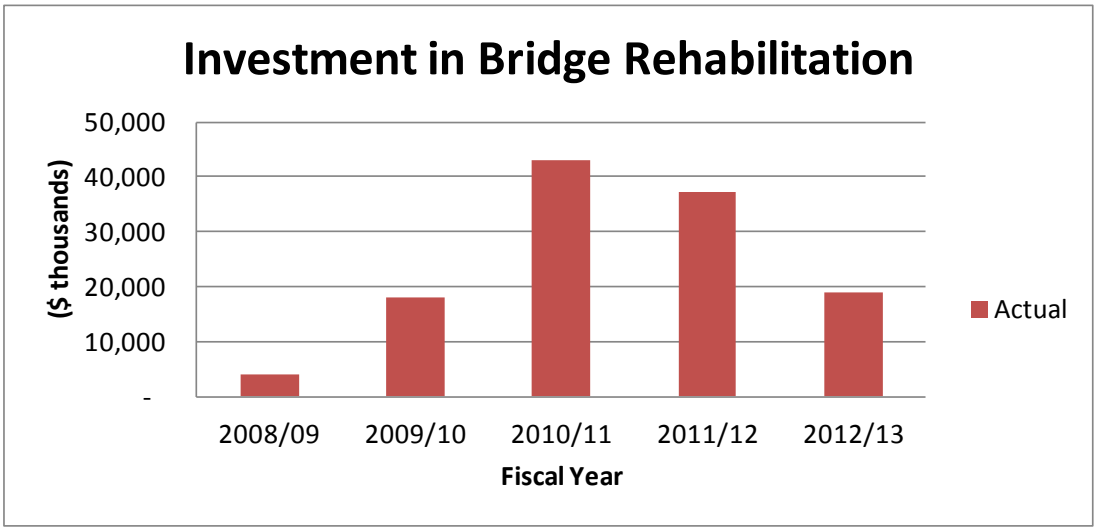
3.127 The investment in regular maintenance and bridge rehabilitation in recent years has been steadily decreasing, as shown in Exhibits 3.7 and 3.8.

Exhibit 3.7 - Investment in Ordinary Bridge Maintenance



Source: Graph created by the Office of the Auditor General of New Brunswick with figures obtained from Public Accounts at March 31

Exhibit 3.8 – Investment in Bridge Rehabilitation



Source: Graph created by the Office of the Auditor General of New Brunswick with figures obtained from Public Accounts at March 31

3.128 As a result, there will be a need for a significant increase in funding levels for regular and capital maintenance for Provincial bridges in the coming years. Unless funding levels to bridge maintenance are increased in future years, the Department will not be able to maintain the planned service levels of its bridges. Furthermore, inadequate investment in maintenance will lead to growing deferred maintenance and deterioration of the Provincial bridges.

3.129 To address the growing deferred maintenance issue in Quebec, the Province of Quebec passed legislation (*Projet de loi no 32 Loi favorisant le maintien et le renouvellement des infrastructures publiques)* regarding infrastructure maintenance. Bill 32 was implemented on December 21, 2007.

3.130 [Translation.] The purposes of this bill are to ensure:

- Investment in public infrastructure is made in accordance with best management practices; and
- There is adequate distribution of investments between infrastructure maintenance and new infrastructure.

3.131 The legislation, in particular, requires:

[Translation.] The capital budget to specify the amounts allocated to each of the following categories:

1. maintenance of existing public infrastructure taking

into account accepted standards;
2. elimination of, within 15 years, the estimated maintenance deficit as of April 1, 2008; and
3. addition, improvement or replacement of public infrastructure.

3.132 The legislation followed the De la Concorde overpass collapse in Montreal on September 30, 2006. The Minister of Transport Quebec (MTQ) immediately requested that any overpasses of similar design in Quebec be identified. It was confirmed that the de Blois overpass adjacent to the De la Concorde had a similar design. It was found to have the same issues which caused the collapse of the De la Concorde overpass and was closed to traffic less than three hours after the De la Concorde collapse and subsequently demolished.

3.133 We concluded in our review of highway capital maintenance in the 2012 Auditor General Report that:

"current funding levels do not allow the completion of optimal maintenance treatments on a timely basis. This will result in deferring required maintenance to future periods at greater overall cost to the Province."

3.134 We were also concerned that:

"as the infrastructure debt grows, the Province will be in a situation where sustainability of the highway network cannot be maintained due to the higher cost of repairing greatly deteriorated roads with limited annual funds. At that point the Department may have to consider decommissioning an increasing number of assets if it hopes to maintain the remainder of the highway network in accordance with asset management objectives"

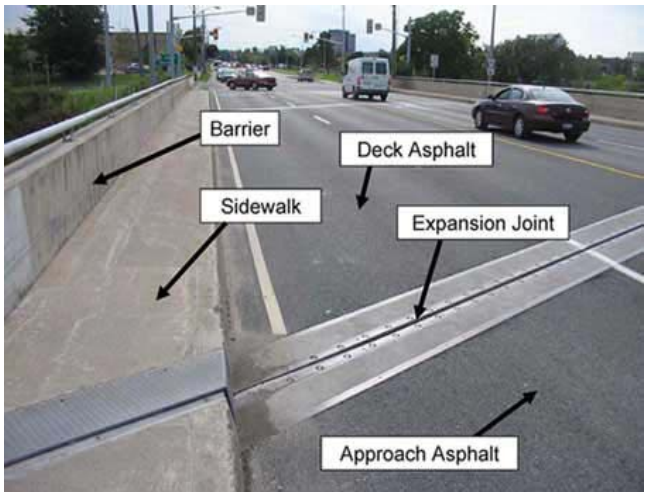
3.135 We have seen similar issues during this audit of Provincial bridges.

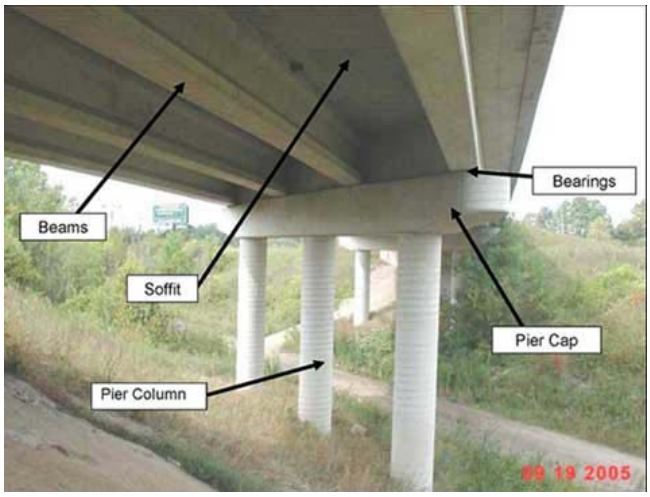
Recommendation

3.136 The Department should develop and implement a long term plan to address current and expected future funding shortfalls in ordinary and capital bridge maintenance. This plan should be communicated annually during the capital budget process in order to appropriately inform senior officials and Cabinet Ministers.

Appendix I: Components of a Typical Bridge

A bridge typically has three major components: deck, superstructure, and substructure. The following photos illustrate the components which are assessed during a bridge inspection.





Appendix II: Excerpts from Ministry of Transportation of Ontario website defining the Bridge Condition Index (BCI)

3.137 A BCI rating is a planning tool that helps the Ministry schedule maintenance and upkeep.

3.138 The BCI is not used to rate or indicate the safety of a bridge.

3.139 The result is organized into ranges from 0 to 100. Immediate action is taken to address any safety concerns.

3.140 Good - BCI Range 70 -100

For a bridge with a BCI greater than 70, maintenance work is not usually required within the next five years.

3.141 Fair - BCI Range 60 -70

For a bridge with a BCI between 60 and 70 the maintenance work is usually scheduled within the next five years. This is the ideal time to schedule major bridge repairs from an economic perspective.

3.142 Poor - BCI Less than 60

For a bridge with a BCI rating of less than 60, maintenance work is usually scheduled within approximately one year.

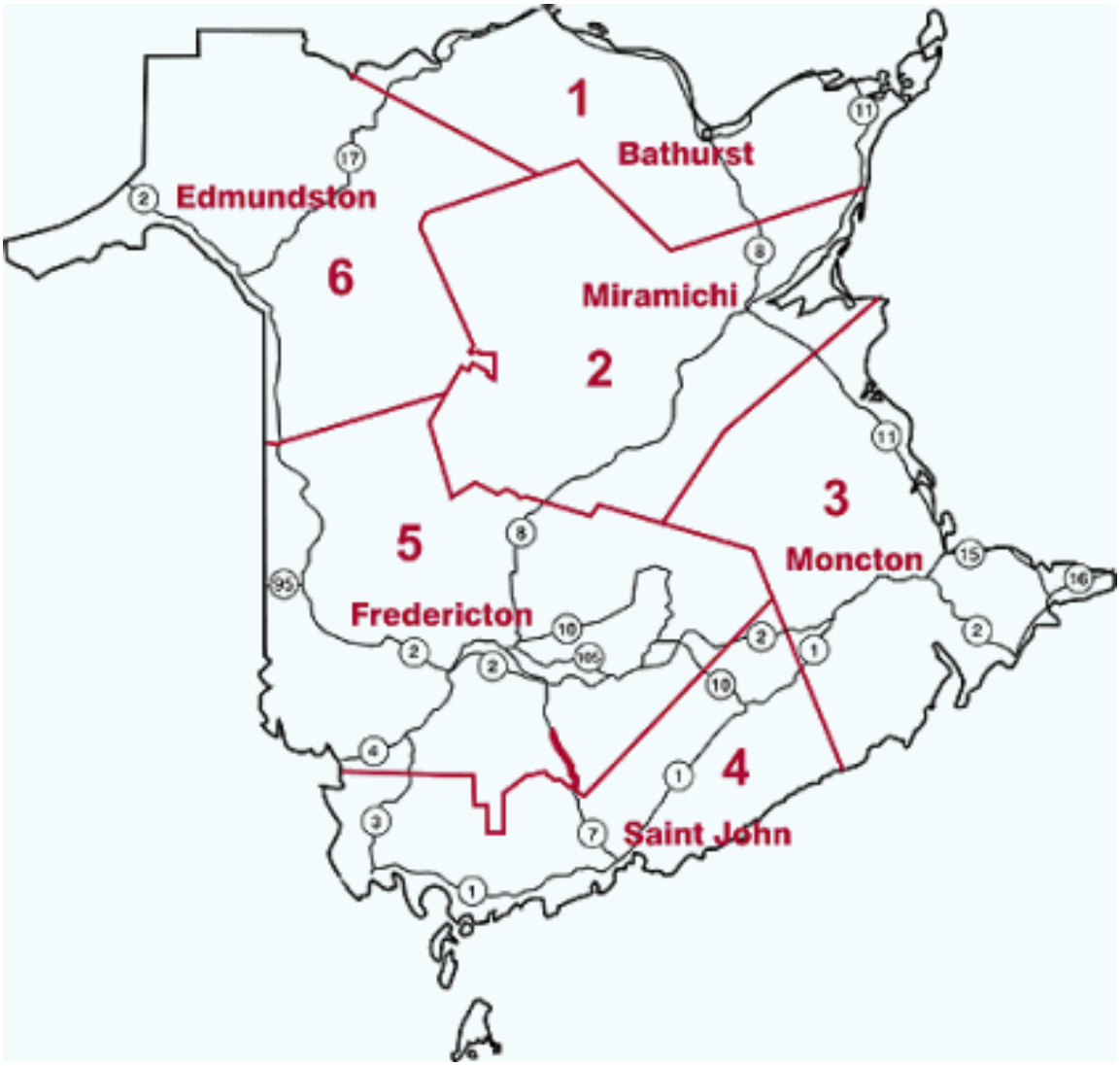
3.143 To calculate the BCI rating, the current value is divided by the replacement cost of the bridge. The replacement value is based on the cost to reconstruct a new bridge.

For example:
Current value = $700,000
Replacement cost = $1,000,000
BCI = Current Value x 100
Replacement Cost
= 700,000 x 100
1,000,000
= 70

(Source: Ministry of Transportation of Ontario website)

Appendix III: Department of Transportation and Infrastructure Map of District Boundaries

(With major highways shown)



Appendix IV: Listing of bridges in audit population with a poor rating (BCI of 60 or less) as at December 2012

The rating noted in the following chart was assessed by the Department. The information was directly taken from the Department's internal system. We did not verify the accuracy and reasonableness of the rating.

BRIDGE #	BRIDGE NAME	DISTRICT #	BCI	YEAR BUILT	LAST INSPECTION	Rating
M440	MILLER BROOK	1	55		5/28/2012	Poor
D352	DICKIE COVE BROOK #1	1	36		5/30/2012	Poor
E475	EEL RIVER #7	1	40		5/29/2012	Poor
A570	ARMSTRONG BROOK #2	1	51	1960	5/30/2012	Poor
C216	CHARLO COVE BROOK #1	1	46	1961	5/30/2012	Poor
E620	ELMTREE RIVER #5	1	37	1963	5/28/2012	Poor
B384	BERESFORD BAR	1	60	1964	6/6/2012	Poor
M358	MIDDLE RIVER #1	1	16	1956	6/22/2011	Poor
M362	MIDDLE RIVER #4	1	48	1968	6/6/2012	Poor
M446	MILLER BROOK #1	1	21	1970	7/10/2012	Poor
L395	LITTLE ELMTREE RIVER #2	1	55	1990	7/14/2011	Poor
N615	NORTHWEST CARAQUET RIVER #4	1	42	1986	7/12/2011	Poor
N085	NASH CREEK (NORTH BRANCH #1)	1	41	1966	6/22/2011	Poor
E390	EEL RIVER #2	1	57	1966	6/14/2011	Poor
N090	NASH CREEK (SOUTH BRANCH #1)	1	37	1966	6/22/2011	Poor
S174	SCOTT BROOK #1	1	47	1980	7/12/2011	Poor
N415	NORTH EEL RIVER #4	1	23	1966	6/14/2011	Poor
S563	SOUTH EEL RIVER #5	1	33		6/14/2011	Poor
S213	SEAL BROOK #1	1	44	1976	6/5/2012	Poor
W145	WALKER BROOK #25	1	41	1976	5/29/2012	Poor
M226	MCINTOSH CREEK #5	1	58	1976	7/12/2011	Poor
B453	BIG HOLE BROOK	1	56	1975	7/12/2011	Poor
T475	TROUT BROOK #1	1	59	1974	7/13/2011	Poor
S539	SOUTH CHARLO RIVER #2	1	58	1974	6/21/2011	Poor
D515	DUGUAY BROOK #1	1	18	1973	11/8/2012	Poor

Appendix IV: Listing of bridges in audit population with a poor rating (BCI of 60 or less) as at December 2012 (continued)

BRIDGE #	BRIDGE NAME	DISTRICT #	BCI	YEAR BUILT	LAST INSPECTION	Rating
P065	PALMER BROOK	2	40	1959	6/7/2011	Poor
P485	PINEVILLE	2	41	1970	6/9/2009	Poor
B123	BARNABY RIVER #8	2	54	1925	10/12/2011	Poor
H410	HAYES BROOK	2	58	1957	7/9/2012	Poor
B564	BLACK RIVER #5	2	47	1961	7/12/2012	Poor
S794	STEWART BROOK	2	49	1962	7/9/2012	Poor
P725	PORTAGE RIVER #1	2	57	1965	6/5/2012	Poor
B489	BLACK BROOK	2	53	1971	7/10/2012	Poor
B216	BAY DU VIN RIVER #7	2	42	1971	7/12/2012	Poor
V150	VANDY BROOK	2	5	1971	7/12/2012	Poor
C596	COLSON CREEK	2	53	1959	6/10/2011	Poor
M730	MUZROLL BROOK #1	2	36	1969	7/11/2011	Poor
E400	EEL RIVER #2	2	33	1972	6/8/2011	Poor
S773	STANDISH BROOK #1	2	39	1955	6/7/2011	Poor
P210	PEABODY BROOK	2	39	1987	7/12/2012	Poor
P740	PORTAGE RIVER #2	2	59	1982	7/12/2012	Poor
M620	MORRISON COVE	2	48	1980	7/12/2012	Poor
W335	WELLS BROOK #1	2	60	1980	7/12/2012	Poor
S668	SOUTHWEST MIRAMICHI RIVER #2	2	49	1972	6/8/2011	Poor
T010	TABUSINTAC RIVER #2	2	48	1958	7/12/2011	Poor
B630	BOGAN BROOK	2	41	1976	7/9/2012	Poor
N905	OX BROOK #2	2	41	1975	7/19/2011	Poor
T105	TAYLOR CREEK #1	2	53	1975	7/12/2012	Poor
B762	BUCHANAN	2	55	1975	7/11/2012	Poor
W575	WHITE RAPIDS BROOK #2	2	59	1974	6/8/2011	Poor
J450	JONATHAN CREEK #1	3	41		10/2/2012	Poor
G345	GOODEN BROOK	3	44		10/2/2012	Poor
P400	PETITCODIAC RIVER #6	3	57	1949	10/4/2011	Poor
T675	TURTLE CREEK #4	3	60	1912	10/2/2012	Poor
S572	SOUTH KOUCHIBOUGUAC	3	47		10/11/2011	Poor
L345	LITTLE BOUCTOUCHE RIVER #1	3	29	1940	10/17/2012	Poor

Appendix IV: Listing of bridges in audit population with a poor rating (BCI of 60 or less) as at December 2012 (continued)

BRIDGE #	BRIDGE NAME	DISTRICT #	BCI	YEAR BUILT	LAST INSPECTION	Rating
N475	NORTH MCINNES BROOK #2	3	44	1971	10/11/2011	Poor
C508	COCAGNE RIVER #3	3	57	1942	10/9/2012	Poor
H792	INTERVALE CREEK #4	3	38	1943	9/25/2012	Poor
S183	SCOTT BROOK #2	3	36	1931	9/21/2011	Poor
K510	KOUCHIBOUGUACIS RIVER #1	3	30	1943	7/19/2012	Poor
F405	FIVE POINTS	3	56	1945	9/25/2012	Poor
B559	BLACK RIVER #5	3	42		10/12/2011	Poor
P220	PECKS COVE	3	57	1952	10/2/2012	Poor
C768	COVERDALE RIVER #9	3	28	1939	10/5/2011	Poor
B039	BAIE VERTE STATION	3	53	1929	9/21/2011	Poor
B201	BAXTER BROOK #1	3	43	1960	10/2/2012	Poor
G135	GASPEREAU RIVER #1	3	48	1960	7/25/2012	Poor
W360	WEST BRANCH BOUCTOUCHE #3	3	50		9/28/2011	Poor
S177	SCOTT BROOK #1	3	46	1931	9/21/2011	Poor
W310	WELDON CREEK #2	3	54	1971	10/6/2011	Poor
M266	MCQUADE BROOK #1	3	1	1967	7/12/2011	Poor
N210	NEVER'S BROOK BRANCH	3	21	1963	10/4/2011	Poor
E240	EAST TURTLE CREEK #2	3	34	1925	10/6/2011	Poor
S530	SOUTH BOUCTOUCHE #2	3	48	1927	10/11/2011	Poor
C594	COLPITTS BROOK #2	3	58		9/13/2011	Poor
M234	MCKAY BROOK	3	41	1950	10/13/2011	Poor
M404	MILL CREEK #3	3	59	1989	8/9/2012	Poor
G030	GALLANT BROOK #1	3	44	1985	10/5/2011	Poor
H900	ISLAND CREEK #3	3	59	1982	6/8/2010	Poor
M688	MURPHY BROOK	3	41	1982	8/1/2012	Poor
B081	BALLA PHILIP	3	41	1982	9/26/2012	Poor
M254	MCLEAN BROOK #1	3	41	1981	9/26/2012	Poor
M408	MILL CREEK #1	3	24	1962	10/4/2011	Poor
W435	WEST ST. NICHOLAS #3	3	41	1980	9/26/2012	Poor
N480	NORTH MCINNES BROOK #4	3	56	1928	10/11/2011	Poor
R665	RUSSELL BROOK #2	3	57	1979	7/18/2012	Poor

Appendix IV: Listing of bridges in audit population with a poor rating (BCI of 60 or less) as at December 2012 (continued)

BRIDGE #	BRIDGE NAME	DISTRICT #	BCI	YEAR BUILT	LAST INSPECTION	Rating
C196	CHAMPLAIN BROOK #1	3	40	1979	10/3/2012	Poor
W507	WHEELER BLVD. PEDESTRIAN TUNNEL	3	59	1979	10/3/2012	Poor
B246	BEAR CREEK	3	40	1979	10/13/2011	Poor
J520	JONATHAN CREEK #3.5	3	46	1979	10/4/2011	Poor
S132	SAULNIER CREEK #1	3	2	1979	10/12/2011	Poor
M214	MCINNES BROOK #2	3	41	1978	7/19/2012	Poor
D510	DUFFY BROOK #1	3	58	1977	9/15/2011	Poor
B093	BARCHARD BROOK #2	3	58	1944	10/3/2011	Poor
B420	BIG BROOK	3	42	1976	9/28/2011	Poor
A255	ALDOUANE RIVER #3	3	59	1976	7/25/2012	Poor
R670	RUSSELL BROOK (NORTH BRANCH)	3	24	1976	7/18/2012	Poor
A060	ABOUJAGANE RIVER #4	3	3	1976	10/18/2012	Poor
B484	BIGGS BROOK #4	3	44	1975	10/16/2011	Poor
B861	BUTLER CREEK	3	29	1975	10/1/2012	Poor
B702	BREAU CREEK #1	3	50	1974	9/14/2011	Poor
A270	ALDOUANE RIVER #4	3	45	1974	10/12/2011	Poor
M380	MILL BROOK #1	3	50	1973	9/21/2011	Poor
W020	WALKER	3	42	1973	10/3/2012	Poor
M412	MILL CREEK #1	3	1	1973	7/25/2012	Poor
C756	COVERDALE RIVER #6	3	48	1973	10/2/2012	Poor
B435	BIG COVE CREEK #1	3	60	1973	10/12/2011	Poor
M402	MILL CREEK #2	3	48	1973	10/12/2011	Poor
D315	DENNIS STREAM #4	4	36	1930	9/13/2011	Poor
M016	MACLEOD BROOK #1	4	58	1925	8/16/2011	Poor
M562	MOHANNAS STREAM #7	4	50	1929	9/11/2012	Poor
M134	MARTINON OVERHEAD	4	56	1929	9/26/2012	Poor
S462	SMITH CREEK #6	4	50	1938	7/25/2012	Poor
P525	POCOLOGAN RIVER #0.5	4	42	1967	8/30/2011	Poor
T280	THORNES BROOK	4	51	1945	7/23/2012	Poor
H295	HARDSCRABBLE	4	44	1946	8/21/2012	Poor
M196	MCGARDNER BROOK	4	56	1947	9/12/2012	Poor

Appendix IV: Listing of bridges in audit population with a poor rating (BCI of 60 or less) as at December 2012 (continued)

BRIDGE #	BRIDGE NAME	DISTRICT #	BCI	YEAR BUILT	LAST INSPECTION	Rating
A390	ANAGANCE RIVER	4	31	1953	8/9/2011	Poor
H135	HAMILTON	4	49	1927	9/13/2011	Poor
H420	HAYES WILBERT	4	51	1965	8/9/2011	Poor
P420	PHILAMUNROE #5	4	46		8/17/2011	Poor
B648	BOONE	4	56	1921	9/14/2011	Poor
B699	BRAYDEN	4	58	1937	8/23/2011	Poor
C832	CRIPPS STREAM	4	53	1958	9/24/2012	Poor
J780	JONES CREEK #1	4	57	1938	8/18/2011	Poor
E640	EMERSON CREEK #1	4	41	1960	9/19/2012	Poor
S852	STONY CREEK	4	40	1961	8/18/2011	Poor
D430	DIPPER HARBOUR	4	53	1959	8/31/2011	Poor
H345	HARRY BROOK #1	4	53	1966	7/24/2012	Poor
H090	HALFWAY BROOK #4	4	22	1967	8/8/2012	Poor
C420	CLEMENTS BROOK #2	4	1	1967	8/8/2012	Poor
B228	BEAR BROOK #1	4	44	1967	8/20/2012	Poor
M114	MARKHAMVILLE	4	59	1971	8/16/2011	Poor
B375	BENNETT BROOK	4	46	1998	7/24/2012	Poor
L015	LACEY	4	59	1960	8/25/2011	Poor
B627	BOG BROOK	4	55	1972	9/11/2012	Poor
K185	KENNEBECASIS #15	4	46	1972	7/25/2012	Poor
D075	DAVIDSON	4	45	1996	9/14/2011	Poor
A420	ANDERSON BROOK #1	4	43	1972	8/17/2011	Poor
T540	TROUT CREEK #1	4	45	1936	9/30/2009	Poor
S438	SMITH BROOK	4	28	1991	8/22/2012	Poor
S219	SEAL COVE DRAW	4	37		8/31/2011	Poor
K020	KEENES	4	59	1987	8/31/2011	Poor
P095	PARKER	4	55	1987	9/25/2012	Poor
B396	BERRY BROOK	4	45	1986	8/21/2012	Poor
L545	LITTLE RIVER #2	4	42	1985	9/20/2012	Poor
S695	SPRAGUE	4	53	1949	8/10/2011	Poor
A615	ARMSTRONG MILL #2	4	46	1982	9/11/2012	Poor
T025	TAIT	4	44	1982	7/9/2012	Poor
L835	LORNEVILLE CREEK #1	4	1	1981	8/18/2011	Poor

Appendix IV: Listing of bridges in audit population with a poor rating (BCI of 60 or less) as at December 2012 (continued)

BRIDGE #	BRIDGE NAME	DISTRICT #	BCI	YEAR BUILT	LAST INSPECTION	Rating
F230	FIRST RUN BROOK #2	4	59	1981	7/26/2012	Poor
H540	HIGGINS BROOK	4	25	1981	7/26/2012	Poor
P130	PARLEE BROOK #4	4	60	1980	8/16/2011	Poor
G275	GIPSY	4	50	1980	8/10/2011	Poor
C812	COX BROOK	4	58	1980	8/30/2011	Poor
T645	TRUNDLE	4	55	1980	9/14/2011	Poor
P170	PASSEKEAG CREEK #4	4	52	1980	8/18/2011	Poor
M392	MILL BROOK #3	4	46	1980	8/31/2011	Poor
P297	PENOBSQUIS LANE #5	4	37	1979	10/27/2011	Poor
T240	THIRD LAKE OUTLET	4	30	1979	8/15/2012	Poor
S518	SOUTH BAY	4	29	1978	8/16/2011	Poor
N840	OSSEKEAG CREEK	4	59	1978	10/20/2009	Poor
D080	DAVIDSON CREEK	4	25	1978	8/14/2012	Poor
W530	WHITE HEAD FERRY LANDING	4	42	1977	10/27/2009	Poor
K010	KANES BROOK	4	18	1977	8/17/2011	Poor
S843	STONE BROOK #1	4	51	1977	8/15/2011	Poor
B312	BEDFORD BROOK #2	4	40	1977	8/23/2012	Poor
S228	SECOND RUN BROOK #2	4	26	1976	7/26/2012	Poor
P295	PENOBSQUIS LANE #4	4	56	1976	8/15/2011	Poor
L075	LAKE STREAM	4	47	1976	9/1/2011	Poor
W470	WESTFIELD OVERHEAD	4	50	1950	8/24/2011	Poor
P880	PROCTOR BROOK #2	4	6	1974	8/14/2012	Poor
M506	MILLSTREAM RIVER #10	4	56	1973	8/10/2011	Poor
T305	THREE BROOKS	4	52	1973	8/31/2011	Poor
H595	HOLMES BROOK #2	5	23		6/27/2012	Poor
M156	MAZEROLLE STREAM	5	41		8/29/2012	Poor
H300	HARDWOOD BROOK #2	5	43		6/28/2012	Poor
N345	NOONAN BROOK	5	58		6/4/2012	Poor
M383	MILL BROOK #1 (DUCEY HILL)	5	42		7/31/2012	Poor
G220	GIDNEY BROOK #3	5	48	1969	7/26/2011	Poor
B718	BRIGGS (RTE. 116)	5	40		8/15/2012	Poor
P265	PENNIAC STREAM #4	5	44		8/22/2012	Poor

Appendix IV: Listing of bridges in audit population with a poor rating (BCI of 60 or less) as at December 2012 (continued)

BRIDGE #	BRIDGE NAME	DISTRICT #	BCI	YEAR BUILT	LAST INSPECTION	Rating
N845	OTNABOG RIVER #1	5	48		7/24/2012	Poor
S815	STICK BROOK #1	5	55		7/4/2012	Poor
S250	SEYMOUR	5	40		7/31/2012	Poor
L458	LITTLE MACTAQUAC STREAM #1	5	20		8/29/2012	Poor
S873	SUCKER BROOK	5	43		7/26/2011	Poor
T291	THOROUGHFARE (SOUTH)	5	47	1924	7/3/2012	Poor
T290	THOROUGHFARE (NORTH)	5	45	1924	7/3/2012	Poor
B804	BULLS CREEK #2	5	41	1926	9/11/2012	Poor
B300	BEDELL BROOK #1	5	58	1965	7/27/2011	Poor
B276	BEAVER DAM	5	53	1937	6/6/2011	Poor
D531	DUNBAR (SOUTH)	5	60	1931	8/22/2012	Poor
B795	BULL CREEK #2	5	53	1935	8/27/2012	Poor
P850	PRESQUE ISLE RIVER #4	5	46	1936	6/27/2012	Poor
R475	ROCKWELL STREAM #1	5	44	1937	9/4/2012	Poor
B723	BRIZLEY BROOK #1	5	58	1937	8/29/2012	Poor
C808	COW PASTURE	5	60	1939	7/25/2011	Poor
Y500	YORK MILLS	5	54	1939	7/30/2012	Poor
M682	MURCH	5	53	1941	8/29/2012	Poor
S426	SLIPP BROOK #2	5	58	1927	6/1/2011	Poor
L760	LONG CREEK #2	5	29	1950	7/4/2012	Poor
T100	TAY RIVER #4	5	49	1953	8/27/2012	Poor
M202	MCGIVNEY BROOK	5	43	1954	7/3/2012	Poor
N260	NEWCASTLE CREEK #1	5	45	1955	7/23/2012	Poor
N015	NACKAWIC RIVER #3	5	40	1955	9/12/2012	Poor
M384	MILL BROOK #1	5	28	1956	7/24/2012	Poor
C180	CENTERVILLE ROAD	5	42	1957	7/3/2012	Poor
B801	BULLS CREEK #1	5	40	1958	9/11/2012	Poor
R145	REGENT STREET UNDERPASS	5	47	1959	8/27/2012	Poor
T450	TREADWELL	5	55	1960	7/4/2012	Poor
P260	PENNIAC STREAM #3	5	58	1962	8/22/2012	Poor
H565	HILL BROOK #3	5	38	1969	7/26/2011	Poor
L805	LONGS CREEK #2	5	37	1962	9/4/2012	Poor

Appendix IV: Listing of bridges in audit population with a poor rating (BCI of 60 or less) as at December 2012 (continued)

BRIDGE #	BRIDGE NAME	DISTRICT #	BCI	YEAR BUILT	LAST INSPECTION	Rating
N580	NORTH SHIKATEHAWK RIVER #1	5	39	1963	6/28/2012	Poor
S351	SHIKATEHAWK RIVER #1 (SOUTH)	5	45	1930	7/25/2011	Poor
M578	MONQUART RIVER #1	5	58	1934	7/20/2011	Poor
S578	SOUTH MACTAQUAC RIVER #2	5	21	1965	8/29/2012	Poor
C304	CHRISTIE MILL POND	5	32		7/28/2011	Poor
P270	PENNIAC STREAM #5	5	46	1965	8/21/2012	Poor
D355	DICKINSON BROOK #1	5	48	1965	7/17/2012	Poor
B873	BUTTERMILK CREEK #3	5	20	1965	10/23/2012	Poor
P255	PENNIAC STREAM #2	5	50	1966	8/22/2012	Poor
N855	OTTER BROOK	5	43	1966	9/5/2012	Poor
B735	BROOKS LAKE	5	58	1966	8/28/2012	Poor
M240	MCKENZIE BROOK	5	44	1967	7/31/2012	Poor
G250	GILCHRIST BROOK #2	5	58	1955	8/8/2011	Poor
M385	MILL BROOK #1 (DAY HILL)	5	40	1967	8/28/2012	Poor
W705	WRIGHT BROOK #1	5	40	1967	9/11/2012	Poor
M036	MACTAQUAC RIVER #5	5	44	1948	7/28/2011	Poor
M258	MCLEARY BROOK	5	45	1968	7/17/2012	Poor
L744	LODERS CREEK #1	5	41	1970	7/3/2012	Poor
L960	LYON STREAM	5	50	1970	9/6/2012	Poor
F720	FOUR MILE BROOK #3	5	57	1972	8/28/2012	Poor
T350	THREE TREE CREEK #1	5	53	1972	9/5/2012	Poor
C380	CLARKE	5	21	1963	7/20/2011	Poor
B690	BRANDY BROOK	5	60		8/2/2011	Poor
L895	LOWER GUISIGUIT BROOK #1	5	35	1967	7/20/2011	Poor
R085	RED BANK CREEK	5	31	1969	8/20/2009	Poor
M038	MACTAQUAC ROAD-RTE. 102 OVERPASS	5	47	1966	8/25/2011	Poor
B798	BULL CREEK #3	5	47	1968	7/26/2011	Poor
G215	GIDNEY BROOK #2	5	16	1972	7/26/2011	Poor
U455	UPPER TROUT BROOK #2	5	58	1990	7/4/2012	Poor
L380	LITTLE COAC	5	57	1988	9/10/2012	Poor

Appendix IV: Listing of bridges in audit population with a poor rating (BCI of 60 or less) as at December 2012 (continued)

BRIDGE #	BRIDGE NAME	DISTRICT #	BCI	YEAR BUILT	LAST INSPECTION	Rating
M188	MCDOUGALL BROOK	5	29		6/22/2011	Poor
C905	CURRIE BROOK	5	56	1966	8/25/2011	Poor
B729	BROOKS	5	57	1984	9/12/2012	Poor
F245	FITCH CREEK #1	5	44	1983	11/2/2011	Poor
J440	JONAH BROOK	5	7	1983	7/24/2012	Poor
R675	RYAN BROOK	5	55	1982	7/3/2012	Poor
B654	BOONE BROOK #2	5	59	1980	8/3/2011	Poor
U250	UPPER GUISIGUIT BROOK #1	5	60	1967	7/20/2011	Poor
C468	CLINCH BROOK #3	5	15	1980	7/31/2012	Poor
K395	KING BROOK	5	32	1979	8/1/2012	Poor
N430	NORTH FORKS #2	5	55	1979	8/27/2012	Poor
K315	KEYHOLE	5	7	1977	7/3/2012	Poor
S894	SYPHER BROOK #1	5	25		7/25/2011	Poor
A105	ACTON	5	60	1976	9/6/2012	Poor
P790	PORTOBELLO STREAM	5	34	1976	8/28/2012	Poor
K060	KELLY BROOK #2	5	4	1975	7/4/2012	Poor
H175	HAMMOND BROOK	5	39	1975	8/1/2012	Poor
T365	THREE TREE CREEK #6	5	59	1975	8/29/2012	Poor
M174	MCCATHEL BROOK #2	5	41	1975	7/4/2012	Poor
F320	FIVE FINGERS BROOK #4	6	42		6/19/2012	Poor
L210	LEFT BRANCH POKIOK RIVER #1	6	52		6/27/2012	Poor
H080	HALEY BROOK #1	6	46	1936	6/25/2012	Poor
M670	MUNIAC RIVER #7	6	39	1965	6/27/2011	Poor
L585	LITTLE RIVER #2	6	43	1958	6/18/2012	Poor
M044	MADAWASKA RIVER #2	6	54	1959	6/12/2012	Poor
P235	PELKEY BROOK	6	44	1964	6/26/2012	Poor
S372	SIEGAS RIVER #2	6	53	1952	7/6/2011	Poor
B234	BEAR BROOK #2	6	35	1966	6/26/2012	Poor
T170	TEDLEY BROOK	6	19	1967	6/14/2012	Poor
T370	TIE CAMP	6	31	1967	6/26/2012	Poor
F520	FOLEY BROOK #1	6	13	1968	6/25/2012	Poor
L565	LITTLE RIVER #2	6	54	1971	7/19/2011	Poor

Appendix IV: Listing of bridges in audit population with a poor rating (BCI of 60 or less) as at December 2012 (continued)

BRIDGE #	BRIDGE NAME	DISTRICT #	BCI	YEAR BUILT	LAST INSPECTION	Rating
L685	LITTLE TOBIQUE RIVER #4	6	46	1994	6/28/2011	Poor
L560	LITTLE RIVER #1	6	22	1965	7/19/2011	Poor
L625	LITTLE SALMON RIVER #2	6	29	1958	7/6/2011	Poor
P185	PAT BROOK (WEST BRANCH)	6	2	1979	6/20/2012	Poor
G020	GAGNON BROOK #2	6	38	1972	6/27/2011	Poor
G475	GRANDMAISON BROOK	6	58	1972	6/28/2011	Poor
H767	INDIAN BROOK #2	6	30		7/20/2011	Poor
F500	FOLEY BROOK #1	6	43	1975	6/12/2012	Poor
B507	BLACK BROOK #1	6	59	1975	6/20/2012	Poor
M593	MOONEY BROOK #3	6	48	1975	6/25/2012	Poor
S416	SIX MILE BROOK	6	41	1975	6/20/2012	Poor
P180	PAT BROOK	6	40	1974	6/20/2012	Poor
H025	HAILES BROOK #2	6	35	1974	6/19/2012	Poor
B615	BLUE BELL BROOK #1	6	46	1974	7/6/2011	Poor
M676	MUNIAC RIVER #10	6	47	1973	7/4/2011	Poor
P820	POWERS CREEK #2	6	30	1973	7/6/2011	Poor
293	**Total**					

Appendix V: Audit Objectives and Criteria

Objective 1

3.144 To determine whether the Department performs bridge inspections in accordance with accepted professional standards and uses the inspection results to identify and prioritize necessary capital maintenance and other remedial measures.

Criteria

- The most recent Ontario Structure Inspection Manual was used;
- The inspection standards being used were up to date;
- Bridges in all regions were inspected regularly at the required frequency;
- Bridge inspection reports were complete, accurate and consistent;
- A quality assurance process was put in place to verify the reliability of the data generated during the visual inspections; and
- The priority list developed by the Maintenance Branch was based on the bridge inspection results and a pre-determined set of criteria.

Objective 2

3.145 To determine whether the Department maintains the service level of its bridge inventory based on a long term least life cycle cost approach.

Objective 3

3.146 To determine whether the Department publicly reports on the condition of designated Provincial bridges and the effectiveness of its bridge inspection activities.

Criteria

- The Department should report publicly the condition of all designated Provincial bridges
- The annual report of the Department should include the following relating to designated Provincial bridge condition:
    - performance indicators
    - targets
    - actual results
    - the rationale for variances

Appendix VI: Sampling Methodology

3.147 A risk based approach was chosen in determining the sample size. A sample size of 31 bridge structures and 62 inspection reports were selected for testing. They are listed in Appendix VII.

3.148 The testing sample consisted of bridge structures in poor condition, large and complex structures and those with interim remediation measures in place such as imposed weight restrictions.

3.149 In selecting the sample, a subset of bridge structures was taken from the 2010-2011 large bridge replacement list, and the 2011-2012 small bridge replacement list. The remaining samples selected were from the lowest third of the bridges based on the BCI rating of the stratified bridge inventory listing.

3.150 Additionally any bridges within the top 2/3 based on the BCI score in the inventory listing which had an imposed weight restriction were added to the testing sample. Lastly, of the remaining population, the three largest bridges based on number of spans and individual span length was added to the testing sample.

3.151 Judgment was applied to individual selection within the target population to ensure that there was a variety of different bridge types included in the sample.

Characteristics of the analyzed sample

3.152 The inspection documents reviewed were from 2008 to 2012 and included 62 Bridge Inspection Reports (BIR) and 62 Picture Sheets. These reports covered 31 bridges and culverts spanning across 15 counties of the province for the 2008-2012 period. The types of bridge structures encountered included: pipe arches; wood and steel stringers; covered and uncovered Burr, Howe and Pratt trusses; cantilevered arch trusses; steel plate girders; reinforced concrete tee beams; and steel rolled beams. The overall length of these bridges ranged from a few meters to over a kilometre.

Appendix VII: List of bridges for which we reviewed inspection reports

Bridge #	Bridge Name	Span Type	County	Inspection(s)	BCI as at Dec 2012
B015	BACK CREEK #2	Covered Howe truss	SUNBURY	2010, 2012	Fair
C244	CHATHAM BRIDGE	Large cantilever-truss system	NORTHUMBER-LAND	2008, 2012	Good
C420	CLEMENTS BROOK #2	Culvert	KINGS	2010, 2012	Poor
C468	CLINCH BROOK #3	Steel stringer	YORK	2010, 2012	Poor
C768	COVERDALE RIVER #9	Open Howe truss with concrete deck slab	ALBERT	2011, 2009	Poor
D380	DIGDEGUASH RIVER #4	Covered Howe truss	CHARLOTTE	2011, 2012	Good
F520	FOLEY BROOK #1	SPCSP pipe arch	VICTORIA	2010, 2012	Poor
H077	HALES BROOK #1	Concrete arch culvert	CARLETON	2010, 2008	Good
H090	HALFWAY BROOK #4	Wood stringer	KINGS	2010, 2012	Poor
K315	KEYHOLE	SPCSP pipe arch	QUEENS	2010, 2012	Poor
K510	KOUCHIBOUGUACIS RIVER #1	Arch Burr Truss, Reinforced concrete tee beam	KENT	2011, 2012	Poor
L345	LITTLE BOUCTOUCHE RIVER #1	Arch Burr Truss	KENT	2010, 2012	Poor
L560	LITTLE RIVER #1	Wood stringer	VICTORIA	2011, 2009	Poor
L625	LITTLE SALMON RIVER #2	Wood stringer	VICTORIA	2011, 2009	Poor
L760	LONG CREEK NO. 2	Reinforced concrete tee beam (haunched)	QUEENS	2010, 2012	Poor
L835	LORNEVILLE CREEK #1	SPCSP pipe arch	SAINT JOHN	2011, 2009	Poor
M188	MCDOUGALL BROOK	Twin CSP pipe arch	SUNBURY	2011, 2009	Poor
M266	MCQUADE BROOK #1	SPCSP pipe arch	WESTMORLAND	2010, 2008	Poor
M346	MERSEREAU STREAM #1	Wood stringer	SUNBURY	2011, 2009	Good[1]
M384	MILL BROOK # 1	Wood stringer	QUEENS	2010, 2012	Poor[2]
N025	NACKAWIC RIVER #5	Covered Howe truss	YORK	2010, 2012	Good
N210	NEVER'S BROOK BRANCH	Steel stringer	WESTMORLAND	2011, 2009	Poor
N665	NORTHWEST MIRAMICHI #1	Steel thru truss, reinforced concrete slab with steel beams	NORTHUMBER-LAND	2011, 2008	Good
P645	POLLETT RIVER #4	Burr truss with reinf concrete slab	WESTMORLAND	2011, 2008	Good[1]
R145	REGENT STREET UNDERPASS	Steel Rolled Beam	YORK	2010, 2012	Poor
S563	SOUTH EEL RIVER #5	Wood stringer	RESTIGOUCHE	2011, 2009	Poor
S578	SOUTH MACTAQUAC RIVER #2	Wood stringer	YORK	2010, 2012	Poor
T170	TEDLEY BROOK	Wood stringer	MADAWASKA	2010, 2012	Poor
T525	TROUT BROOK #1	Reinf concrete tee beam	VICTORIA	2010, 2012	Good
T590	TROUT CREEK #10	Steel stringer	KINGS	2010, 2012	Good
V150	VANDY BROOK	SPCSP pipe arch	NORTHUMBER-LAND	2010, 2012	Poor

[1] Bridge replaced in 2012 –BCI of new bridge
[2] Bridge replaced in 2012 –BCI of replaced bridge

Appendix VIII: Examples of bridge condition public reporting from other Canadian jurisdictions

Example #1:

Ontario Provincial Bridges - West Region

BCI = Bridge Condition Index. The BCI rating is a planning tool that helps the Ministry schedule maintenance and upkeep. The BCI is not used to rate or indicate the safety of a bridge.

The result is organized into ranges from 0 to 100. Immediate action is taken to address any safety concerns.

Good - BCI Range 70 -100
For a bridge with a BCI greater than 70, maintenance work is not usually required within the next five years.

Fair - BCI Range 60 -70
For a bridge with a BCI between 60 and 70 the maintenance work is usually scheduled within the next five years. This is the ideal time to schedule major bridge repairs from an economic perspective.

Poor - BCI Less than 60
For a bridge with a BCI rating of less than 60, maintenance work is usually scheduled within approximately one year.

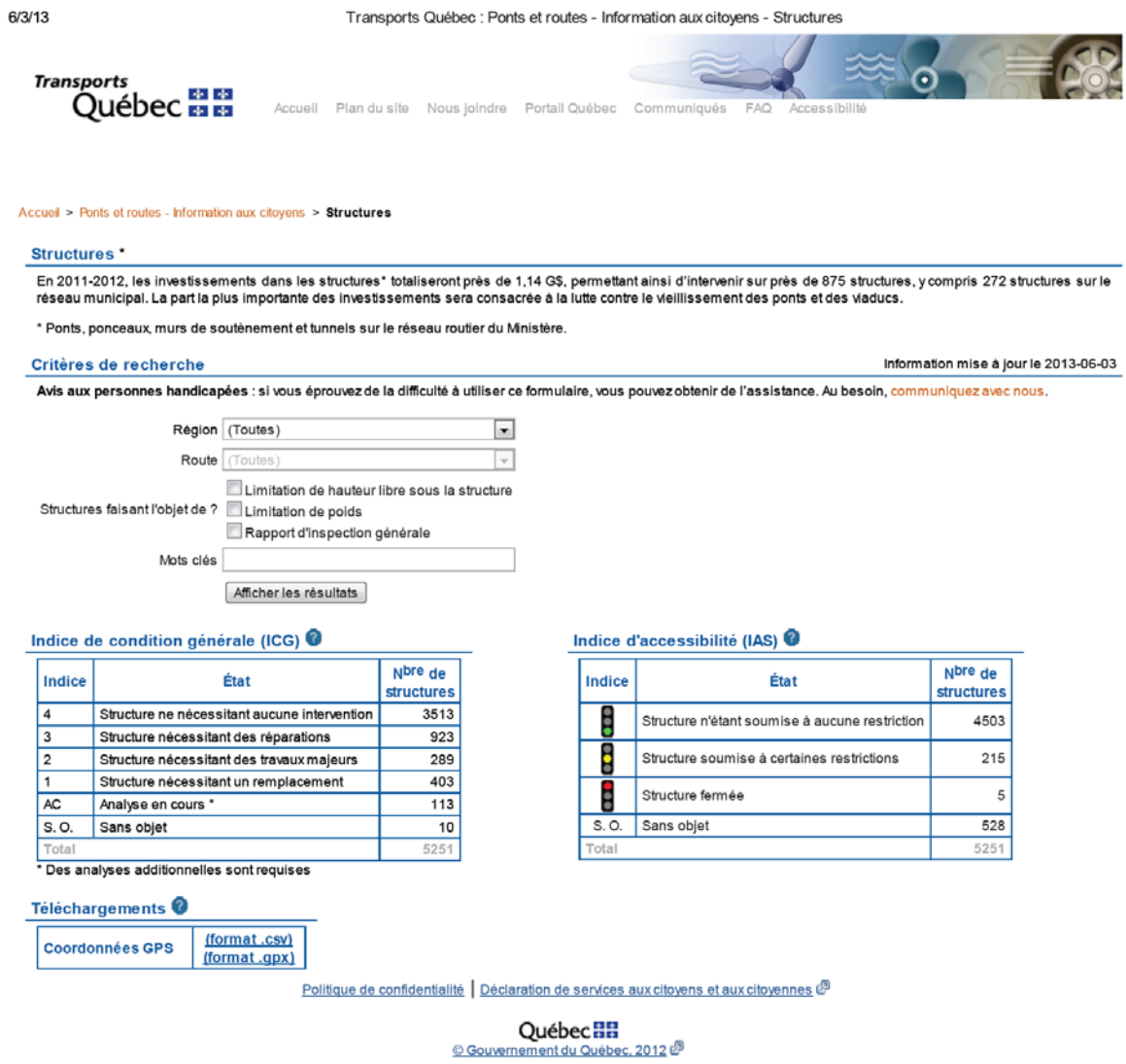
SITE #	REGION	STRUCTURE NAME	HWY	YEAR BUILT	LAST INSP	BCI
9 - 43/	W	GRAND RIVER BRIDGE IN CAYUGA	3	1924	2011	Fair
9 - 42/	W	STONEY CREEK BRIDGE	3	1964	2011	Good
9 - 41/	W	SANDUSK CREEK HWY. 3	3	1984	2011	Good
20 - 46/	W	NANTICOKE CREEK BRIDGE	3	1953	2011	Good
20 - 59/	W	BIG CREEK BRIDGE (DELHI)	3	1965	2011	Good
20 - 157/	W	BIG OTTER CK BR-N. STR.	3	1972	2011	Good
5 - 97/	W	CATFISH CREEK BRIDGE	3	1962	2010	Good
5 - 96/	W	CATFISH CREEK BRIDGE (WEST BRANCH)	3	1998	2010	Good
5 - 220/	W	BURWELL ROAD UNDERPASS	3	1974	2010	Fair
5 - 219/	W	First Avenue Underpass	3	1974	2010	Good
5 - 218/	W	BALACLAVA STREET UNDERPASS	3	1975	2010	Good
5 - 216/	W	KETTLE CREEK BRIDGE	3	1979	2010	Good
5 - 4/	W	DODDS CREEK BRIDGE	4	1967	2010	Good
19 - 162/	W	MEDWAY CREEK BRANCH BRIDGE (ST. JOHN'S).	4	1964	2010	Good
19 - 161/	W	MEDWAY CREEK BRANCH BRIDGE	4	1963	2010	Good
19 - 160/	W	MEDWAY CREEK BRANCH BRIDGE (BIRR)	4	1963	2010	Good
19 - 69/	W	AUSABLE RIVER BRIDGE	4	1969	2010	Good
12 - 246/	W	AUSABLE RIVER BRIDGE	4	1962	2010	Fair
12 - 232/	W	KIPPEN RIVER BRIDGE #2	4	1947	2010	Fair
12 - 195/	W	Bayfield River Bridge (Clinton)	4	1932	2010	Fair
9 - 25/	W	NANTICOKE CREEK BRIDGE	6	1994	2011	Good
20 - 80/	W	LYNN RIVER LIFT BRIDGE	6	1969	2011	Good
9 - 24/	W	SANDUSK CREEK BRIDGE	6	1963	2011	Good
9 - 16/	W	MACKENZIE CREEK BRIDGE	6	1960	2011	Good
9 - 15/	W	BOSTON CREEK BRIDGE	6	1960	2011	Good
9 - 129/	W	SIXTH LINE UNDERPASS	6	1981	2011	Good
9 - 132/	W	STERLING STREET UNDERPASS	6	1981	2011	Good
9 - 130/	W	GRAND RIVER BRIDGE	6	1981	2011	Good
9 - 133/	W	DOMTAR ACCESS RD. OVERPASS	6	1981	2011	Good
9 - 1/	W	BLACK CREEK BRIDGE	6	1957	2011	Good
35 - 404/1	W	SPEED RIVER BRIDGE, N.B.L.	6	1971	2011	Good
35 - 404/2	W	SPEED RIVER BRIDGE, S.B.L.	6	1971	2011	Good
35 - 410/	W	IMPERIAL AVENUE UNDERPASS	6	1975	2011	Fair
35 - 211/	W	IRVINE CREEK BRIDGE	6	1964	2011	Good
35 - 135/	W	FARLEY'S CREEK BRIDGE	6	2008	2011	Good
35 - 136/	W	Mitchell's Creek	6	1989	2011	Good
35 - 78/	W	FOUR MILE CREEK BRIDGE	6	2009	2011	Good
35 - 76/	W	SMOKEY CREEK BRIDGE	6	1952	2011	Good
35 - 77/	W	BELLS CREEK BRIDGE	6	1997	2011	Good
8 - 317/	W	FAIRBANK CREEK BRIDGE	6	1958	2010	Good
8 - 449/	W	Camp Creek Bridge	6	2009	2010	Good
8 - 450/	W	Kemp Creek Bridge	6	2009	2010	Good
8 - 159/	W	ROCKY SAUGEEN RIVER BRIDGE	6	1958	2010	Fair
8 - 414/	W	POTTAWATOMI RIVER BRIDGE	6	1978	2010	Good
2 - 4/	W	STOKES RIVER BRIDGE	6	1958	2011	Fair

29/03/2012

Source: www.mto.gov.on.ca/english/bridges/west-region.pdf

Appendix VIII: Examples of bridge condition public reporting from other Canadian jurisdictions (continued)

Example #2:



6/3/13 Transports Québec : Ponts et routes - Information aux citoyens - Structures

Transports Québec

Accueil Plan du site Nous joindre Portail Québec Communiqués FAQ Accessibilité

Accueil > Ponts et routes - Information aux citoyens > **Structures**

Structures *

En 2011-2012, les investissements dans les structures* totaliseront près de 1,14 G$, permettant ainsi d'intervenir sur près de 875 structures, y compris 272 structures sur le réseau municipal. La part la plus importante des investissements sera consacrée à la lutte contre le vieillissement des ponts et des viaducs.

* Ponts, ponceaux, murs de soutènement et tunnels sur le réseau routier du Ministère.

Critères de recherche Information mise à jour le 2013-06-03

Avis aux personnes handicapées : si vous éprouvez de la difficulté à utiliser ce formulaire, vous pouvez obtenir de l'assistance. Au besoin, communiquez avec nous.

Région (Toutes)

Route (Toutes)

Structures faisant l'objet de ? Limitation de hauteur libre sous la structure / Limitation de poids / Rapport d'inspection générale

Mots clés

Afficher les résultats

Indice de condition générale (ICG)

Indice	État	Nbre de structures
4	Structure ne nécessitant aucune intervention	3513
3	Structure nécessitant des réparations	923
2	Structure nécessitant des travaux majeurs	289
1	Structure nécessitant un remplacement	403
AC	Analyse en cours *	113
S. O.	Sans objet	10
Total		5251

* Des analyses additionnelles sont requises

Indice d'accessibilité (IAS)

Indice	État	Nbre de structures
	Structure n'étant soumise à aucune restriction	4503
	Structure soumise à certaines restrictions	215
	Structure fermée	5
S. O.	Sans objet	528
Total		5251

Téléchargements

Coordonnées GPS	(format .csv) (format .gpx)

Politique de confidentialité | Déclaration de services aux citoyens et aux citoyennes

Québec

© Gouvernement du Québec, 2012

Source: www.mtq.gouv.qc.ca/pls/apex/f?p=TBM:STRCT:3422872473549441::NO:RP,56::.[1]

[1] English version not available on Transport Québec website