Bridge Maintenance & Rehabilitation

Credentials Package

Morrison Hershfield

TABLE OF CONTENTS

>> North Channel, Cornwall, ON

ABOUT MORRISON HERSHFIELD

70+

Years in Business

Canadian Based
Canadian Focused

950+

Number of Full Time,
In-house Employees

100%

Employee Ownership, Over
20% of Staff Shareholders

80%

Annual Revenue from
Repeat Clients

Morrison Hershfield is a market leading engineering firm delivering innovative, cost effective and technically sophisticated solutions for both horizontal and vertical infrastructure. Social well-being and economic prosperity are our highest consideration in the communities we serve. We are anchored by exceptional technical and solution experts, thought leaders and high performing employees across North America. Our highly focused approach to the clients and markets we serve ensures that we deliver the value our clients demand.

When our founders established this consulting practice in 1946, they set the highest standards of ethics, technical excellence and customer service. These high standards have become the hallmark of Morrison Hershfield. We continue to be guided by our values of integrity, accountability and mutual respect and believe in continuous improvement, quality and teamwork.

Our Values and Mission make a difference.

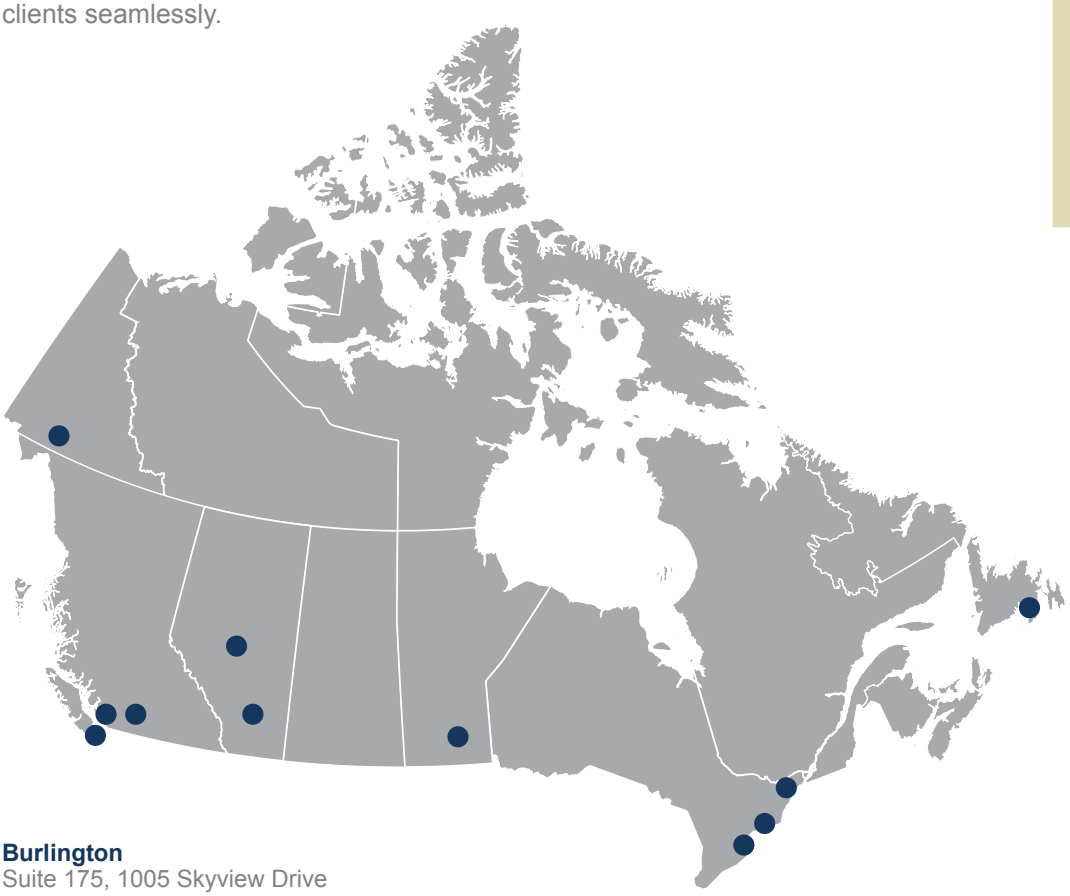
Our core values and principles are entrenched in our culture and drive us to make a difference in everything we do. Our Mission: We will...

OUR LOCATIONS

We Work Where You Need Us

With 11 office locations throughout Canada, Morrison Hershfield services our clients seamlessly.

Your First Call for Engineering Solutions That Make a Difference



Burlington
Suite 175, 1005 Skyview Drive
Burlington, ON L7P 5B1

Calgary
Suite 300, 6807 Railway Street SE.
Calgary, AB T2H 2V6

Edmonton
Suite 300, 1603 – 91 Street SW
Edmonton, AB T6X 0W8

Nanaimo
630 Terminal Avenue North
Nanaimo, BC V9S 4K2

Ottawa
2440 Don Reid Drive
Ottawa, ON K1H 1E1

St. John's
Suite 200, 251 East White Hills Road
St. John's, NL A1A 5X7

Toronto
Suite 300, 125 Commerce Valley Drive W
Markham, ON L3T 7W4

Vancouver
Suite 310, 4321 Still Creek Drive
Burnaby, BC V5C 6S7

Victoria
536 Broughton Street, Second Floor
Victoria, BC V8W 1C6

Whitehorse
Suite 202, 208 Main Street
Whitehorse, YT Y1A 2A9

Winnipeg
Suite 1, 59 Scurfield Blvd.
Winnipeg, MB R3Y 1V2

BRIDGE ENGINEERING

Our Technical Expertise and Ability to Deliver any Bridge or Culvert Project Sets us Apart.

Introduction

Bridges play an important part in our daily lives and are essential components of the economy for transporting people and goods. Our Bridge Engineering Group is comprised of skilled and respected professionals with industry-leading technical know-how. From new construction to asset monitoring to rehabilitation to decommissioning, this team of design and inspection engineers, technologists, and support personnel has vast experience in the field of bridges and transportation infrastructure.

Our Transportation team has successfully delivered some of the most notable projects in Canada. From coast to coast, Morrison Hershfield's team of planners, engineers and contract administrators deliver transportation solutions that drive economic growth and social prosperity. We work with owners, constructors, consultants, concessionaires, and lenders in the public and private sectors to meet the Transportation industry's growing demands, perspectives, and competing investment priorities to achieve success. From project inception through to completion, our team's wide range of experience enables us to identify and respond to issues quickly, develop innovative solutions and successfully deliver our Client's most complex projects. Our technical expertise and track record of successful delivery of complex transportation projects is what sets Morrison Hershfield apart from our competitors.

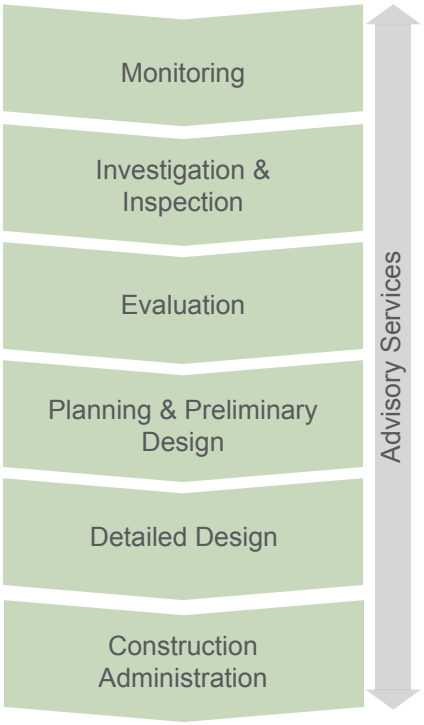
>> Golden Ears Bridge, Langley BC

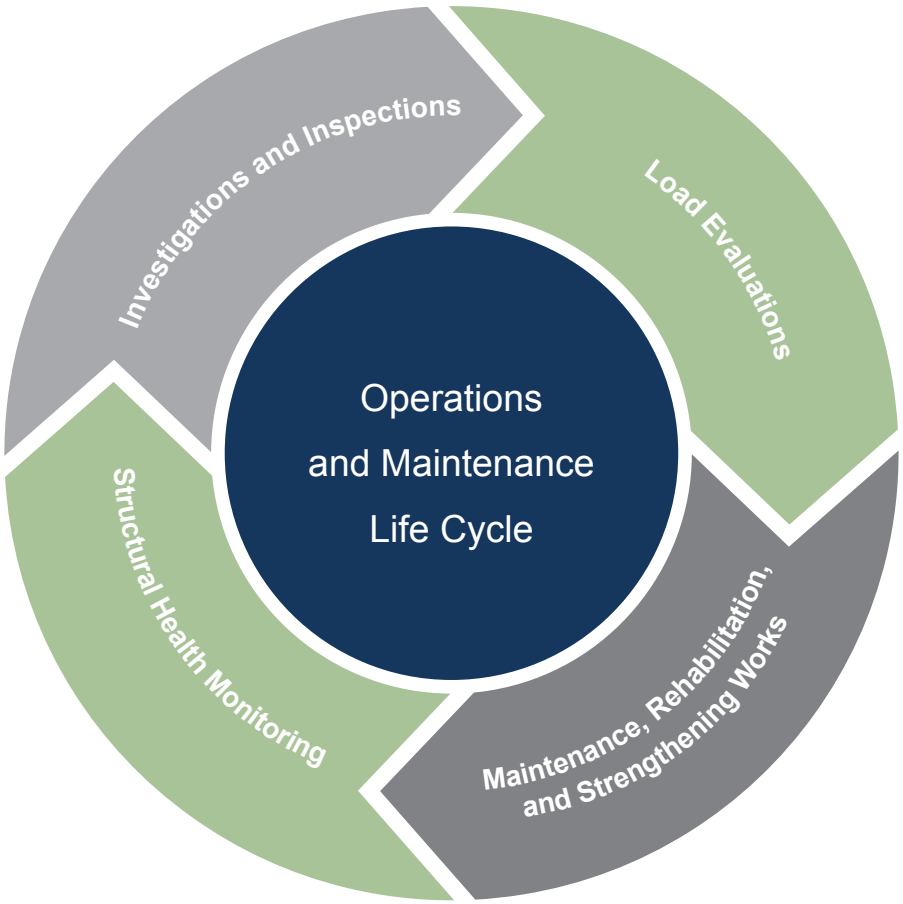
CREATING VALUE

Engineering Services to Maximize Service Life

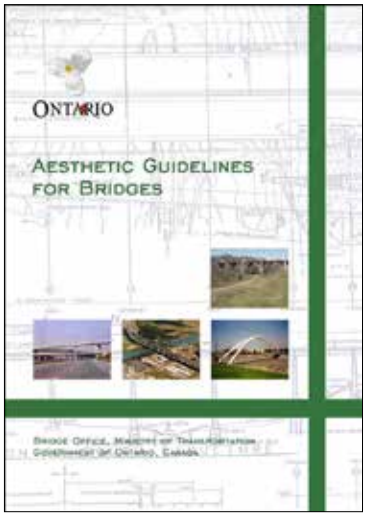
The forces of nature begin their work deteriorating man-made structures from the moment they are constructed. Whether constructed of concrete, steel, or timber, ongoing maintenance and timely intervention is critical to realizing the full service life of your asset. At Morrison Hershfield, we have partnered with clients across Canada to provide services to realize and extend service lives of bridges throughout the assets' life cycle, including during the critical operations and maintenance phase. Our Bridge Engineering team is ready to assist you with all aspects of the maintenance and operation of your asset. Whether completing routine inspections, performing load evaluations, or designing and constructing anything from a large multi-bridge rehabilitation project ti a small culvert restoration project, we get the job done right, on-time, and on-budget.

Rehabilitation Life Cycle





WHY MORRISON HERSHFIELD



Morrison Hershfield developed the Ontario Aesthetic Guidelines for Bridges. The publication is used today by Ontario's leading bridge designers and has had a major impact on the design process and the ultimate appearance of the Province's highway system.

Experienced Trusted Experts

Our teams bring significant design and construction experience, with nearly 100 staff across Canada, and growing, with innovation and horsepower to ensure the timely and professional delivery of your project.

- Our bridge engineers are experts with hundreds of years of combined, focused design experience, recognized and respected nationally and internationally.
- Our team has the know-how to optimize design and save clients' money, while reducing project design and construction risk.
- Our engineers are active members in provincial, national and international organizations and participate in technical committees in developing of standards and design practices.
- We have solid relationships with constructors and have conducted a wide range of Design Build to Public-Private-Partnership (P3) projects.
- We have served in a variety of Alternative Finance Project (AFP) roles including: Owner's Engineer, Lead Design Engineer; Independent Design Reviewer; Independent Certifier; Expert Advisor.

>> Bertrand Bridge, Aldergrove BC

STRUCTURAL HEALTH MONITORING

Knowing is Powerful

Structural Health Monitoring (SHM) provides owners with real insight into structural changes, alerts and service life predictions through the extraction and analysis of relevant structural data, streamlining owner's operations and maintenance strategies. SHM's ability to record changes in structural components over time provides owners with real quantifiable data to make confident decisions about their infrastructure asset. A typical SHM program may include collection of data over time or in a discrete visit, from a series of sensors, and analysis of that data to obtain information that is meaningful for making decisions, such as the rate of crack growth in a concrete element, the tension in a stay cable, or the rate of movement of a foundation structure.

Data on significant adverse changes can provide the justification required for a structural maintenance or rehabilitation intervention. Conversely and equally important, data which demonstrates that a perceived issue is in fact not as serious as originally suspected can support decisions to defer a rehabilitation intervention, and free up funding for other priorities.

Monitoring

- Instrumentation Assessment and Design
- Specification Definitions and Tender Documents
- Supervision of Installation during Construction
- Data Analysis and Interpretation

- Investigation & Inspection
- Evaluation
- Planning & Preliminary Design
- Detailed Design
- Construction Administration

Advisory Services

1 **Skybridge**
Surrey to New Westminster, BC | Cable

2 **Airport Tunnel**
Calgary, AB | Tunnel

3 **Esplanade Riel Bridge**
Winnipeg, MB | Cable Stay

PROJECTS

1 Skybridge

- 616 m long cable-stayed SkyTrain transit bridge over the Fraser River
- Custom instrumentation design and installation of high speed triggered camera systems for traffic and train location assessments
- Sensor solution design, technology selection, data acquisition and analysis, and installation
- Temporary instrumentation and testing for cable tensile forces and fatigue analysis with optical vibration based methods
- **Value:** Completed testing during non-revenue hours at night at a rate of six to eight cables per hour and without requiring physical access to take measurements, resulting in minimal disruption to users

2 Airport Tunnel

- Six lane, 620 m long, 36 m wide, 5.3 m clear height reinforced concrete tunnel under one runway and three taxiways at the Calgary International Airport
- Selection and design of sensors, casting forms, and additional framework for instrumentation system containing over 120 channels
- Provided installation and administration support and project management for instrumentation system
- Deployed server software and client software
- **Value:** Designed and installed a fully wireless, cost-efficient structural health monitoring system with 10+ years of service life

3 Esplanade Riel Bridge

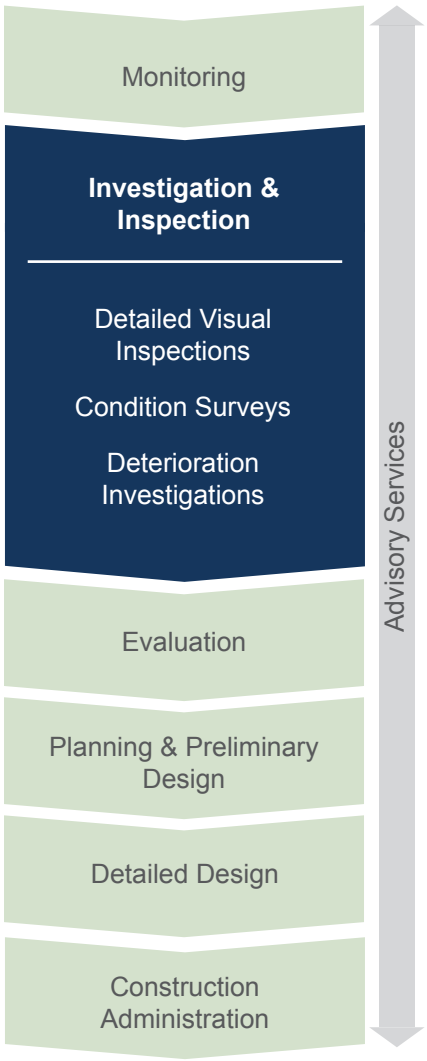
- 197 m long side-spar signature cable-stayed pedestrian bridge over the Red River in Winnipeg
- Detailed structural inspection including data acquisition and analysis
- Detailed stay cable inspections including a vibration-based tension force analysis of all stay cables to determine variation between as-built and design forces
- **Value:** Completed the testing program within two days without requiring a bridge closure, minimizing impacts to pedestrians and the restaurant patrons

INVESTIGATION AND INSPECTION

Experience Matters

The need for mobility requires that our transportation network be kept in good repair. Structures are a vital part of our transportation networks and the efficiency of the network is impaired and the public inconvenienced or put at risk if a structure fails or its load-carrying capacity is reduced. To avoid such failings, an effective structure management system is required and an essential component of this system involves the systematic inspection and condition assessment of structure assets. Ongoing, regular inspection completed in accordance with specific standards is crucial to identifying required maintenance, repair, and rehabilitation strategies for your structure.

Morrison Hershfield has visually inspected well over 3,000 individual bridge structures and completed over 300 detailed condition surveys for various clients across Canada. Our client base for bridge inspections is as diverse as the structures themselves and includes provincial ministries, port authorities, municipalities, airport and transit authorities, federal agencies and private corporations.

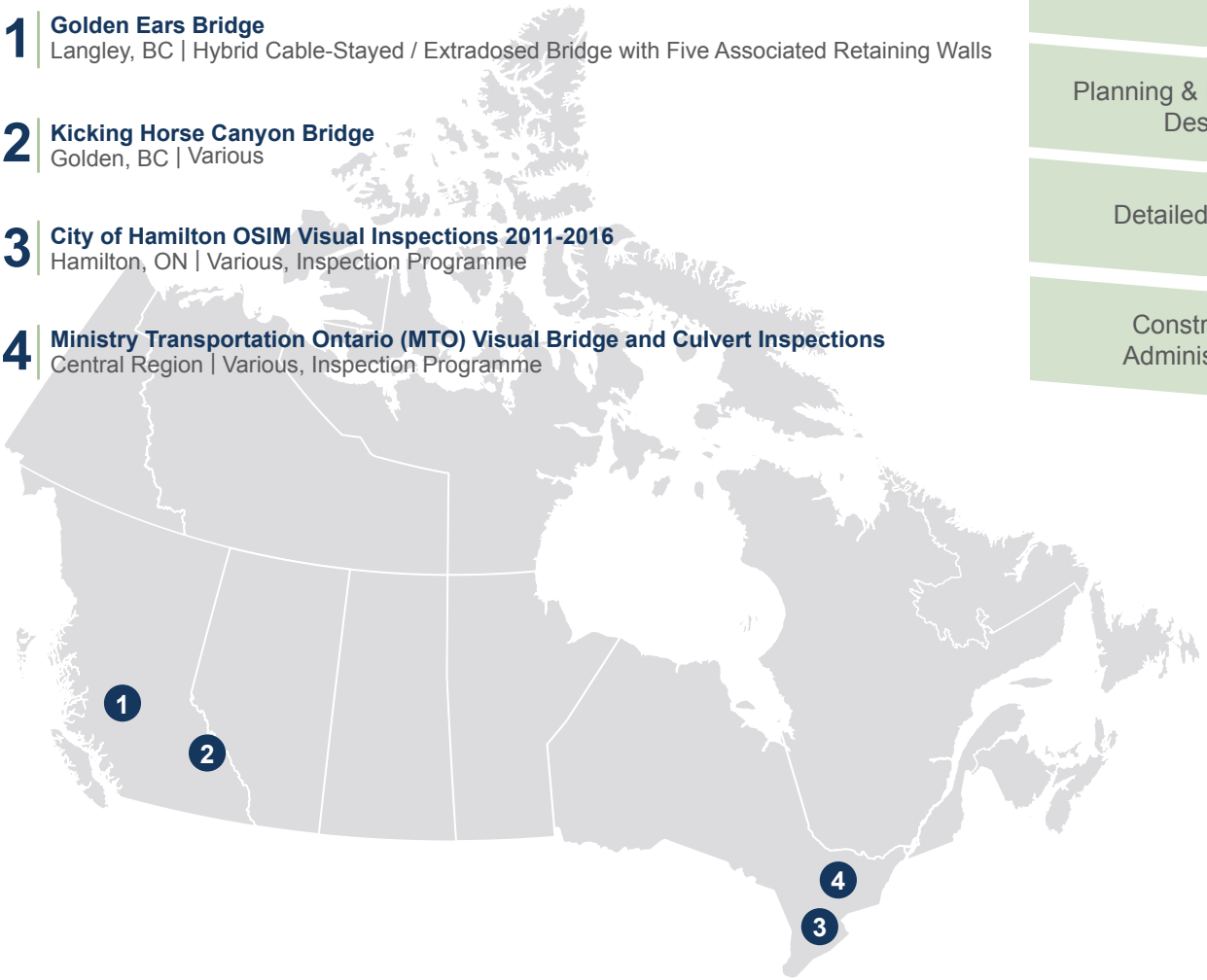


1 **Golden Ears Bridge**
Langley, BC | Hybrid Cable-Stayed / Extradosed Bridge with Five Associated Retaining Walls

2 **Kicking Horse Canyon Bridge**
Golden, BC | Various

3 **City of Hamilton OSIM Visual Inspections 2011-2016**
Hamilton, ON | Various, Inspection Programme

4 **Ministry Transportation Ontario (MTO) Visual Bridge and Culvert Inspections**
Central Region | Various, Inspection Programme



PROJECTS

1 Golden Ears Bridge

- Six lane, five span, 968m long hybrid cable-stayed/extradosed bridge over the Fraser River including four towers and 1.4 km of concrete girder approaches
- Annual visual inspections requiring specialized equipment, climbing inside the four towers and girders, and traveling on the maintenance gantry under the main spans
- Condition assessment and recommendations in accordance with BC MoTI's BMIS. Specialists performed a scour survey for Fraser River piers
- **Value:** Completed inspections of the cable anchorages and assemblies for significantly lower cost than the supplier could provide and the design and construction of the specialized equipment allowed for cost efficient future inspections

2 Kicking Horse Canyon Bridge

- 405 m long, 6 span bridge and twin 260 m long Yoho Bridges over the Kicking Horse River. Project included review of four additional bridges, 28 retaining walls, and three wildlife overpasses
- Provided third-party assessment of P3 Contractor / Operator's compliance with the performance criteria of the contract with BC MoTI
- Annual visual inspections identified and monitored structures' condition
- Condition assessment in accordance with BC MoTI's BMIS with remediation strategies and programming developed to address defects
- **Value:** Inspection of piers using an Aerial Unmanned Vehicle (UAV) as they are otherwise inaccessible, allowing for inspection of these areas.

3 OSIM Visual Inspections

- Detailed visual inspections of 500 rail, road, highway, culverts and pedestrian bridges as part of the City's annual inspection program
- Individual inspection reports using OBMS software from OSIM forms
- **Value:** Trusted inspection advisors carried out repeated annual programme that minimized disruptions to roadway and City operations by careful scheduling and investigation methods

4 Ontario Visual Bridge and Culvert Inspections

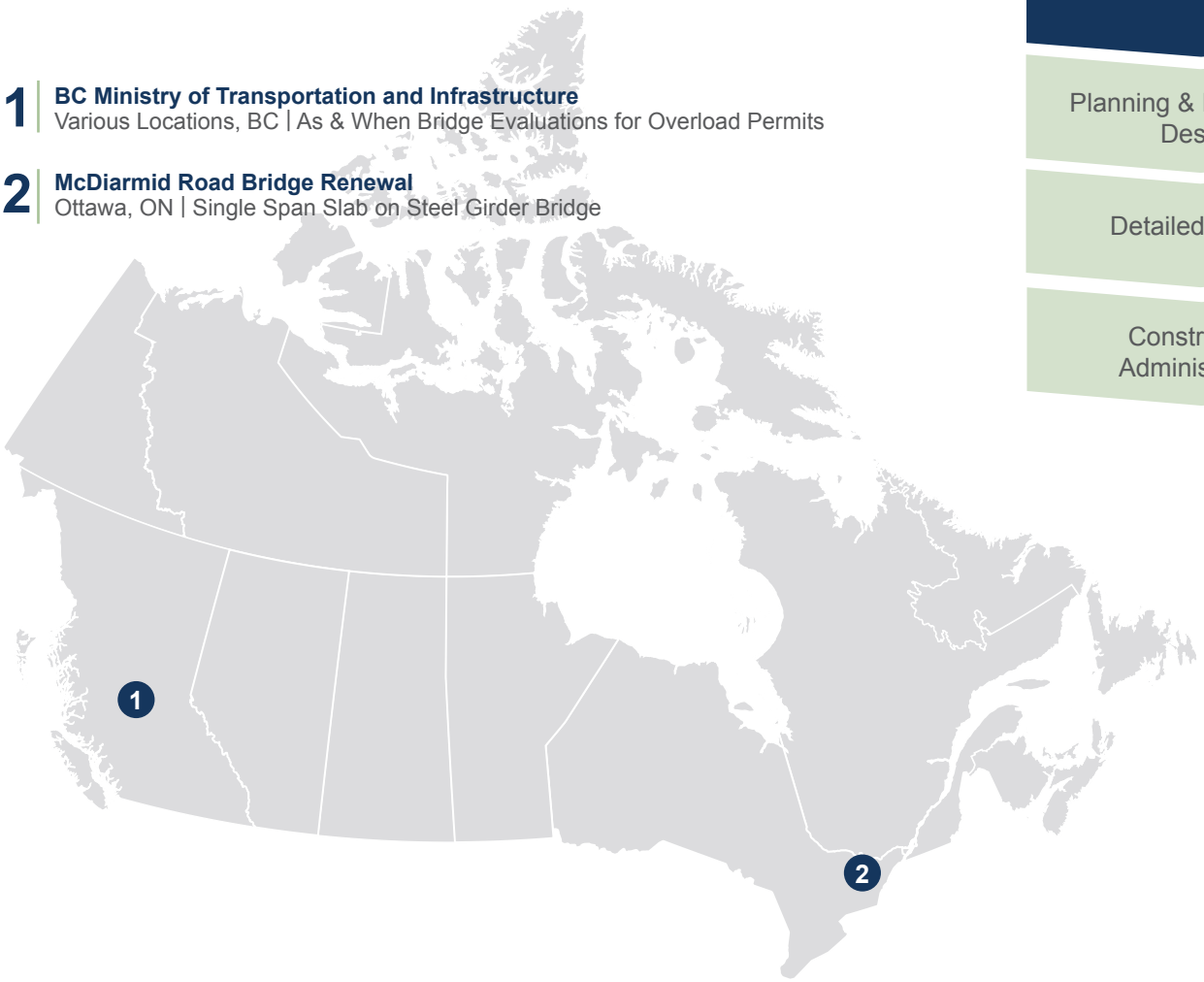
- The detailed visual inspections of 120 bridges and 77 culverts in 2015 and 178 bridges and 38 culverts in 2016 in accordance with the requirements of the OBMS and OSIM
- Visual inspections included all field reviews, relevant NDT tests, inspections and studies, in accordance with technical standards and specifications specified in OSIM and OBMS
- Typical of annual programme of inspections for MTO, conducted by team of inspectors who prove our capability to MTO year after year
- **Value:** Field reviews involved protection of utilities and property from damage, and co-ordination with ongoing construction contracts and highway maintenance nearby

LOAD EVALUATIONS

Ensuring Structural Integrity & Safety

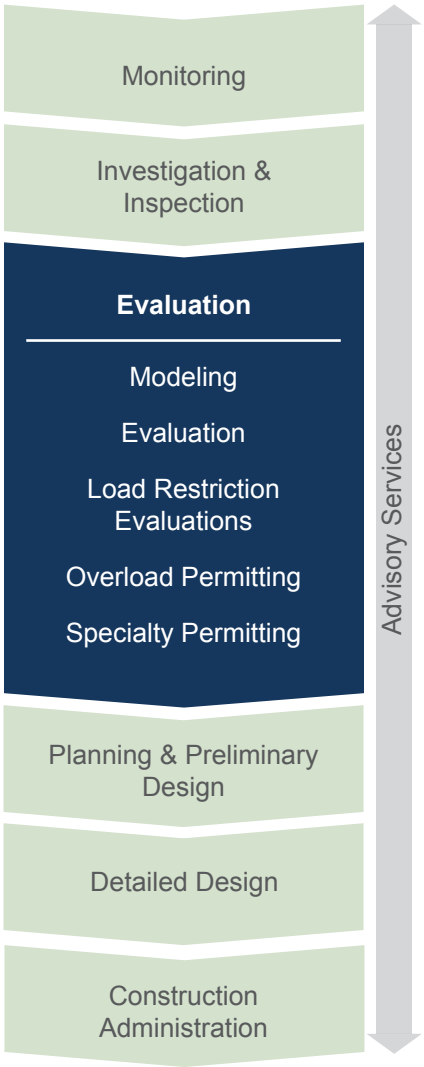
Determining and confirming the load carrying capacities of bridges is a major ongoing activity for owners. Transportation system owners and operators are continuously tasked with approving overload and specialty permits and monitoring the condition and load capacity of existing, aging structures. The value of transportation systems can be maximized with consistent, thorough, and properly documented bridge load evaluations which ensure an adequate level of safety is maintained.

Morrison Hershfield has experience in completing the analysis and preparing reports for all types of bridge load evaluations. Our experience ranges from evaluating structures for standard highway design vehicle checks for determining bridge load restrictions to detailed overload calculations for heavy equipment hauls with GVW in excess of 800 tonnes. Our overload evaluation results follow accepted reporting practices and we are experienced with overload permitting for various government agencies. In addition to vehicle loads, we have also performed construction staging, erection, demolition, vibration, and seismic capacity evaluations.



1 **BC Ministry of Transportation and Infrastructure**
Various Locations, BC | As & When Bridge Evaluations for Overload Permits

2 **McDiarmid Road Bridge Renewal**
Ottawa, ON | Single Span Slab on Steel Girder Bridge



PROJECTS

1 BC As & When Bridge Evaluations for Overload

- Evaluation of individual overload permit requests, overall route evaluations, detailed bridge load ratings, and data checking and validation for the bridge overload automated tool (BOAT) program for bridge sites across BC
- Completed several detailed load evaluations for BC MOTI's 85 tonne overload vehicles configurations to Section 14 of the Canadian Highway Bridge Design Code (CHBDC) for Multiple Vehicle / Lane Combinations
- Completed a Technical Study on the load effects / benefits of increasing the overload vehicle axle widths to up to 6 metres to assist in the screening of Wider Overload Vehicle Permit requests (paper was presented at the 2014 CSCE Short & Medium Span Bridge Conference in Calgary and the 2013 Western Bridge Engineers Seminar in Seattle)
- Developed QA/QC Processes to Streamline the Overload Permitting Process and Improve Accuracy
- **Value:** We have developed an understanding of both BC MOTI's and the trucking company's requirements and constraints and are able to use this to make appropriate recommendations and assumptions during the evaluation process

2 McDiarmid Road Bridge

- Structural load evaluations with both CHBDC standard and multiple client-specific vehicle types
- Preliminary and detailed design for the rehabilitation of a single-span steel girder bridge
- Preparation of a preliminary design report which included the development of several rehabilitation alternatives, life-cycle cost analysis, and providing rehabilitation recommendations tailored to the Client's needs
- Rehabilitation design included recoating of the girders and diaphragms, strengthening of the girders, waterproofing and paving, barrier replacement, introduction of deck curbs, and concrete repairs
- Rehabilitation design services were carried out with due regard for environmental impact mitigation, traffic accommodation and safety concerns, capital cost, and operating efficiency
- **Value:** Load evaluations were customized to specific City-owned emergency vehicles known to operate in the vicinity. The collection of client specific data allowed the rehabilitation work to be scaled to the City's immediate operating requirements, minimized total cost of the bridge rehabilitation while maintaining critical services until such time that the bridge could be replaced entirely

PLANNING & PRELIMINARY DESIGN

Understanding Client Requirements

Once the need for rehabilitation works has been identified, to ensure a cost-effective design that meets your needs, it is essential to start with a planning and preliminary design. By considering design alternatives and evaluating each using criteria specific to each client, we determine a specialized solution for each rehabilitation project. Our clients benefit from a well-organized design team that exceeds expectations during planning and produces preliminary designs for effective rehabilitation of bridge structures.

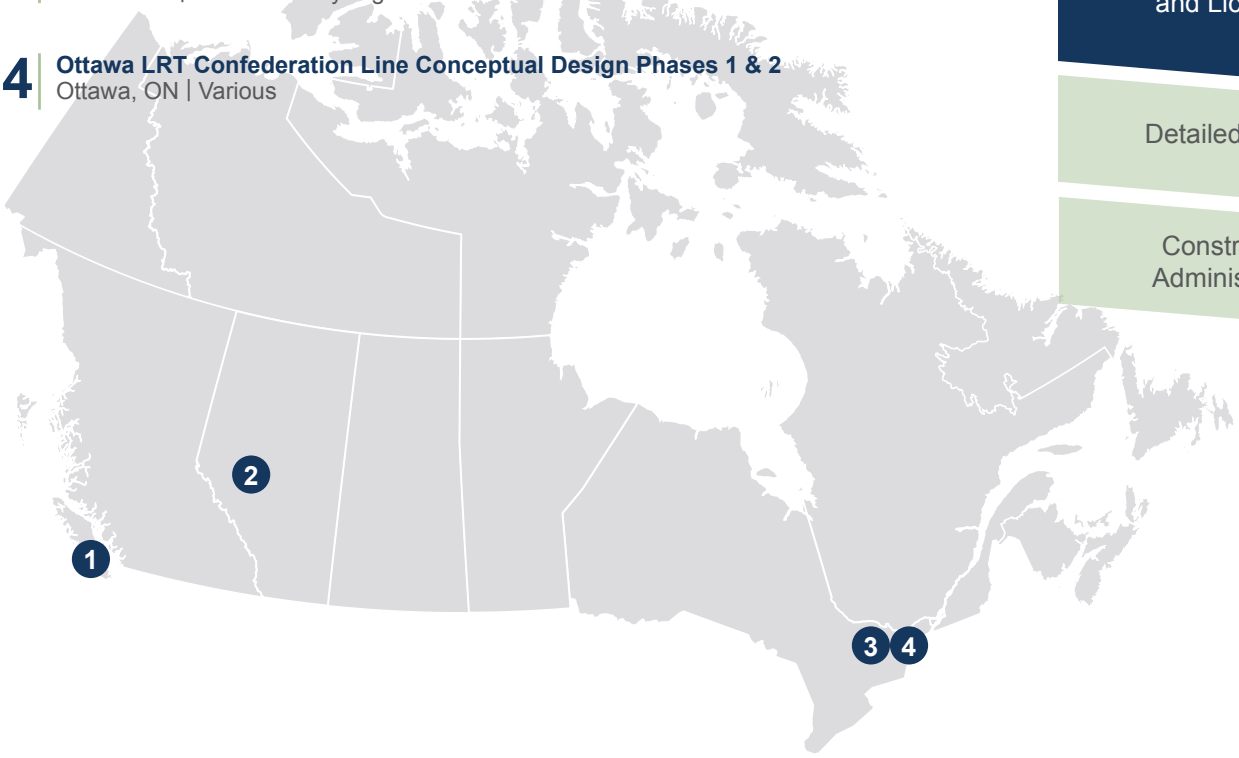
Morrison Hershfield has a strong reputation with a rich history of bridge structure design, assessment, and rehabilitation services. Our bridge engineers have hundreds of years of combined, directly-relevant planning, preliminary, and detailed design experience, and are flexible in their approach to meet our client's priorities. Our team has the know-how to optimize design and save clients' money, while reducing project design and construction risk with an integrated discipline and services portfolio and a proven quality management philosophy.

1 **City of Victoria, Heron Cove & Raymur Point Pedestrian Bridges**
Victoria, BC | Precast Concrete Box Girder

2 **Athabasca River Bridge Replacement Planning Study**
Fort Assiniboine, AB | Structure Type to be Confirmed by Future Studies

3 **Highway 417 Queensway Planning for 23 Bridges**
Ottawa ON | Predominantly Rigid Frame

4 **Ottawa LRT Confederation Line Conceptual Design Phases 1 & 2**
Ottawa, ON | Various



Monitoring

Investigation & Inspection

Evaluation

Planning & Preliminary Design

- Functional / Conceptual / Feasibility Design
- Environmental Assessment
- Public Consultation
- Survey
- Structural Design
- Hydraulic Design
- Environmental Assessment and Licensing

Detailed Design

Construction Administration

Advisory Services

PROJECTS

1 Heron Cove & Raymur Point Pedestrian Bridges

- Conceptual options and renderings for several pedestrian bridge configurations forming part of the David Foster Harbour Pathway of the Trans Canada Trail
- 48 m long pedestrian bridge at Raymur Point as well as 39 m long pedestrian bridge spanning Heron Cove, linking Fisherman's Wharf to an existing boardwalk and one of the pathway's "Special Places"
- Site survey, stakeholder consultations, preliminary and detailed design, and environmental management and permitting
- **Value:** A significant number of options were considered, including: cable-stayed; tied arch; steel pony truss; and concrete girder (with and without a pier) to best balance the aesthetic, engineering, and budgetary requirement

2 Athabasca River Bridge

- 56 year old, four span, 262 m long through-truss Athabasca River Bridge on Hwy 33
- Three phase planning study to facilitate replacement without a full closure
- Phase 1 – Alternatives development: examined six different bridge crossing corridors ranging from 2 km upstream to 5 km downstream
- Phase 2 – Alignment Alternatives: considered highway & bridge alignment options within the preferred corridor
- Phase 3 – Recommendations: finalized the preferred location of a replacement bridge and produced Design Data drawings for use in future design work
- **Value:** MH assembled a full team, including highway, structural, geotechnical, hydraulic, and environmental specialists, as well as utility, archaeological, First Nations consultation and value engineering specialists to ensure a meaningful recommendation was developed

3 Highway 417 Queensway

- Project goal was to establish a Bridge Management Plan for 23 bridges, all 50 years old, on the Queensway, considering traffic staging options and impacts
- Structural needs, staging and property impacts were key considerations. One bridge replacement was proposed as being the most cost effective, while for the remaining structures, both rehabilitation and replacement alternatives were deemed suitable
- **Value:** With our past experience in rapid bridge replacement execution, several structures were deemed appropriate for this construction method as a means to minimize construction and associated traffic impact disruption

4 Ottawa LRT Confederation Line

- Reference Concept Design for 12.5 km roadway conversion of Bus Transitway to Light Rail Transit technology
- Developed structural alternatives, coordinated the inspection of existing structures, identified, evaluated, recommended, and designed the modified structures that included a total of 34 bridges and 12 major retaining walls
- Coordinated with the road and environmental disciplines to ensure the structures design options met or exceeded the road network functional, geometric, and safety requirements
- **Value:** City Council made post-award decision to accelerate the design schedule by 6 months. MH drew on staff from across the firm and brought additional resources to successfully meet this challenge

DETAILED DESIGN

Functional, Durable & Cost Effective Design

Comprehensive detailed designs are best suited for experienced professionals who have the expertise to ensure that a design truly meets the Owner's functional and constructability requirements. Moreover, to ensure public safety, a design needs to be thorough and compliant with all required codes, regulations, and technical standards. To ensure an economical design that reduces capital and operation costs, the designs and considerations of all disciplines should be integrated into the final tender package.

Morrison Hershfield's team has the knowledge and experience to provide comprehensive designs that either bring new life to an aging structure or provide a practical solution to challenges you are faced with. Whether you are completing smaller rehabilitation works like replacing expansion joints and approach slabs or undertaking a comprehensive full structure rehabilitation, our team can provide innovative detailed designs for any project, small or large.

1. **Highway 13 Bertrand Bridge Replacement**
   Town of Langley, BC | Precast Box Girder Bridge
2. **Nairn Avenue Overpass**
   Winnipeg, MB | Curved Precast / Prestressed Concrete Girder Bridge
3. **Highway 8 Widening and Grand River Bridge Twinning, Hwy 401**
   Guelph and London, ON | Steel Girder
4. **Strategic Rehabilitation of Structures Across Highway 401 Corridor**
   Toronto, ON | Various

- Monitoring
- Investigation & Inspection
- Evaluation
- Planning & Preliminary Design
- **Detailed Design**
  - Tender Document Preparation
  - Construction Drawings, Specifications, and Contract Documents
  - Structural Design
  - Construction Staging
  - Traffic Management
  - Environmental Licensing
  - Public Consultation
- Construction Administration

Advisory Services

PROJECTS

1 Highway 13 Bertrand Bridge

- Replacement of existing 8.5 m bridge with 15 m long precast box girder bridge on sheet pile abutments, an option that maintained one open lane of traffic at all times
- Project constraints and challenges included identification of two fish species at risk, undersized hydraulic opening impacting adjacent farmland and requiring hydraulic variances, settlement issues, and traffic detours
- **Value:** Two designs were completed. MH had completed a design, including construction documents, when traffic management requirements changed, MH completely redesigned the structure to meet the Owner's needs
- **Award:** 2016 Deputy Minister's Award for Design (BC MOTI)

2 Nairn Avenue Overpass

- 11 span, four lane, 260 m long curved precast/prestressed concrete girder bridge
- Rehabilitation of abutment backwalls, barriers, deck expansion joints, approach slabs, and approach roadways staged to maintain walkway continuity and maintaining one lane of traffic in each direction at all times
- Identified significant deterioration in two concrete piers and undertook emergency works including condition assessment, load evelutation, contract administration and rehabilitation design of concrete jacketing and cathodic protection
- Reinforcement completed under full dead and live load without supplementary shoring
- **Value:** We identified emergency rehabilitation requirements, provided additional resources, and delivered the project on time and on budget

3 Highway 8 & Grand River Bridge

- New 192 m long, 5-span steel girder bridge carrying four lanes over the Grand River
- Deck replacement and widening of the existing Grand River Bridge
- Major construction items performed included the complex traffic / construction staging to maintain traffic along Highway 8 and at the interchanges
- **Value:** This project is a high profile project on a major Ontario highway that required significant public and municipal consultation, with complex construction staging requirements required to maintain traffic and high emphasis and need for environmental consultation and compliance

4 Highway 401 Corridor

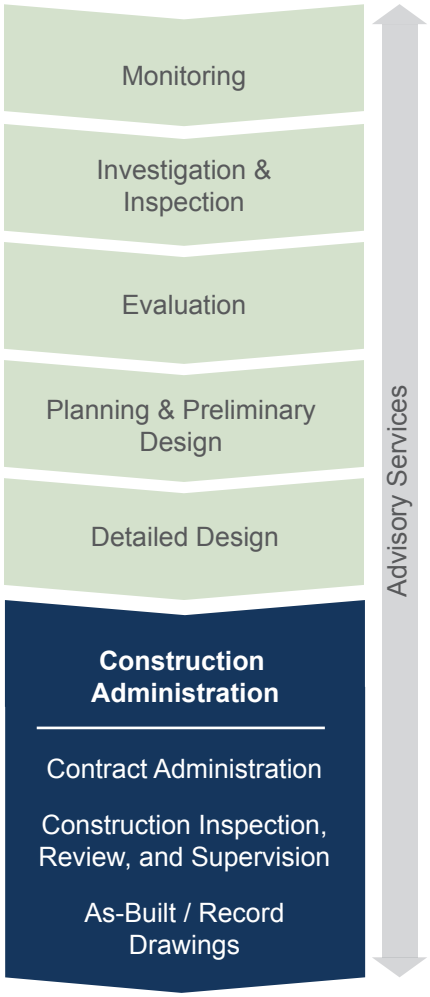
- Complete deck replacement of Hogg's Hollow structures
- Structural rehabilitation superstructure replacement of bridges at Hwy 404 Interchange, Leslie Street, Don River, Bayview Avenue, Yonge Street, Jane Street, Humber River, Hwy 400 Interchange, Weston Road, CPR, CNR, Basketweave and Wendell Avenue
- Widening of structures, retaining walls, culverts, drainage improvements, median barrier reconstruction, highmast lighting and noise barrier installation
- **Value:** Complex multi-staged construction to maintain traffic on the core and collector lanes during the construction period utilized eight construction stages to maintain all lanes in operation

CONSTRUCTION ADMINISTRATION

Manage, Execute & Deliver

Construction Administration services include monitoring the performance of the Contractor by reviewing documentation and conducting on-site assessments and reviews to determine whether the work is in general conformance with the Contract Documents. Construction Administration is critical to ensure the Owner receives a constructed product meeting the quality and life-cycle expectations of the design. Construction administration typically involves both on-site and office support services.

Morrison Hershfield has experienced structural field inspectors and contract administrators who will ensure work is in compliance with the contract documents and meets all quality requirements, helping our clients receive the full benefit of their rehabilitation intervention.

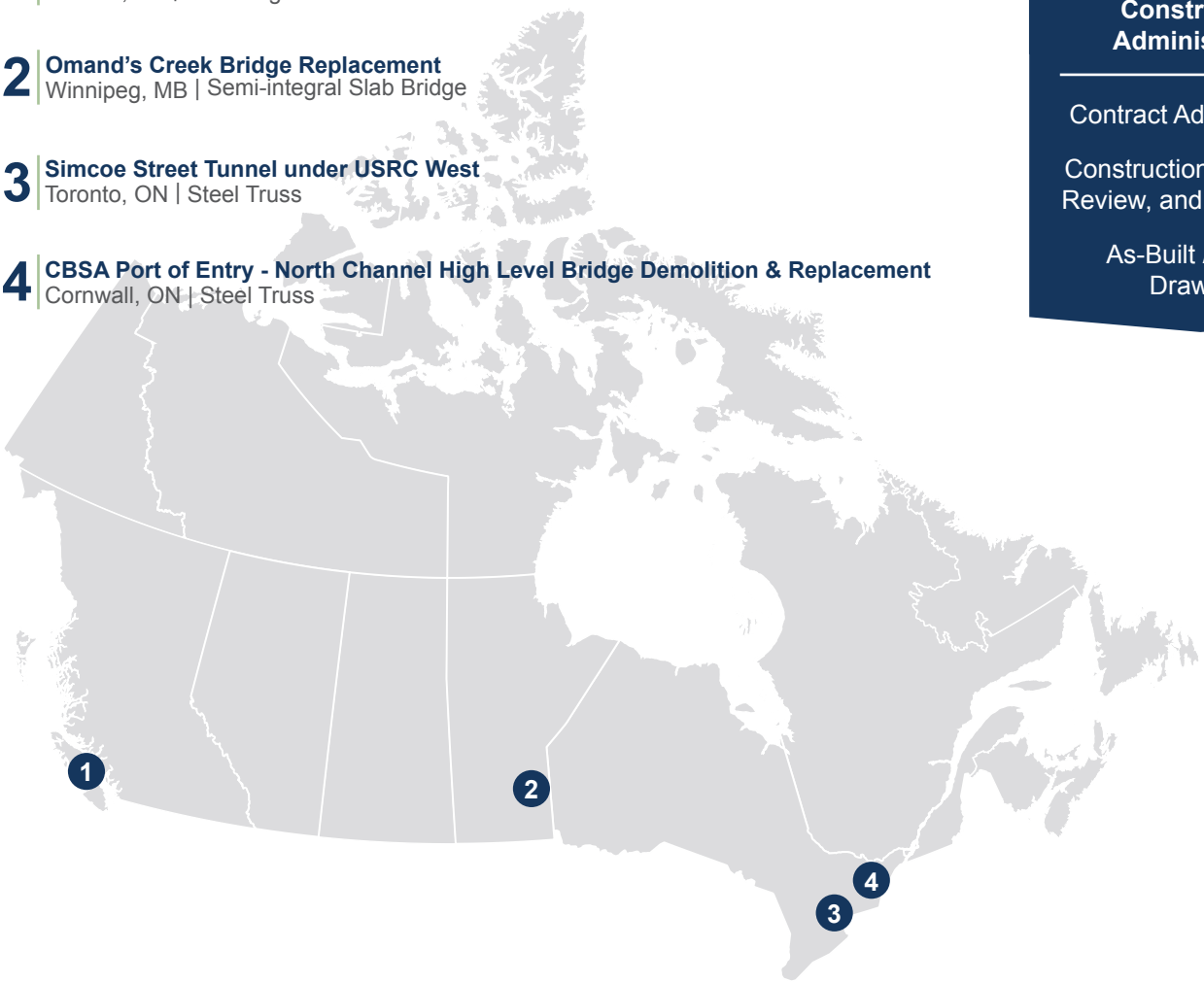


1 **City of Victoria Douglas Street Retaining Wall**
Victoria, BC | Retaining Wall

2 **Omand's Creek Bridge Replacement**
Winnipeg, MB | Semi-integral Slab Bridge

3 **Simcoe Street Tunnel under USRC West**
Toronto, ON | Steel Truss

4 **CBSA Port of Entry - North Channel High Level Bridge Demolition & Replacement**
Cornwall, ON | Steel Truss



PROJECTS

1 Douglas Street

- 113 m long, 4.2m high concrete gravity wall built prior to 1909 supports a four lane roadway corridor
- Extensive utilities located under Douglas Street. Hydro-vac field locate investigation was performed prior to construction
- Soil anchor wall selected as the most feasible due to utility constraints, site access concept and construction costs
- A field test anchor program was completed to determine accurate geotechnical capacities of the soil anchors
- **Value:** We provided MMCD certified Contract Administration and field inspection services

2 Omand's Creek

- Replacement of a 13 m long, three span timber bridge with an 8.7 m long single span semi-integral cast-in-place concrete slab bridge
- High utility area and extremely confined work site with a feedermain, watermain, overhead power lines, in-service CP Rail crossing, a busy intersection, and an industrial foundry in close proximity, which all needed to remain in-service
- The design incorporated provisions for future improvements including a future turning lane and cycle track at the adjacent intersection
- **Value:** Designed by MH, a well-considered solution resulted in competitive bid prices and satisfied the constraints of the site. MH proficiently managed key stakeholder coordination and special provisions for key phases of construction.

3 Simcoe Street Tunnel

- The new Simcoe Street Tunnel crossing under the 16 tracks of GO Transit's Union Station Rail Corridor West maintained uninterrupted passenger service
- Required coordinating with GO Transit, Toronto Terminal Railways, Via Rail, CN/CP and the City of Toronto while constructing a 75m long, 4 lane, grade separation
- Work included inspection of extensive piling operations, track and tie removal and placement, onsite production of precast girders, extensive excavation and management of soils, installation of rock anchors and management of site water
- **Value:** Exemplary coordination with all stakeholders

4 CBSA Port of Entry - North Channel

- Phase I was for new North Channel Bridge and Plaza
- Existing bridge decommissioned due to rising maintenance costs construction
- Phase II involved construction of the new Main Port Building.
- Services included tendering and procurement of over 14 sub-trades and onsite management
- **Value:** Project was completed 4 months ahead of schedule
- **Award:** The 2014 Canadian CEA Project Management Award

ADVISORY SERVICES

Helping Our Clients Every Step of the Way

In addition to the broad services portfolio included in the Operations and Maintenance Life cycle, Morrison Hershfield's transportation group often conducts other specialty and advisory services.

Morrison Hershfield is able to offer a one-stop shop for the diverse technical support required on P3|AFP projects. Our extensive design experience coupled with a deep understanding of the P3|AFP delivery model allows us to offer technical expertise with the necessary life-cycle and net present value focus critical to the success of P3|AFP projects. Since our technical disciplines exist under one roof, we are able to offer bundled services which enhance communication and foster a seamless project team environ. With a 360° perspective on the P3|AFP process, we are able to interact effectively with all project stakeholders facilitating ongoing dialogue and collaboration.

Monitoring

Investigation & Inspection

Evaluation

Planning & Preliminary Design

Detailed Design

Construction Administration

Advisory Serives

1 **Port Mann Bridge Highway 1 Stay Cable Maintenance Manual**
New West / Surrey, BC | Cable-stay

2 **Regina Bypass Independent Structural Design Review**
Regina, SK | Various

3 **Souris Swinging Bridge**
Souris, MB | Swinging Bridge

4 **F.G. Gardiner Expressway Baseline Study**
Toronto, ON | Elevated Expressway

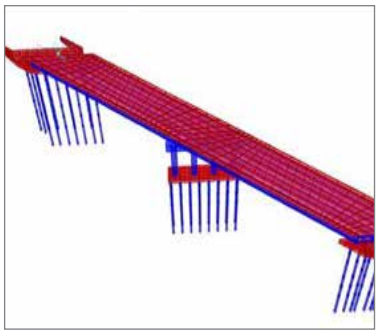
Advisory Services

- Cost and Life Cycle Cost Analysis
- Research Projects
- Expert Witness and Dispute Resolution
- Feasibility Studies
- Value Engineering
- Independent Design Review
- Owners Engineers
- Compliance Monitors
- Independent Certifiers
- Lenders Technical Advisors
- Procurement Advisors

PROJECTS

1 Port Mann Bridge

- This is a 3 year “As and When” project to evaluate the bridge stay cables’ condition after ice and snow removal
- Phase 1 of this assignment was to identify and classify damage to the cables from photographs provided by the owner’s robotic inspection tool
- Phase 2 is to develop criteria for monitoring stay cable behavior using instrumentation on the bridge and determining critical limits for fatigue service life.
- Phase 3 is to develop and implement a stay cable inspection program
- **Value:** We developed a condition based inspection program that will provide substantial inspection cost savings in the future



2 Regina Bypass

- Retained by the Regina Bypass Design Builders for 25 bridge structures
- One review is performed for each structure and consists of a CSiBridge analysis for design loads, member capacities and a review of the drawings package
- Comments are resolved with the design firms (Parsons and Buckland & Taylor) and a certificate is issued
- **Value:** IDR is a key element to a QMS and performed by firms with experience in assessing whether structural systems are complete, consistent, and in compliance with standards, regulations and codes

3 Souris Swinging Bridge

- 184 m long historic swinging bridge, the longest in Canada
- Intentionally cut down in 2011 during unprecedented flooding of the Souris River
- Independent design review including vibrational analysis to specifically provide the same movements as the original bridge which was known for its swinging character
- Vibrations and movements confirmed during a “soft” bridge opening featuring the Canadian military
- Provided technical advice during the design and construction
- **Value:** MH was selected as independent reviewer to the project due to our many years of experience as Park Engineer for the Capilano Suspension Bridge

4 F.G. Gardiner Expressway

- Carried out two baseline studies for both the elevated structures and the at grade structures in support of the City’s application for Federal funding to P3 Canada
- Studies and the resulting reports provided as back-up information during the procurement of the project
- We developed a systematic study program, reviewed all pertinent existing information, performed the field investigation, analyzed and evaluated available information, and summarized with comprehensive recommendations
- **Value:** Our involvement in the rehabilitation of various parts of the Gardiner, at both on-grade and elevated sections, throughout the planning, investigation, design and construction stages, has continued since the mid 1970s until the present day. Numerous innovative designs, details, and traffic management plans we developed have become provincial and national standards

QUALITY MANAGEMENT SYSTEM

Morrison Hershfield maintains a Quality Management System (QMS), certified and registered in accordance with ISO 9001:2008 International Standards (Certificate No. 0013112-00). We continually review and improve the effectiveness of this system and are committed to ensuring that our deliverables consistently satisfy the needs and requirements of our clients as defined in our contracts and agreements.

Our QMS applies to all activities and practices related to the provision of engineering and management services in Canada and the USA. It provides direction and guidance for the consistent, effective, and efficient operation of the business for the benefit of our clients. The system functions within a “continuous improvement loop” that captures all critical processes, links them together, and places responsibility at every level where quality is impacted.

HEALTH, SAFETY, & ENVIRONMENTAL

The most important aspect of Morrison Hershfield’s business is the health and safety of its employees and the protection of the environment. Morrison Hershfield’s Health, Safety, and Environmental (HSE) Program has been developed to provide all workers with the knowledge and means to perform all tasks in a safe manner. Through the proactive management of workplace behavior and conditions, injuries, illness and loss can be prevented. The Morrison Hershfield HSE program is a dynamic process that evolves through employee and management review. Our objective is to promote continuous improvement in an effort to achieve a ‘zero injury’ workplace.

CONTACT US

Thank you for reviewing our qualifications. We invite you to learn more about the solutions we provide by calling us directly. We look forward to providing you with exceptional service.

Edward Li (National)
Vice President, Transportation & Civil Structures
1.416.499.3119 x1011206
eli@morrisonhershfield.com

Scott Loptson (British Columbia)
Manager, Structures West
1.604.454.0402 x 1052327
sloptson@morrisonhershfield.com

Ryan Gidluck (Alberta)
Vice President, Infrastructure
1.403.246.4500 x 1032245
rgidluck@morrisonhershfield.com

Bill Ebenspanger (Manitoba)
Senior Structural Engineer
1.204.977.8370 x1131031
bebenspanger@morrisonhershfield.com

Doug Porter (Ottawa)
Manager, Ottawa Structures
1.613.739.2910 x10211636
dporter@morrisonhershfield.com

Morrison Hershfield

morrisonhershfield.com