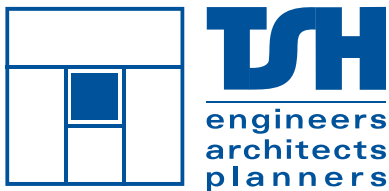




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Municipal Infrastructure Renewal

A sample of how TSH is working with clients

from
vision to Plan to
 REALIZATION™

Municipalities have a broad range of infrastructure including civic centres, police and fire stations, community centres, maintenance depots, roads, bridges and culverts, sewerage and water systems, waste management facilities, fleet, sidewalks, streetlights, and signage.

All municipal infrastructure requires renewal throughout its life to ensure it consistently provides the services and performs the duties for which it was designed. Renewal projects can be as simple and inexpensive as crack sealing pavement, flushing sewers, or repairing a leaky roof on a community centre, to much more complex and expensive projects like bridge replacement or treatment plant upgrades. Regular infrastruc-

ture renewal is important to avoid more expensive repairs or reconstructions.

Events like the recent bridge collapse in Montreal, the road and bridge washout in

TSH is providing clients with effective solutions

Toronto, and the intersection collapse in Vaughan, remind municipalities of their obligation to examine their infrastructure and look for areas that require renewal or repair. Municipalities have limited funding and are forced to prioritize renewal projects and seek out additional funding

where possible. Organizations like the Ontario Good Roads Association and the National Research Council have identified infrastructure deficits and the need for sustainable funding. There are funding programs like COMRIF that help deal with infrastructure renewal needs, but the level of funding for municipal infrastructure renewal is still a long way from reaching a sustainable level.

TSH has expertise in a broad range of infrastructure renewal projects from basic repairs to cutting-edge reconstructions. TSH continues to assist clients in planning and implementing municipal infrastructure renewal projects, including sourcing areas where funding might be available.

Parkdale Avenue Rehabilitation

The City of Ottawa identified the need for rehabilitation/replacement of watermains, storm and sanitary sewers, the roadway and sidewalks for Parkdale Avenue between Carling Avenue and Gladstone Avenue. Parkdale Avenue is a major collector roadway running north-south and connects with exit and entrance ramps to Highway 417. Between Carling Avenue and Gladstone Avenue, Parkdale is residential, except for the Ottawa Hospital Civic Campus and medical building located at Carling Avenue, and three churches within the project limits.

The City of Ottawa hired TSH to complete the design for this rehabilitation/replacement. The design included replacements of underground services within a tight corridor containing multiple utilities; tight cross section design to ensure adequate drainage in areas with differential elevations, including retaining walls where necessary; developing a Traffic Management Plan to reroute traffic during construction and developing a contingency plan to deal with potential water service disruption to the hospital. TSH also worked with the city's Urban Design and Zoning staff for

streetscaping and streetlighting design.

The City of Ottawa completed the construction between Gladstone Avenue and Highway 417 in 2005, but hired TSH in 2006 to complete the construction administration for the remaining portion to Carling Avenue, including the section at the Ottawa Hospital Civic Campus and medical building. TSH provided project management, contract administration and field inspection services.



Municipal Stormwater Management Financing for Sustainability

Providing an efficient stormwater management program that meets the needs and service expectations of a community has always been a daunting task. New stormwater quality standards, fish habitat guidelines, and the prospect of changes to municipal accounting practices have many municipalities scrambling to take stock of their stormwater assets, and to re-establish their capital and operating priorities. Complicated by infrastructure needs that are highly variable on an annual basis, municipalities are being forced to seek out new funding options in order to achieve sustainable financing for their stormwater programs.

A stormwater rate is a financing mechanism that offers an equitable method for allocating stormwater management program costs. With a stormwater rate, property owners are levied in relation to the amount of impervious area (i.e., rooftops, driveways, and parking areas) on their property, which directly correlates to their contribution to runoff volume and pollutant loading. This approach quantifies usage of the municipal stormwater management system in terms of the land-use practices and development decisions of property owners. The implementation of a stormwater rate represents a dedicated and sustainable source of revenue that is more

equitable than property taxes, which are based on assessed property value not a usage system. The stormwater rate approach is a relatively new concept in Canada, but has been successfully implemented in nearly 500 municipalities throughout the U.S.

The graphics below show examples of the inequities of property tax-based funding when compared to the impervious area-based funding of a stormwater rate.

On stormwater projects, TSH has partnered with Camp Dresser & McKee Inc., an established leader in developing and implementing stormwater rates. TSH is currently providing these services in the cities of Kitchener, Waterloo, and Stratford.



Academy Street

TSH was retained by the Township of Loyalist for pre-engineering, detail design, and construction administration services along Academy Street in the historic Village of Bath, located on Lake Ontario, just west of the City of Kingston. TSH applied rehabilitation strategies to optimize the functioning of existing infrastructure, minimize costs, and reduce user inconvenience.

The renewal project ensured that historic buildings were preserved; public consultation was undertaken to resolve parking issues; drainage and stormwater quality were updated; and relining strategies for watermain rehabilitations were adopted.



Getting Best Value in Project Lifecycle Costs

InfraGuide, a national organization expert in best practices for municipal infrastructure engineering and management, recently published guidelines on how municipalities can get the best value for their infrastructure dollars.

InfraGuide believes that the long-term savings that can be gained from considering high-quality engineering services that add value in the form of innovation, sustainability, and lifecycle analysis are far more significant than short-term savings provided by the lowest-price design. Engineering fees are generally only 1-2% of the total lifecycle cost of a project, yet if this 1-2% is wisely invested on design, municipalities can save significantly on construction, operation, and maintenance costs, which make up the remaining 98-99% of the lifecycle costs.

Municipal Infrastructure Funding

Municipalities will be interested in the many funding programs established by the federal and Ontario provincial governments to support the renewal of aging infrastructure - programs such as Renew Ontario, Ontario Strategic Infrastructure Financing Authority Loans Program, Canada-Ontario Municipal Rural Infrastructure Fund (COMRIF), the COMRIF Asset Management Program, Rural Investment Initiative, and the Rural Economic Development (RED) Program.

Each program comes with its own conditions, terms and qualifiers. Common to all programs, however, is that successful applicants can demonstrate commitment and preparedness. They will have a project plan that addresses needs which have been confirmed through formal EA and budgetary processes, and they will have demonstrated commitment to initiatives by having actionable projects ready for construction implementation. Municipalities who do their homework and are ready are more likely to secure the funding support they need to renew their aging infrastructure.

TSH has been liaising with the federal and Ontario provincial governments to provide constructive input on behalf of Ontario municipalities in refining various infrastructure renewal programs, and in streamlining application processes. This enhances our ability to assist in the preparation of funding application submissions and supplements our extensive experience in undertaking planning and engineering work for municipal projects of all types.

Carleton University

Since 2000, TSH has provided a variety of civil engineering design and assessment services to Carleton University, most frequently for their storm sewer, sanitary sewer, and water supply infrastructure.

Storm Sewer System: Given the varying age of the stormwater system, and flooding and drainage problems, TSH was asked to inventory, assess, and prioritize rehabilitation of the system's capacity and condition. The stormwater system involves 7 km of gravity flow sewers, ranging in diameter from 200 mm to 1350 mm, draining a total of 50 hectares. From a structural perspective, 34 structures required immediate attention, with another 215 requiring attention within the next 5 years. From a serviceability perspective, 18 structures required immediate attention.

Sanitary Sewer System: Given the varying age of the sanitary system and potential capacity problems at the City of Ottawa pumping station due to campus expansion, TSH was asked to inventory, assess and prioritize rehabilitation of the system, as well as identify the pumping station capacity and potential loads due to expansion. The sanitary system involves 4.2 km of gravity flow sewers ranging in diameter from 150 mm to 530 mm.

Water Distribution System: TSH was asked to undertake a watermain condition assessment and rehabilitation review, and provide specific recommendations for corrosion control measures. Watermain break history and corrosion penetration rates were investigated. The water distribution system involves 6.8 km of water supply pipes, ranging in diameter from 100 mm to 400 mm. Low-pressure areas were identified and a master plan study was recommended. The condition assessment and rehabilitation review recommended a ten-year broad-based cathodic protection program.

Harmony Road Class EA/Detail Design/Construction

TSH was hired by The Regional Municipality of Durham to complete the planning, Environmental Assessment, design, and construction contract administration for widening Harmony Road to four lanes between Florell Drive and Rossland Road in the City of Oshawa. Turning lanes will be added at the following intersections: King Street East, Adelaide Avenue, Copperfield/Glebe Avenue, and Rossland Road. The reconstruction and widening of Harmony Road involves approximately 3 km of urban roadway. In addition, provisions have been made for additional eastbound and westbound through lanes at the Adelaide Avenue and Rossland Road intersections. The reconstruction also involves replacing portions of the underground services: sanitary sewer and watermain, as well as upgrading the storm sewer system along Harmony Road. Upgrades to the storm system involve improvements to the outfalls at Harmony Creek to provide water quality as well as water quantity controls. The project is broken into two parts: construction from King Street East north to Rossland Road and construction from King Street East south to Florell Drive.



Trent River Bridge Rehabilitation, County Road 30, Northumberland County

Trent River Bridge in Northumberland County needed rehabilitation. The bridge consists of five CPCI prestressed concrete girders and a concrete deck over eight spans with a total length of 268 m. Existing bridge expansion joints were leaking and significant concrete damage developed at the ends of the CPCI concrete prestressed girders, pier caps, and abutments. The concrete deck wearing surface was deteriorated, with numerous cracks, spalls and delaminations. The bridge had been repaired several times, but concrete deterioration continued due to leakage of expansion joints over piers and abutments. To prevent further concrete deterioration and leakage, expansion joints were removed and the bridge's deck was converted to a continuous deck.

TSH was retained to prepare a detailed design and to provide construction contract administration for this rehabilitation. The conversion of the existing bridge deck into a continuous deck required replacement of existing bridge bearings with new bearings of various heights to accommodate bridge temperature movements. The change in bearings' heights was accommodated through an improved road profile. Bridge-jacking sequence and construction staging was designed to allow uninterrupted traffic flow over the bridge during the construction. Underwater investigation was done to detect any scour or concrete damage at pier footings.

Conger Marsh Wastewater Treatment Plant

Faced with failing septic systems that were contaminating a nearby lake in the community of MacTier, the District of Muskoka hired TSH to complete the design and construction contract administration for a new sewage treatment plant.

The proposed location of the new plant was within the endangered eastern massasauga rattlesnake habitat. To minimize intrusion, a detailed habitat survey was undertaken that involved capturing several snakes and tagging them with radio collars, and tracking their movements for two years. TSH staff chose a site for the plant based on the results of this survey.

Project regard for protecting the environment was further demonstrated in meeting the extremely stringent effluent requirements for discharge into a sensitive wetland area, and through the incorporation of advanced wastewater treatment techniques.

Further environmental sustainability was also achieved by optimizing energy use within the facility through HVAC energy control and incorporation of LEED principles in the building design. The architecture for the facility reflects the historic character of the area, and the colour scheme complements the cranberry harvesting heritage of the area.



Sydenham Water Works System

The community of Sydenham in the Township of South Frontenac was faced with poor quality private well water due to bacteria and nitrate contamination in the aquifer.



TSH prepared an Environmental Study Report, a detailed design, and construction contract administration for the water works system that consisted of a new treatment plant, a water distribution system, over 8 km of watermains, and a composite concrete/steel elevated storage tank.

Sydenham Lake is the raw water source for the water treatment plant. The treatment process uses ceramic media filtration rather than a conventional water treatment plant process to provide greater removal and inactivation of parasites that contaminate the water supply. The building design was based on sustainable architectural principles, incorporates LEED concepts, as well as HVAC energy management.

This project will provide a long-term sustainable water supply for the community, protecting public health, increasing property values, and allowing for future community growth.



TSH is Growing Again

TSH is committed to investing in the communities we work in, and to work in the communities in which we invest. TSH provides clients with regional offices that are convenient and offer a full range of services. TSH has opened two new offices in Canada: one in Mississauga, Ontario, and one in Calgary, Alberta.

The **Mississauga** office, located near Mississauga Road and Highway 401, is scheduled to open in February 2007. Senior staff are already in place and TSH's full services are being offered to clients. Karin Wall will manage Environmental Planning, Rob Shames will manage Municipal and Civil Projects, Steve Keen will manage Transportation Planning, and Don Kemp will manage Environmental Engineering.

In January 2006, TSH took a big step into the West when a new office opened in Calgary Alberta. Throughout 2006, Alf Guebert worked on building client relationships across Alberta and spreading the word about TSH. The main focus for the **Calgary** office is Transportation Planning, Traffic Engineering, Roadway and Bridge Design, Asset Management and Subsurface Utility Engineering. Many proposals have been submitted, and the workload is rapidly growing.

The work potential is great in Western Canada, and recruiting is in full force to meet those demands. With new staff coming aboard, and the help of other TSH offices, the Calgary office will expand rapidly this year.

Canmore Alberta Roundabout

Bow Valley Trail is one of a few major streets in the Town of Canmore. TSH was hired to perform an operational analysis of a roundabout versus a traffic signal and to develop design concepts. Based on the recommendations, the Town of Canmore agreed that a roundabout better meets medium-term and long-term needs of the area.

TSH was contracted to do the plan design of the single-lane roundabout, and Mountain Engineering did the contract administration. The roundabout provides the primary access into a new large residential development and an existing mixed-use development. The option of a two-lane roundabout was built into the design should the road be widened in the future.

The Bow Valley Trail roundabout is the first for the Town of Canmore and is being well received. The landscaping, which generated considerable public interest, will be completed in the spring of 2007.



TSH Staff Member Elected as International VP of Institute of Transportation Engineers



Alfred A. Guebert, P. Eng., Vice President of TSH, based in Calgary, Alberta, was recently elected as International Vice President of the Institute of Transportation Engineers (ITE). Alf will serve on the Executive Committee of ITE for three years as Vice President (2007), President (2008), and past President (2009). ITE is an international educational and scientific association of transportation professionals who are responsible for meeting mobility and safety needs. ITE facilitates applying technology and scientific principles to research, planning, functional design, implementation, operations,

Eastern Gateway EA in Downtown Niagara Falls

To draw on the popularity of tourist attractions like Niagara Parks and the Niagara Gorge, the City of Niagara Falls wants to revitalize its downtown centre and create a welcoming place to work and visit. To achieve these objectives, they have developed their own community improvement plan and strategic implementation plan.

TSH's Transportation and Environmental Planning groups, supported by the Landscape Architectural group, were hired by the City of Niagara Falls to help them realize portions of their vision for their Eastern Gateway to downtown by completing an Environmental Assessment. The major focus involved integrating two diverse, yet equally important themes: a pristine natural environment and an urbanized working and shopping area. Planned attractions include theatres, offices, shopping, entertainment, restaurants, as well as a large parkland area.

TSH will also coordinate with other consulting activities in the area as Niagara Falls has an aggressive schedule for realizing revitalization. Achieving this schedule requires significant negotiations with the Parks Commission because the proposed large parkland area has an impact on the Parks Commission River Road, which is a heritage road and is considered a processional route.

To help the community visualize the integration of high-rise buildings and the parkland area in the downtown centre, TSH was partnered with Niagara College to create a 3-D visualization.



policy development, and management for any mode of transportation. Through its products and services, ITE promotes professional development of its members, supports and encourages education, stimulates research, develops public awareness programs, and serves as a conduit for the exchange of professional information.

Alf served for more than 21 years with the City of Saskatoon as Traffic Operations Engineer and Electric System Manager, before moving into the private sector in 2000. He joined TSH in 2006. Alf also serves the Transportation Association of Canada (TAC) as Vice Chair of the Traffic Operations and Management Standing Committee.

Bridge Repair Projects

Oro Line Heat Straightening Repairs

The Oro Line 5 Underpass, located on Highway 11, north of 5th Concession Road was struck by a dump truck on the south girder over the northbound lanes. Significant damage occurred to the girder and minor damage occurred to the deck overhang. TSH was retained by the Ministry of Transportation Ontario (MTO)-Central Region to provide detailed inspection and design services, and to act as construction liaison.

The inspection phase consisted of a detailed visual and dimensional inspection of the damaged area; non-destructive testing of the girder to assess potential cracking of the girder and/or welds; and a detailed report documenting findings, assessment of remaining fatigue life, estimated construction costs, and providing recommendations for repair.

The design phase consisted of liaising with local property owners; designing repairs for the damaged girder and deck overhang; designing a secondary access hatch into the box girder; assessing traffic impacts for construction works; and preparing detailed contract specifications.



The construction phase consisted of assessing contractor shop drawings for heat straightening of the girder; providing structural assistance to MTO in the direction of the contractor and review of shop drawings; and providing non-destructive inspection of all works on a daily basis during all heat straightening activities.

Wayne Gretzky Parkway Underpass Repairs, Highway 403

A vehicle collision on the Wayne Gretzky Parkway bridge damaged an exterior girder above the westbound lanes, forcing an emergency lane closure. TSH's structural engineering services provided emergency design repairs, including replacing the damaged girder portion of the bridge deck, and installing a unique concrete protection wall in front of the exterior girder. The protection wall serves as a barrier to prevent further vehicle impact damage to the



bridge. TSH also provided site inspection services during construction. The project was completed within 18 weeks of the collision. TSH was commended for their rapid response and innovative design approach for this critical MTO project.

Garden City Skyway Substructure Rehabilitation

The Garden City Skyway Bridge is located along the Queen Elizabeth Way in the City of St. Catharines, and consists of 48 spans, for a total length of 2200 m. Rehabilitation of the superstructure has been carried out several times, with full rehabilitation of the deck in early 2002. However, there has been no major rehabilitation work for the substructure. Previous condition survey records (1997 and 1998) indicate that the piers' overall conditions vary from acceptable to poor, with the majority being in fair to poor condition.



Due to the increased deterioration of bridge components, especially those of the bridge substructure, immediate attention to undertake remedial repairs to restore the structural integrity for the protection of the public was warranted. A variety of rehabilitation techniques were employed to minimize cost, while ensuring durable, long-lasting repairs. The repair treatments considered included concrete patch repairs, patching with passive cathodic protection, concrete jacketing and jacketing with cathodic protection, as well as shotcreting, pinning of delaminations, electrochemical chloride extraction, and pier cap strengthening. The repair method chosen for each component was based on the level of deterioration and a lifecycle cost analysis. The restoration will be undertaken over the next five years at a total cost of approximately \$30 million.

The TSH Quality Management System

By applying our Quality Management System (QMS), a set of formal procedures compliant with ISO 9001:2000 standards, TSH strives for excellence in the quality of our products and services, ensuring they conform to our clients' requirements and accepted professional practices. TSH's commitment to quality extends beyond QMS and includes investing in the ongoing skill development of our employees, thereby fostering a workplace culture of continuous improvement and a capacity to provide superior value to our clients.



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