30 October 2012

HERITAGE IMPACT ASSESSMENT (HIA)

Michigan Central Railroad Bridge
Kettle Creek Valley, Fingal Line at Sunset Drive
City of St. Thomas, Elgin County, Ontario

Submitted to:
Mr. Andrew Ross, P.Eng.
B.M. Ross and Associates Limited
62 North Street
Goderich, Ontario N7A 2T4
Tel: (519) 524-2641 Fax: (519) 524-4403

REPORT

Report Number: 12-1136-0066-R01

Distribution:

3 Copies - B.M. Ross and Associates Limited

2 Copies - Golder Associates Ltd.

Golder Associates

Executive Summary

BM Ross Associates was retained by the City of St. Thomas to conduct a bridge inspection and structural assessment of the former Michigan Central Railway Trestle. The purpose of the study was to make recommendations regarding any required remediation and associated costs to permit the bridge to continue to function as an overhead crossing of the Kettle Creek Valley. The City also requested that the engineering study include a Heritage Impact Assessment of the bridge. BM Ross retained Golder Associates to prepare the Heritage Evaluation.

The Ministry of Tourism Culture and Sport guidelines for conducting a Heritage Impact Assessment were used in preparing this report. A structural history of the bridge was prepared to determine events that influenced its location, operational history, and impact on the community of St. Thomas. Various agencies and organizations were contacted to determine if as-built drawings of the bridge still exist. Character defining elements of the bridge were identified, described and photographed. The cultural heritage value of the bridge was assessed using the three criteria set out in the *Ontario Heritage Act, O. Reg 09/06*.

The Heritage Impact Assessment determined that Michigan Central Railway Trestle has cultural heritage value because of its association with the history of St. Thomas and the broader theme of the economic history of railways in Ontario. More specifically, it is a prominent landmark to the former significance of the railway industry to St. Thomas. Along with the former Canada Southern Railway station and the Michigan Central shop building it is a key component of the city"s railway heritage. In addition, the massive character of the bridge is indicative of the large volume of traffic that the railway once carried and, by extension, of the economic importance of railways in the early 20th century. At the same time, the bridge was designed and built to accomodate a future road alignment and was thus indicative of the growing influence of motor vehicle traffic in the early 20th century. Finally, its location with the broad Kettle Creek valley creates a distinct and highly visible cultural landscape.

Since a specific future use for the bridge has not yet been determined, generic impacts of the future use of the bridge are described. It is recommended that any future reuse of the bridge should follow the conservation approached contained in the federal *Standards and Guidelines for the Conservation of Historic Places in Canada.* As well, copies of this Heritage Impact Assessment should be deposited with the St. Thomas Public Library, Elgin County Railway Museum, and Elgin County Archives.

Table of Contents

TABLES

FIGURES

PLATES

1.0 STUDY PURPOSE

BM Ross Associates was retained by the City of St. Thomas to conduct a bridge inspection and structural assessment of the former Michigan Central Railroad (MCR) Bridge (also called the Michigan Central Railway Trestle). The purpose of the study was to make recommendations regarding any required remediation and associated costs to permit the bridge to continue to function as an overhead crossing of the Kettle Creek Valley.

The bridge structure may become a publicly owned facility through partnerships between interested community groups that have recognized the potential heritage aspect of this bridge along with possible municipal involvement. Therefore the City also requested a Cultural Heritage Evaluation Report (CHER) as a component of the engineering study. BM Ross retained Golder Associates to prepare the CHER. As explained in the Study Method, Golder prepared a Heritage Impact Assessment (HIA) rather than a CHER.

The bridge is currently owned by Rexton Developments Ltd, a company which recently acquired all former Michigan Central railway lands including any associated fixed assets from the Canadian National/Canadian Pacific Railways.

2.0 STUDY METHOD

2.1 Heritage Impact Assessment

In the Request for Proposals (RFP) the City had requested that a Cultural Heritage Evaluation Report (CHER) be prepared as a component of the engineering study though the specific methodology for the heritage assessment was left to the judgement of the consultant. The Ministry of Tourism Culture and Sport (MTCS) guidelines for conducting an HIA were used in preparing this report. While the Ministry of Transportation"s (MTO) *Ontario Heritage Bridge Guidelines* could have been used for evaluation purposes, since the MTO guidelines were prepared specifically for highway bridges and were based on the MTCS guidelines, it was considered that the MTCS guidelines are more directly applicable to this study. Preparation of an HIA consists of the tasks briefly summarized below.

A history of the bridge was prepared to determine events that influenced its location, operational history, and impact on the community of St. Thomas. Information was gathered from historic photographs, maps, published and archival sources, and knowledgeable individuals.

An inventory of the bridge features was undertaken to identify, describe and photograph character defining elements of the bridge.

Based on the research and field inventory, the cultural heritage value of the bridge was assessed using the three criteria set out in the *Ontario Heritage Act, O. Reg 09/06*. The three criteria are:

1) The property has ***design value or physical value*** because it:

- is a rare, unique, representative or early example of a style, type, expression, material or construction method;
- displays a high degree of craftsmanship or artistic merit; or
- demonstrates a high degree of technical or scientific achievement.

2) The property has ***historic value or associative value*** because it:

- has direct associations with a theme, event, belief, person, activity, organization, or institution that is significant to a community;
- yields, or has the potential to yield information that contributes to an understanding of a community or culture; or
- demonstrates or reflects the work or ideas of an architect, artist, builder, designer, or theorist who is significant to a community.

3) The property has ***contextual value*** because it:

- is important in defining, maintaining or supporting the character of an area;

- is physically, functionally, visually or historically linked to its surroundings; or
- is a landmark.

At this time, there is no specific future use identified for the bridge and therefore specific recommendations could not be made. In general terms, however, the deck is being proposed as a public right-of-way. Within this general undertaking, generic impacts of the future use of the bridge are described.

2.2 Engineering Drawings of Bridge

The City of St. Thomas did not have any original drawings of the bridge and was unaware of any plans in other public or private collections. One of the contract stipulations was that the successful bidder should attempt to locate any plans. The results of this work are included in Appendix A

2.3 Notes

2.3.1 Metric Units

In 1971 Canada adopted the metric system, however all structural dimensions for the bridge in this text are given in Imperial units given that it was constructed long before national implementation of the metric system. In general the use of Imperial (or US Customary units) rather than metric is preferred for describing historic structures. Engineered structures were built to standard Imperial dimensions and distinctive patterns within such structures can be obscured by converting the original Imperial into metric units.

2.3.2 Bridge, Trestle, Viaduct

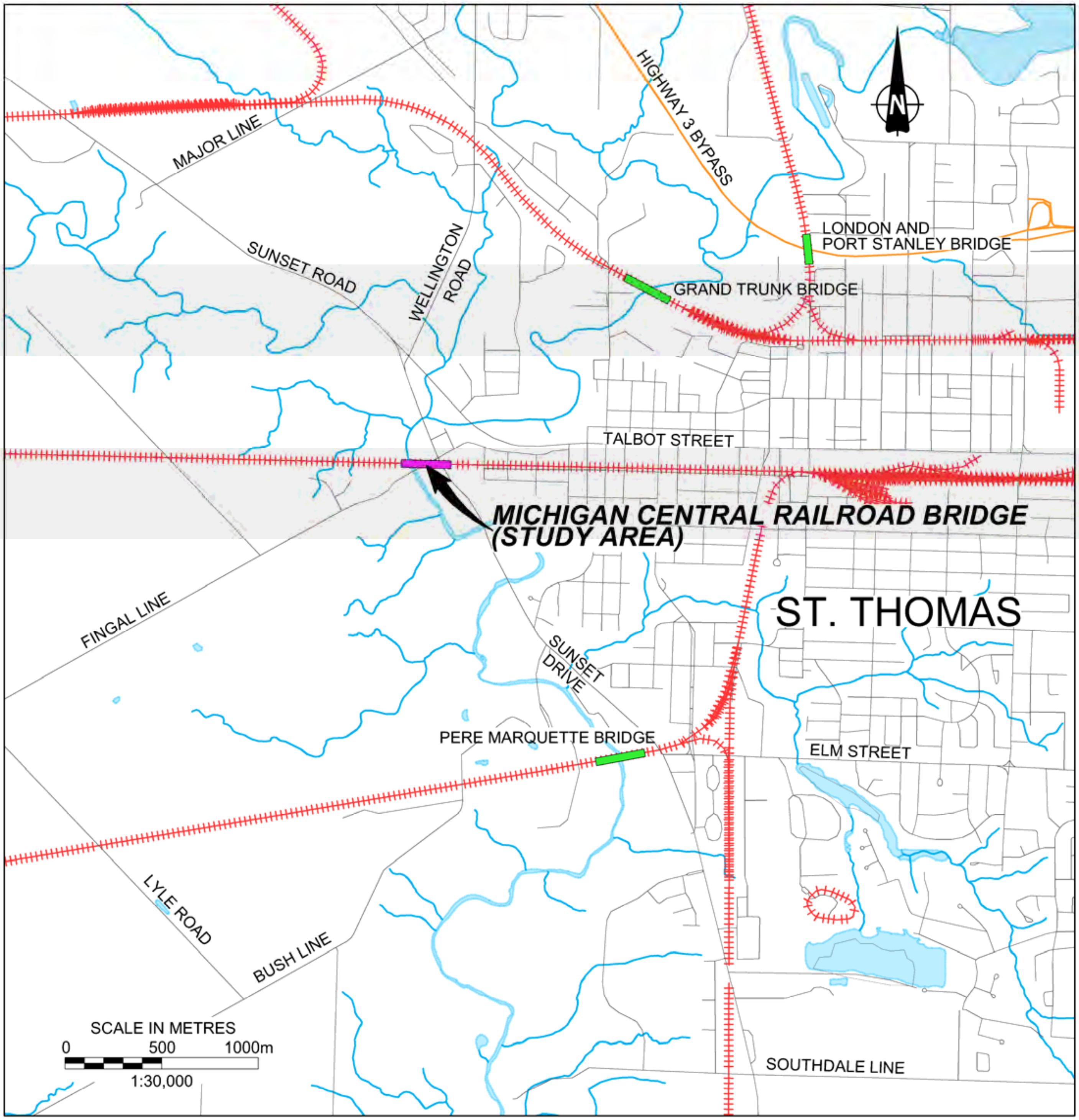
The City of St. Thomas refers to the bridge as a trestle. Technically, a trestle is a series of bridge spans formed of rigid frames, that resembles a lattice-like structure, supported on multiple piers. Plates 1 through 5 illustrate the predecessor rail bridge structures at the site and these are more consistent with the use of the term “trestle”. In these plates, the structure supporting the rail is formed of many short spans and the framing below the rail level is complex including many vertical supports connected by cross-braces and horizontal tie-beams. While the term viaduct is often used as an alternative term for a trestle bridge, viaducts are more commonly elevated transportation structures formed by a series of arches or simple bridge spans supported by massive stone or concrete piers, similar to the present structure, rather than a complex rigid steel or timber framework. Continued use of the term trestle for the structure in St. Thomas may be the result of local tradition following from the former structure configurations. This HIA uses the more all-encompassing term of bridge.

2.3.3 Name of Bridge

The 1872 and 1883 structures appear to have been known as the Kettle Creek Bridge. Railways typically named their bridges after the watercourse that they crossed. When the present bridge was constructed an article described it as the Kettle Creek Viaduct. The RFP for this project called the structure the Michigan Central Railway Trestle. Naming a bridge after the company was not common usage; however, given the multiple bridges that cross Kettle Creek, local tradition, and consideration of the appropriate usage of bridge and railway terms, this report refers to the structure as the Michigan Central Railroad (MCR) Bridge.

2.3.4 Name of Railway

The original railway line was known as the Canada Southern Railway Company. Although the track and bridge was leased to the Michigan Central Railroad Company since 1883, the Canada Southern Railway Company continued to exist until 1985. Under lease, the track in Canada was known as the Michigan Central – Canada Division. The term „railway" is in common usage in Canada while "railroad" is typically an American term. Since the Michigan Central Railroad was the name of the track lessee, this name is kept for the bridge naming in this report.



REFERENCE

DRAWING BASED ON CANMAP STREETFILES V2008.4; AND MNR LIO, OBTAINED 2009, PRODUCED BY GOLDER ASSOCIATES LTD UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2012.

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

ALL LOCATIONS ARE APPROXIMATE.

PROJECT
CULTURAL HERITAGE EVALUATION REPORT
MICHIGAN CENTRAL RAILROAD BRIDGE, KETTLE CREEK VALLEY
INTERSECTION OF FINGAL LINE AND SUNSET DRIVE
CITY OF ST. THOMAS, ELGIN COUNTY, ONTARIO

TITLE

STUDY AREA LOCATION

Golder Associates
LONDON, ONTARIO

PROJECT No.	12-1136-0066	FILE No.	1211360066-R01001
		SCALE	AS SHOWN REV.
CADD	DCH	Oct. 30/12	
CHECK			**FIGURE 1**

Drawing file: 1211360066-R01001.dwg Oct 30, 2012 - 2:52pm

REFERENCE

DRAWING BASED ON 2006 AERIAL IMAGE PROVIDED BY THE CITY OF ST. THOMAS.

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

ALL LOCATIONS ARE APPROXIMATE.

PROJECT

CULTURAL HERITAGE EVALUATION REPORT
MICHIGAN CENTRAL RAILROAD BRIDGE, KETTLE CREEK VALLEY
INTERSECTION OF FINGAL LINE AND SUNSET DRIVE
CITY OF ST. THOMAS, ELGIN COUNTY, ONTARIO

TITLE

STUDY AREA MAP

Golder Associates LONDON, ONTARIO	PROJECT No.	12-1136-0066	FILE No.	1211360066-R01002
			SCALE AS SHOWN	REV.
	CADD	DCH	Oct. 30/12	
	CHECK			FIGURE 2

Drawing file: 1211360066-R01002.dwg Oct 30, 2012 - 2:54pm

3.0 FACTORS AFFECTING LOCATION OF THE BRIDGE

3.1 Physiography

The Michigan Central Railroad (MCR) Bridge crosses Kettle Creek on the west side of the City of St. Thomas. Kettle Creek is approximately 80 km long and enters Lake Erie at Port Stanley, approximately 15 km south of the City. At Port Stanley the shoreline bluff is about 40 m high. Consequently the valley, as it cuts through the surrounding bordering plain, is quite deep. Although steep-sided, the valley is flat-bottomed and the river meanders widely as far upstream as St. Thomas. At St. Thomas, about 15 km from the shoreline, the valley is still over 23 m deep.[1]

Five railways once crossed Kettle Creek at St. Thomas (Figure 1 – four are mapped). The earliest was made by the London and Port Stanley Railway (Part of Canadian National today) in 1856 (Plate 1). The bridge crossed a narrow valley upstream of the MCR bridge and has been rebuilt and is still in service in 2012. The Great Western (Today part of the Canadian National) built a long, but lower bridge north of the CSR. The 1872 Canada Southern Railway (CSR) bridge, that later was rebuilt as the Michigan Central Railroad bridge and the subject of this study, was by far the longest (Plate 2, 3). Rather than cross with a shorter, lower bridge, the company was determined to build the straightest line between New York State and Michigan through Canada. Even when rebuilt in 1929 as a shortened structure it was still a major bridge. The fourth crossing of Kettle Creek was built in 1902 by the Lake Erie and Detroit River (later part of the Chesapeake and Ohio Railroad system) just downstream of the MCR Bridge as is referred to as the Pere Marquette bridge. This was similar in length and height to the MCR Bridge. It has been dismantled. These four bridges crossed Kettle Creek at the height of the table land on either side of the valley. The last company, an electric interurban railway, the Southwestern Traction Line, traversed down the valley slope, crossed the creek in 1906 on a short bridge and worked its way up the other valley wall. The line was abandoned soon after and is therefore not mapped on Figure 1.

3.2 Economic Considerations

The CSR and later the MCR ran from Fort Erie through St. Thomas to Windsor. The MCR Bridge at St. Thomas is a massive structure that is far out of scale to the demands generated by local traffic. The size of the bridge is indicative that the railway was built to carry trans-regional American rail traffic between the United States mid-west and New York City (Figure 3). This type of traffic pattern gave rise to the term “bridge railway.” The company carried traffic between its end points and “bridged” the low traffic territory in between. Southern Ontario contained several such bridge railways in addition to the MCR. The Great Western built a line at the same time that virtually paralleled the CSR. The Wabash and the Pere Marquette railways did the same thing but used trackage rights rather than building physical track.

[1] . Chapman and Putnam. *Physiography of Southern Ontario* p.140

Plate 1: London and Port Stanley Trestle over Kettle Creek, c. 1920. Source C. Andreae Collection

The CSR was completed in 1873 from Fort Erie, opposite Buffalo, by way of St. Thomas to Amherstburg. The terminal was later relocated to Windsor, opposite Detroit. In December 1882 the CSR was leased to the MCR for 21 years. The MCR between Detroit and Chicago was effectively controlled by the New York Central Railroad. Although the New York Central Railroad also operated a route between New York and Chicago along the south shore of Lake Erie, through Cleveland, this could become congested with traffic. The track through southern Ontario was both shorter, and less congested than the south shore route. At the end of 1903, the CSR was leased to the MCR for 999 years, effective January 1, 1904.[2]

Traffic over the MCR line in Canada grew substantially. By early 1897 the company was handling an average of 50 freight and passenger trains per day. In 1898 the company commenced double tracking the railway, including over 40 km of line east and west of St. Thomas. The last section of route was completed in 1906.[3]

“Bridge railway” traffic across southern Ontario on all railways continued to increase up to the time of the Great Depression in the 1930s. The MCR Canada Division carried one of the fastest and densest train schedules in the Midwest. In 1927 the New York Central Railroad gateway at Detroit handled 5,260,000 tons of freight all of which effectively passed through St. Thomas. A study of train movements at St. Thomas during a 21 day period in 1928 showed an average daily movement of 36 trains in both directions. Of this number about 85 percent were scheduled trains and the remainder being extras.

---

[2] See Tennant, *Canada Southern Country for more detailed history.*

[3] Andreae, *Lines of County,* Plate 22; Tennant, *Canada Southern Country* p.92

he maximum daily number of movements during this time was 47 and the minimum was 29. The average maximum interval between east-bound trains was three hours and thirteen minutes. Between westbound trains, the time was two hours and fifteen minutes

The traffic for the Pere Marquette is not as clearly identified but suggests that in 1929 it carried 2,468,000 tons of freight.[4] Most of this would have passed through St. Thomas. Statistics for other bridge railways in southern Ontario are hard to compare because the Grand Trunk data are mixed in with its overall Ontario services.

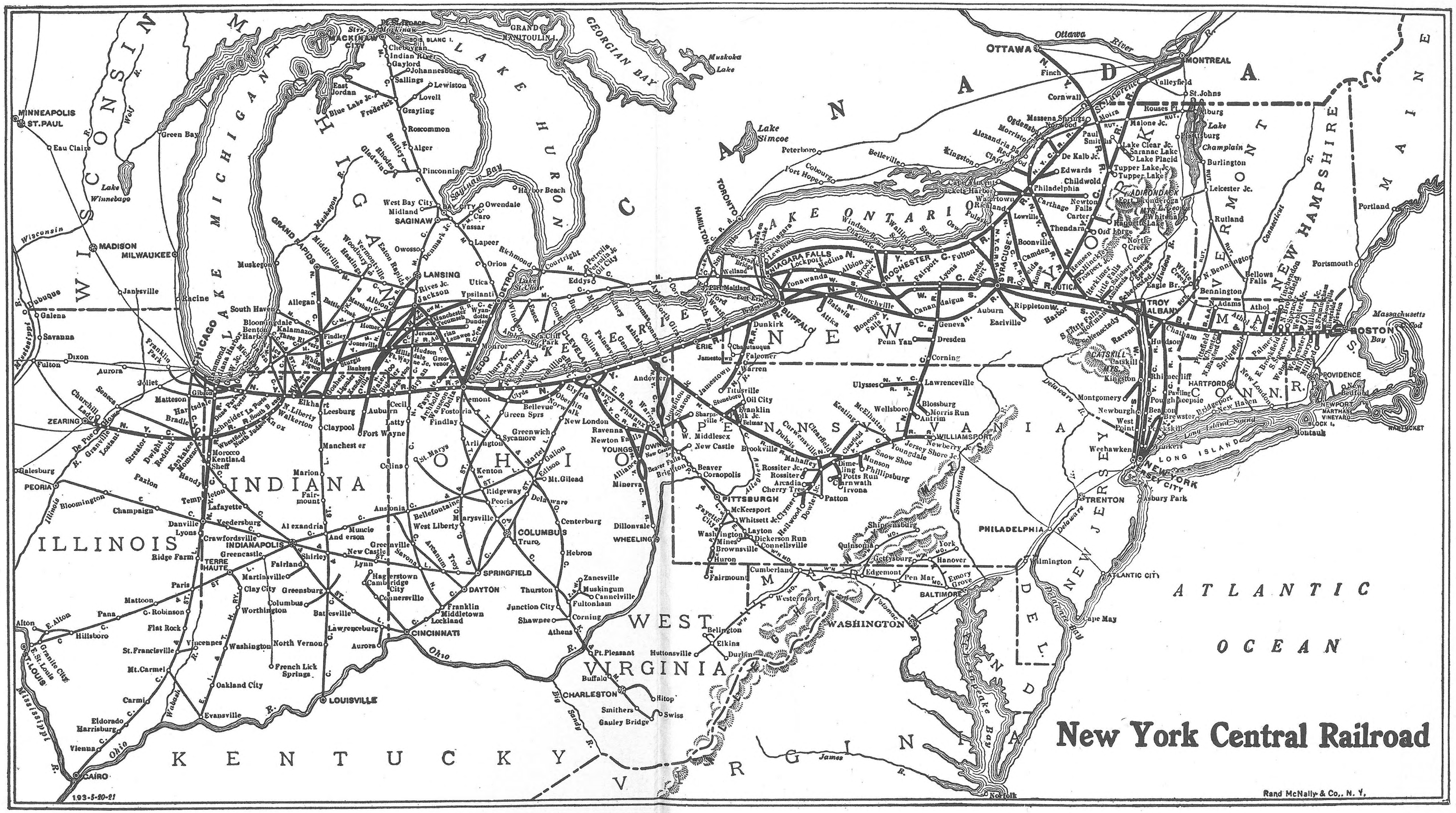
This level of traffic, and potential future growth, led to three characteristics that affected the design of the MCR Bridge. The route was double tracked at a very early date to handle the number of trains being operated. Second, the track structure, including bridges had to be continually improved to handle heavier trains. Third, the track had to remain available even while bridge replacements were undertaken. These requirements dictated the design and construction of the MCR Bridge at St. Thomas.

With the Great Depression, rail traffic decreased precipitously in the early 1930s. By 1934 traffic on the MCR had declined by about 40 percent to 3,210,000 tons and on the Pere Marquette it had fallen to 2,103,000 tons of freight.[5]

The irony of the MCR Bridge is that it was completed just as the Great Depression began. Traffic levels of the 1920s did not recover until the Second World War. During the war traffic was high but almost immediately after the war it began to fall again. During the 1950s and 1960s freight and passenger rail traffic continually transitioned to highways. By the end of the 1960s rail traffic was very light. In 1968 the New York Central Railroad went bankrupt and became part of Penn Central Railroad. In 1985 the Canada Division of Penn Central Railroad was sold the line jointly to the Canadian National and Canadian Pacific Railways. Over the following 20 years they gradually diminished the operations on this line until the line was abandoned and the track lifted.

[4] Wilgus, *Railway Interrelations of the United States and Canada* p.87, 101, 102, 112

[5] Wilgus, *Railway Interrelations of the United States and Canada* p.87, 101, 102, 112



Drawing file: 1211360066-R01003.dwg   Oct 30, 2012 – 2:55pm

REFERENCE

DRAWING BASED ON WYMOND, CHARLES E. "ATLAS OF RAILWAY TRAFFIC MAPS", LASALLE EXTENSION UNIVERSITY, CHICAGO, 1922.

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

ALL LOCATIONS ARE APPROXIMATE.

PROJECT

CULTURAL HERITAGE EVALUATION REPORT
MICHIGAN CENTRAL RAILROAD BRIDGE, KETTLE CREEK VALLEY
INTERSECTION OF FINGAL LINE AND SUNSET DRIVE
CITY OF ST. THOMAS, ELGIN COUNTY, ONTARIO

TITLE

NEW YORK CENTRAL MAP

Golder Associates LONDON, ONTARIO	PROJECT No.	12-1136-0066	FILE No.	1211360066-R01003
			SCALE AS SHOWN	REV.
	CADD	DCH	Oct. 30/12	
	CHECK			FIGURE 3

4.0 PREVIOUS BRIDGES

4.1 Canada Southern Railway Kettle Creek Bridge

The CSR single-track, timber-trestle over Kettle Creek at St. Thomas was completed in February, 1872. The trestle was made of framed timber, carried a single track, and was 28m (92 feet) high and 416 m (1,365 feet) long. It consisted of 14 Howe truss deck spans supported on timber bents. The longest span over Kettle Creek was 13.7 m (45 feet).[6] (Plates 2, 3)

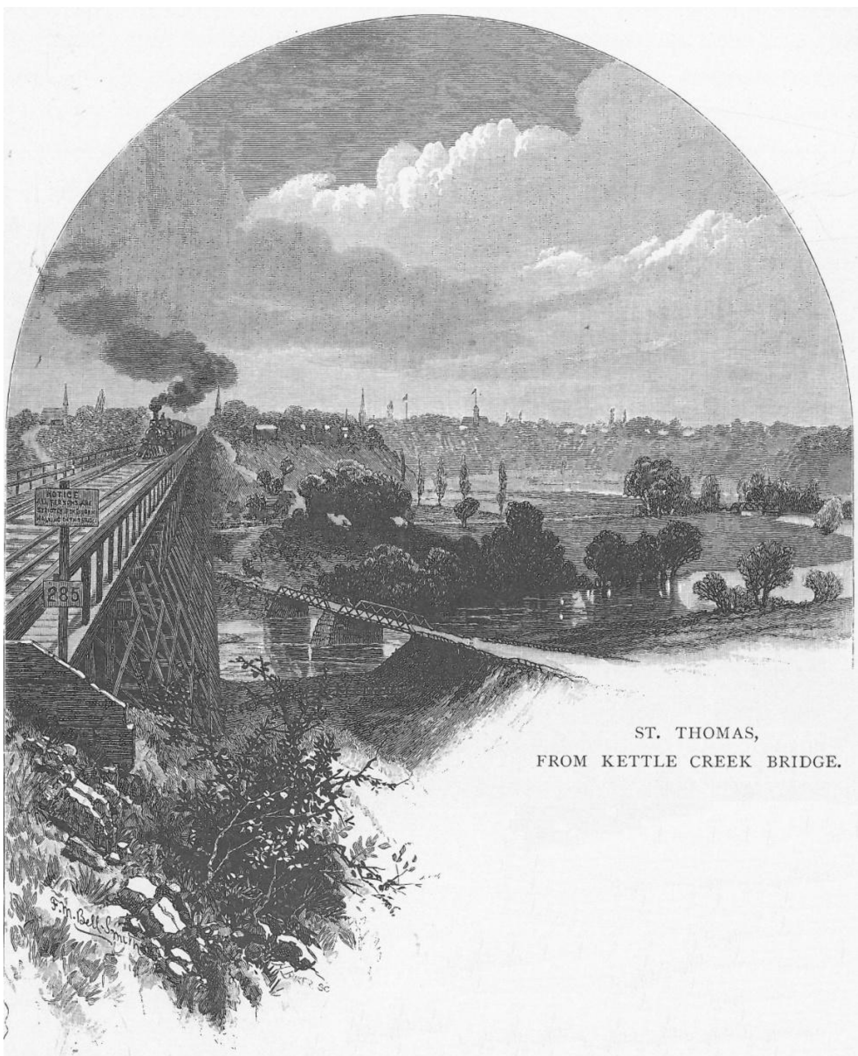


Plate 2: Canada Southern timber trestle St. Thomas. Source: Picturesque Canada

[6] *CRMW* 1930, p.617-619 “Rebuilding of Kettle Creek Viaduct”; Tennant, *Canada Southern Country* p.22

Plate 3: Canada Southern bridge under construction January 1872.

4.2 Michigan Central Railroad Kettle Creek Bridge

In 1883, the year after the CSR was leased to the MCR, the timber trestle was replaced with a double-tracked, metal structure 425 m (1,395 feet) long and 28.3m (93 feet) above the creek bed (Plate 4). The bridge deck was supported on metal trestle bents that formed towers 9.1 m (30 feet) long at their tops (in the direction of the rail). Between the towers was a clear span of 13.7 m (45 feet). The deck was constructed of plate girders which carried an unballasted track structure. The viaduct was the same length as the previous timber trestle. Although

the bridge was double-tracked, trains travelling in opposite directions were prohibited from meeting each other on the structure.[7]

Twenty years later, in 1902, the bridge was strengthened to accommodate the increasing weight of locomotives and trains (Plate 5). This strengthening was undertaken by adding a vertical column to the bents and additional girders to the deck. The open timber deck was also replaced with a ballasted deck. At the same time, the structure was shortened to 260.6 m (855 feet) by filling the ends of the viaduct with earth. The original towers were encased in concrete up to the level of the new fill.[8]

One article described the bridge as being constructed of wrought iron – this seems an unusual choice of material.[9] Steel was a stronger material and by 1883 had become cost competitive with wrought iron. During the 1870s railway companies started converting their iron rails to steel and using the material in bridge work. Possibly the article was loose in its use of terminology for wrought iron and steel.

Plate 4: Kettle Creek Bridge, 1889

[7] *CRMW* 1930, p.617-619 “Rebuilding of Kettle Creek Viaduct”; Tennant, *Canada Southern Country* p.96

[8] Tennant, *Canada Southern Country* p.96; St. Thomas Public Library. “Proposed New Double Track Railway Bridge at St. Thomas.”

[9] *CRMW* 1930, p.617-619 “Rebuilding of Kettle Creek Viaduct

Plate 5: MCR Bridge c. 1908 after strengthening Source: Elgin County Archives

5.0 MICHIGAN CENTRAL RAILROAD BRIDGE

5.1 Construction History

The design for a replacement structure over Kettle Creek was underway in 1928. The final plan (Figure 4) was selected to involved minimal disturbance to rail traffic during the rebuilding. The general contract for the work was awarded on April 25, 1929. The entire project cost $689,000 (at the time). The entire work, except for field painting and the hand railings was completed on January 3, 1930. The steel was fabricated by the Canadian Bridge Company in Walkerville, Ontario.[10]

As built, the structure consisted of 13 piers however, since the abutments were also counted as piers, the bridge was described as having 15 piers. The piers were constructed of concrete except for the centre one which was a steel-truss. The main, eight spans were of 22.9 m (75 feet) and provided a clear span of 18.3 m (60 feet) between the piers. The two piers at each end were shorter and less massive, being built on the slop of the earthworks. The main piers were approximately 27.4 m (90 feet) tall except for pier five which was located within Kettle Creek and was 33.2 m (109 feet).

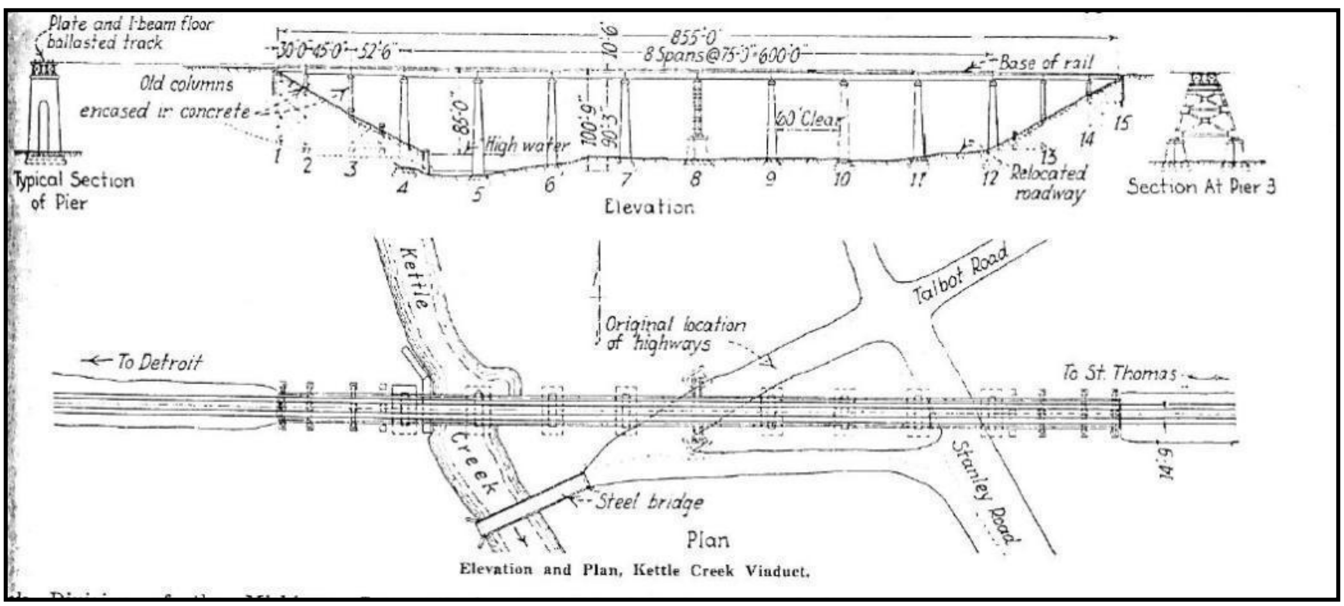
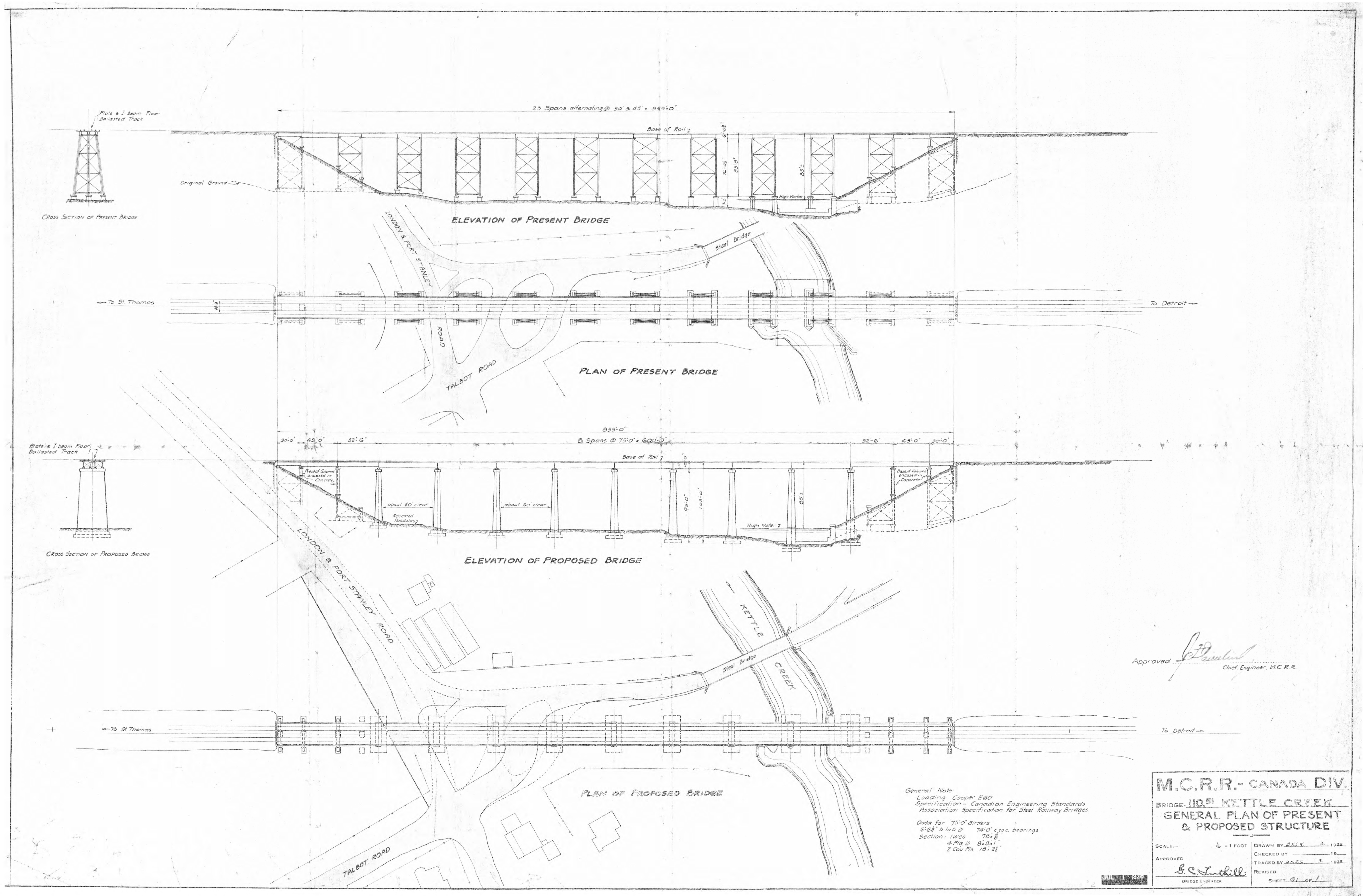


Plate 6: Plan and Elevation of bridge. Source Canadian Railway and Marine World

[10] *CRMW* 1930, p.617-619 "Rebuilding of Kettle Creek Viaduct



REFERENCE

DRAWING BASED ON M.C.R.R.-CANADA DIV., "BRIDGE 100.51 KETTLE CREEK GENERAL PLAN OF PRESENT & PROPOSED STRUCTURE", 1928, PROVIDED BY THE CITY OF ST. THOMAS.

NOTES

THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

ALL LOCATIONS ARE APPROXIMATE.

PROJECT

CULTURAL HERITAGE EVALUATION REPORT
MICHIGAN CENTRAL RAILROAD BRIDGE, KETTLE CREEK VALLEY
INTERSECTION OF FINGAL LINE AND SUNSET DRIVE
CITY OF ST. THOMAS, ELGIN COUNTY, ONTARIO

TITLE

PLAN OF BRIDGE

PROJECT No.	12-1136-0066	FILE No.	1211360066-R01004
		SCALE AS SHOWN	REV.
CADD	DCH	Oct. 30/12	
CHECK			

Golder Associates
LONDON, ONTARIO

FIGURE 4

5.2 Technical Considerations

5.2.1 Bridge Loading

There is some ambiguity about the designed loading for the bridge. A 1928 drawing states that it was designed for a Cooper‟s E-60 loading while an apparently later, undated but knowledgeable manuscript indicates it had an E-70 loading. The Cooper‟s classification was developed by a famous- American engineer, Theodore Cooper, in 1894 to provide a series of standard loadings in railway bridge design. The number was determined by a combination of locomotive axle weights and train weight. In 1910 an E-50 loading was most common; by the mid 1920s an E-60 was common with an E-70 used for heavy main lines. By 1960 an E-75 was the heaviest loading used.[11]

If the bridge was designed for an E-70 loading, this must have been in anticipation of continued growth in train sizes. If it was an E-60 bridge, it was following best practices for the era.

5.2.2 Concrete Piers

In rebuilding the bridge, a completely new structure was constructed except for three of the old bents at each bank head that were retained as supports for the new superstructure.

The eight main piers, numbered 4-7 and 9-12 from north to south, appear to have been built as monolithic concrete structures without reinforcement. The main challenge was in handling the volume of concrete involved in their construction. A concrete plant was constructed at track level at the east of the viaduct. Concrete was carried to the piers on a narrow gauge railway built onto the bridge attached to the horizontal struts below the deck of the old viaduct. About 80 percent of the concrete could be delivered without working from the active railway deck of the viaduct. The remainder was placed by dumping from the track level.[12]

The approach piers, numbered 2, 3 and 13, 14 are thinner than the main piers and located closer together. The novel aspect of these piers is that they incorporated part of the 1883 tower bents into the structure. One set of bents that made up the tower was encased in concrete. The second bent was cut down to grade and capped in concrete.[13]

The bridge abutments (piers 1 and 15) were also constructed in the same manner as the approach piers. The use of the steel towers in the abutments may account for the small size of the abutment structures.

[11] Johnson, *Modern Framed Structures,* p.245-246, Mallory, *Bridges and Trestle Handbook*, p.14; Simmons-Boardman. *Railway Engineering and Maintenance Cyclopaedia*, 11

[12] *CRMW* 1930, p.617-619 "Rebuilding of Kettle Creek Viaduct"

[13] *CRMW* 1930, p.617-619 "Rebuilding of Kettle Creek Viaduct."

5.2.3 Ballasted Deck

The new bridge, like the 1902 strengthened structure, was built with a ballasted deck. It was constructed of steel beams with a steel plate floor. A ballasted deck required proper drainage because the ballast was contained within a watertight trough formed by the floor and sides. In ordinary railway traffic, track ties are laid directly onto the steel framing of the bridge. Such open bridge decks are less costly to build than a ballasted deck. However, this design had disadvantages when built over streets or highways. Ballast, coal, water or other materials used in the movement of trains could fall between the ties onto highway traffic bellow.

With regard to the MCR Bridge, the main advantage of a ballasted deck was that it provided a better riding track. This was an important factor when frequent, heavy trains were operated. A ballasted deck reproduced as nearly as possible track conditions of the adjoining ballasted roadbed. The ballasted deck did not create an abrupt change in the rigidity of support between the structure and the embankment approaches. With regard to maintenance, ballasted track on a bridge would be inspected by trackmen who patrolled track more frequently than bridge maintenance forces inspected bridges. Although construction of a ballasted deck was more expensive than an open deck, typically, the overall maintenance costs for ballasted deck bridges were less.[14]

5.2.4 Highway Bent

Highway 4 and Fingal Line are old routes that pre-date the construction of the 1872 CSR bridge. Fingal Line was originally Talbot Road and was the major entrance into St. Thomas. The new railway bridge was built across the valley without regard to the location of the roads. As a result they had to be realigned to fit between the trestle bents. The same situation occurred when the 1883 bridge was completed. However, by the time the existing bridge was being designed in 1928, the nature of road usage had changed. Faster, more frequent automobiles required better alignments and visibility than had horse traffic.

Initially, the MCR engineers followed the practice of the previous road alignments and place the piers without regard to road safety. However, the City of St. Thomas objected and, apparently with the involvement of the province, compelled the company to provide a straight, unobstructed alignment for Talbot Road. This was done by replacing the proposed concrete pier with a structural steel bent that spanned the highway and provided a 6.4 m (21 foot) clearance over the roadway. To create a 12.2 m (40 foot) wide road allowance the posts of this bent were battered.[15]

---

[14] Simmons-Boardman. *Railway Engineering,* p.675-678

[15] *CRMW* 1930, p.617-619 "Rebuilding of Kettle Creek Viaduct"

5.2.5 Deck Girders

The deck spans used in the MCR Bridge were relatively short by 20th century standards. The eight main spans were 22.9 m (75 feet) long center-to-center of the piers and produced a clear span of 18.3 m (60 feet) between the piers At each end, where the earthworks sloped into the valley, the approach spans were 16 m (52.5 feet), 13.7 m (45 feet), and 9.1 m (30 feet), respectively.[16]

The spacing of the piers, and hence the length of the bridge girders, was dictated by the need to keep the existing trestle in operation while the new structure was under construction. The steel towers of the 1883 bridge had to remain in place throughout construction of the new trestle so that at least one track was open to traffic throughout the construction of the new bridge.

By way of comparison, the 234.7 m (770 foot), 1905, double-track Grand Trunk bridge over the Grand River at Paris, consisted of five spans; one a 38.2 m (126 feet), two at 44.2 m (145 feet) and two at 45.7 m (150 feet) (Plate 22).

Each single-track span was erected near the end of the viaduct, riveted and waterproofed. The entire span, weighing 96 tons, was then carried to the structure by a special erection crane and lowered into position on the piers (Plate 7). The erection of the eastbound track superstructure commenced on September 16, 1929, and was completed on October 30. For the westbound track erection started on November 4 and was completed on November 29.[17]

Plate 7: Bridge under construction, 1929 showing the steel towers between the concrete abutments

[16] *CRMW* 1930, p.617-619 "Rebuilding of Kettle Creek Viaduct"
[17] *CRMW* 1930, p.617-619 "Rebuilding of Kettle Creek Viaduct"

5.2.6 Kettle Creek Retaining Wall

In addition to reusing some of the tower bents in the piers, the engineers also incorporated a stone pier of the 1883 bridge into a retaining wall to protect Pier 4 on the west end. This had originally been a footing for one of the tower bents for the earlier bridge.

6.0 INVENTORY OF EXISTING BRIDGE

6.1 Concrete Piers

The size of the concrete piers was optimized in the design by giving them a slight taper toward the top and by casting the first two thirds of each pier as separate columns. In addition, horizontal chamfered lines were cast into the face of the piers to visually break the scale of the flat surfaces. (Plate 9) The footings of the piers are located below grade. Pier 5 is located in the flood channel of Kettle Creek and is the tallest of the eight piers. The profile and height of the two columns is the same as the others but they site on a monolithic base that starts at the elevation of the flood height of the creek (Plate 10).

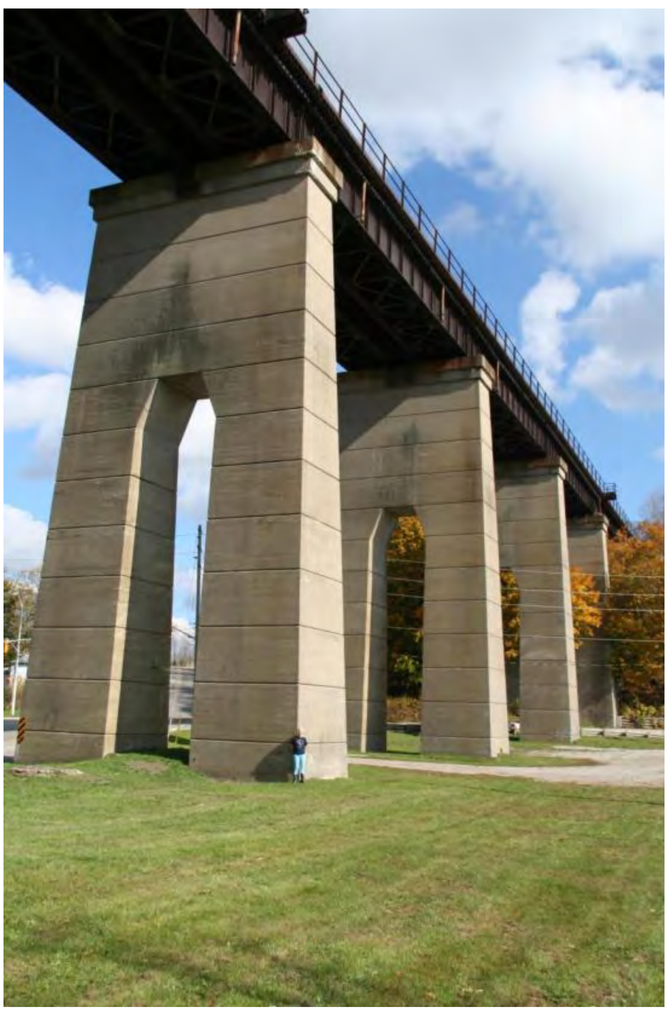


Plate 8: Piers 9 (foreground) to12, looking east

Plate 9: Piers 4 and 5 (foreground) in Kettle Creek, looking west

6.2 Abutments

The bridge abutments appear to be smaller than one would expect for the loading on this bridge. There are effectively no wing walls to the structure (Plate 10). This design may be due to the additional strength that was provided by the steel framing of the earlier trestle that has since been embedded in the concrete.

Plate 10: Abutment, pier 15 east end

6.3 Highway Truss

The riveted, lattice steel bent is support on two low concrete pedestals (Plate 11). The pedestals are aligned to be parallel to the road rather than the bridge alignment.

Plate 11: Pier 8, looking east along Fingal Line to the intersection with Highway 4

6.4 Deck Girders

Due to the short spans between the piers, the deck beams are not especially deep. In Plate 12 the 22.9 m (75 foot) main beam span is on the right. The shallow beam is an approach span of 16 m (52.5 feet). A drain spout from the ballast deck is vertically attached to the main beam.

Plate 12: Transition between shallow end span and deeper main span

6.5 Deck

The bridge deck is very wide due to the former double-track right-of-way (Plate 13). The stone track ballast is still in place. The steel beams and drain for the ballasted deck are visible in Plate 12. Each track was carried on separate spans and the division can be seen in a line of light-grey ballast in Plate 13. An expansion joint is visible in the foreground of the deck as a faint horizontal line. In addition to the railings on either side of the bridge, safety refuges were built on to the sides of the deck.

Plate 13: Looking west from east abutment over double track deck

6.6 Former Bridges

Several components of the 1873/1883 bridge were either incorporated into the new structure or abandoned in place. The stone pier of an earlier tower span is being used as retaining wall on the west bank of Kettle Creek (Plate 14). The remnants of former steel bents from the earlier bridge can be seen in the approach earthworks (Plate 15) and on the valley floor (Plate 16). In addition, the earthworks and the two highway underpasses at the east end also date from the earlier bridges (Plates 17-19).

Plate 14 Stone pier from 1880s bridge on west bank of Kettle Creek

Plate 15: Possible remnant of 1883/1902 tower bent between piers 12 and 13.

Plate 16: Possible footings of 1883/1902 tower bends

6.7 Approach Earthworks

The earthworks of the earlier bridges were not modified during construction of the new bridge. Although visually invisible due to vegetation on their slopes, they are immense bridge components in their own right. Plate 7 does not show any trees on the slopes. The tree cover on the steep slopes appears to be relatively recent compared to the bridge age.

The most interesting earthworks are located on the east, St. Thomas, side of the valley where the embankment continues into St. Thomas almost to Stanley Street. The original valley wall appears to have started just west of Pleasant Street and the most extensive earthwork extends into the valley (Plate 17). East of Pleasant Street the slope of the table land is more gradual. In order to maintain the City"s street circulation system, road underpasses were built into the embankment at Pleasant and King Streets (Plates 18, 19). The style of the stonework in the abutments is suggestive of late 19th century construction

The history of this embankment was not determined. The official record is that the filling occurred in 1902. However, prior to that, the filling of the east end must have occurred in order to remove a steep grade for trains coming into the station. It is possible that the east end could have originally been part of the CSR timber trestle.

Plate 17: Earthworks at east end showing Piers 13 and 14

Plate 18: Pleasant Road underpass with stone abutments and wing walls

Plate 19: King Street Underpass with stone abutments

6.8 Landscape

The MCR Bridge is a component of a transportation landscape where road and rail meet in the Kettle Creek valley. The setting is dominated by the vast railway piers that reach up to the crest of the valley. The relatively shallow beams of the bridge deck are relatively insignificant. The valley walls create a clear termination of the railway bridge. At the level of the deck, the bridge blends into the flat table lands to the west (Plate 13). From the north and south the bridge is visible for some distance.

Although the Kettle Creek valley is deep and wide, the creek itself is not as prominent today as it was formerly. The lack of vegetation and visibility of the Talbot Road bridge trusses over the creek formerly drew attention to the creek. Indeed, many historic views of the railway bridge taken from the Talbot Road all show the creek (Figures 2, 4, 5).

Whereas the rail line ran straight cross the valley, Highway 4 and Talbot Road/Fingal Line follow the contours of the valley and pass under the bride. The railway bridge is unusually visible in the valley because of the good access provided by the two highways. The view from the roads defines the way people perceive the MCR Bridge (Plate 20).

Plate 20: Looking east along Fingal Line

7.0 CULTURAL HERITAGE VALUE OF BRIDGE

7.1 Analysis

The engineering design of the MCR Bridge followed standard practice of the early 20th century. The use of materials, approach to structural design, and method of erection did not require novel solutions. The overall design consideration had been to build a structure that could handle the present and future volume and weight of railway traffic passing through St. Thomas. However, the local site conditions created design solutions that make the bridge distinctive. The short spans of the deck girders were dictated by the need to keep the earlier bridge in service during construction. The rising use of motor vehicle traffic required that better highway sightlines had to be built into one of the bridge piers. The significance of the three bridges built at this location has been commemorated with a plaque erected in 2000 by the Canadian Society for Civil Engineering.

The setting of the bridge within the Kettle Creek valley has created a very pronounced railway landscape that has been enhanced by its public accessibility. The alignment of Highway 4, and to a lesser extent Fingal Line, provides varied views and vistas of the structure and brings the public directly to the base of the bridge.

The following heritage attributes of the bridge contribute to its cultural heritage value:

- double track;
- short spans of the bridge deck;
- eight massive concrete piers;
- lattice steel highway bent;
- four small concrete approach piers;
- Fingal Road alignment;
- approach earthworks and road underpasses; and
- the stone retaining wall in Kettle Creek

There are other large railway bridges in southern Ontario. The 1905, double-track Canadian National (former Grand Trunk) bridge over the Grand River at Paris is perhaps the best comparable bridge to the St. Thomas structure. At 234.7 m (770 foot) long and 29.3 m (96 feet) high over the river, it has similar overall dimensions to the MCR Bridge. Like the MCR Bridge, the Grand Trunk structure was also built using engineering best practice of the time. The Grand Trunk bridge has only five spans and the piers are not prominent visual components of the structure. The deep, lattice deck trusses are the dominant feature of the bridge.

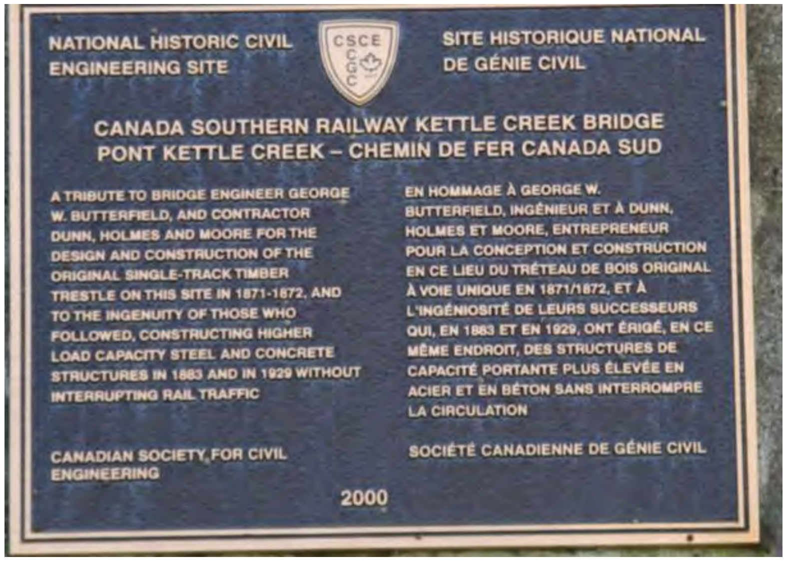


Plate 21: Commemorative Plaque for MCR Bridge

Plate 22: Canadian National Paris Bridge over the Grand River, 2012. Source: Meaghan Rivard

The criteria used to determine cultural heritage value or interest a property is contained in the *Ontario Heritage Act* O.Reg. 9/06.

Table 1: Evaluation of Cultural Heritage Value/Interest for MCR Bridge

O.Reg. 9/06 Criteria		Site Specific Evaluation
The property has *design value* or *physical value* because it:		
i)	Is a rare, unique, representative or early example of a style, type, expression, material or construction method;	Massive concrete piers dictated by site conditions; use of steel bent over road a novel solution to addressing local highway traffic flow
ii)	Displays a high degree of craftsmanship or artistic merit; or	Concrete in good condition; shadow lines cast into face of piers to provide visual pattern
iii)	Demonstrates a high degree of technical or scientific achievement.	Not applicable
The property has *historic value* or *associative value* because it:		
i)	Has direct associations with a theme, event, belief, person, activity, organization, or institution that is significant to a community;	Heavily-trafficked rail line due to bridge traffic across Ontario; St. Thomas was a major railway town
ii)	*Yields, or has the potential to yield information that contributes to an understanding of a community or culture; or*	Archaeology has potential to determine if wrought iron used in previous bridge; determine fill history of earlier bridges.
iii)	*Demonstrates or reflects the work or ideas of an architect, artist, builder, designer, or theorist who is significant to a community.*	Not applicable
The property has *contextual value* because it:		
i)	*Is important in defining, maintaining or supporting the character of an area;*	Location within Kettle Creek valley;
ii)	*Is physically, functionally, visually or historically linked to its surroundings; or*	Fingal Line and Highway 4 road alignment make the bridge highly visible
iii)	*Is a landmark.*	Piers are landmarks

7.2 Statement of Cultural Heritage Value

The MCR Bridge has cultural heritage value because of its association with the history of St. Thomas and the broader theme of the economic history of railways in Ontario. More specifically, it is a prominent landmark to the former importance of the railway industry to St. Thomas. Along with the former CSR station and the MCR shop building it is a key component of the city‟s railway heritage. In addition, the massive structure of the bridge is indicative of the large volume of traffic that the railway once carried and, by extension, of the economic importance of railways in the early 20th century. At the same time, the design built into the bridge to accomodate a new road alignment is indicative of the growing importance of motor vehicle traffic in the early 20th century. Finally, its location with the broad Kettle Creek valley creates a distinct and highly visible cultural landscape.

8.0 PROPOSED UNDERTAKING

At the time of preparing this HIA, a future use of the former railway bridge had not been determined. However, since all track of the former MCR has been removed, the City of St. Thomas anticipates that a future use of the bridge will likely involve the establishment of a multi use trail as an extension to the Trans Canada Trail.

This HIA has determined that a multi-use trail option would be compatible with and sympathetic to the historic significance of the bridge. The wide bridge deck of the former double-track rail line will permit a variety of reuse options. It is anticipated that some changes would have to be made to the deck in order to provide adequate public safety.

Any future reuse of the bridge should take into account the conservation approached contained in the federal *Standards and Guidelines for the Conservation of Historic Places in Canada.*

Copies of this HIA should be deposited with the:

St. Thomas Public Library

Elgin County Railway Museum

Elgin County Archives

GOLDER ASSOCIATES LTD.

ORIGINAL SIGNED

Christopher Andreae, Ph.D.
Associate, Senior Built Heritage Specialist

ORIGINAL SIGNED

Storer J. Boone, Ph.D., P.Eng.
Associate, Senior Geotechnical Engineer

CA/SJB/slc

n:\active\2012\1136 - arch\12-1136-0066 bm ross-cher michigan rail trestle-st. thomas\rpts\1211360066-r01\1211360066-r01 oct 30 12 bm ross hia michigan central trestle st thomas.docx

9.0 SOURCES

9.1 Published

Andreae, Christopher. *Lines of County; An Atlas of Railway and Waterway History in Canada.* Toronto: Stoddard, 1997.

Canadian Railway and Marine World October 1930, p.617-619 "Rebuilding of Kettle Creek Viaduct, Michigan Central Railroad," by J.E. Bebb and L.B. Alexander, Assistant Bridge Engineers, Michigan Central Railroad.

Chapman, L.J. and D.F. Putnam. *The Physiography of Southern Ontario*. Toronto: University of Toronto Press, 1966. (2nd Edition)

Johnson J.B., C.W. Bryan, and F.E. Turneaure, Theory *and Practice of Modern Framed Structures.* New York: John Wiley, 1926 (vol. 1, 10th ed.)

Mallery, Paul. *Bridge and Trestle Handbook* Boynton and Associates, Clifton Virginia, 1976

Simmons-Boardman Publishing Corporation. *Railway Engineering and Maintenance Cyclopaedia* Chicago, 1948, 7th Edition.

Tennant, Robert D. Jr. *Canada Southern Country.* Erin, Ontario: Boston Mills Press, 1991

Wilgus, William J. *The Railway Interrelations of the United States and Canada* New York: Russell and Russell, 1937 (reprint 1970)

9.2 Archival

City of St. Thomas, Environmental Services. "M.C.C.R.R. – Canada Division Bridge 110.51 Kettle Creek. "General Plan of Present and Proposed Structure" 1/50 inch=1 foot, July, 1928.

St. Thomas Public Library. "Proposed New Double Track Railway Bridge at St. Thomas for Michigan Central Railway" n.d.; Local History Collection.

10.0 APPENDIX – BRIDGE PLAN SEARCH

The City of St. Thomas contract requested a search for engineering as-built drawings of the MCR Trestle. As described in the following summary, only one technical drawing was located.

The City of St. Thomas, Environmental Services was able to locate one drawing: "M.C.C.R.R. – Canada Division. Bridge 110.51 Kettle Creek. "General Plan of Present and Proposed Structure" 1/50 inch=1 foot, July, 1928. This plan is reproduced in this report as Figure 4.

The most likely source of drawings would have been the Canadian Transportation Agency, known as the Board of Railway Commissioners in the 1920s. The Board had to approve all bridge plans prepared by railway companies and required that drawings be submitted. Gillian Prot, Analyst, Dispute Resolution Branch Office Canadian Transportation Agency in Gatineau was contacted. She searched the deposit files but no plans were located. Curiously plans for the adjacent Lake Erie and Detroit River Railway bridge at St. Thomas were on file.

The Bridges and Building Department of Canadian National Railways was contacted. As of the completion of this report, no information has been received back.

The following repositories in St. Thomas were also contacted but did not have plans:

Elgin County Railway Museum

Elgin County Archives

St. Thomas Public Library:

At Golder Associates we strive to be the most respected global company providing consulting, design, and construction services in earth, environment, and related areas of energy. Employee owned since our formation in 1960, our focus, unique culture and operating environment offer opportunities and the freedom to excel, which attracts the leading specialists in our fields. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees who operate from offices located throughout Africa, Asia, Australasia, Europe, North America, and South America.

Africa	+ 27 11 254 4800
Asia	+ 86 21 6258 5522
Australasia	+ 61 3 8862 3500
Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
South America	+ 55 21 3095 9500

solutions@golder.com
www.golder.com

Golder Associates Ltd.
309 Exeter Road, Unit #1
London, Ontario, N6L 1C1
Canada
T: +1 (519) 652 0099

Golder Associates