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# 1.0 Executive Summary

## Key River Bridge (Site 44-04) Highway 69

Highway 69 within the limits of this study area is a rural arterial undivided, two-lane, north-south King's Highway with a design speed of 110 km/h and a posted speed of 90 km/h. It connects Sudbury to Parry Sound. This preliminary design project includes the replacement of the Key River Bridge and highway work associated with the structure replacement.

The year 2003 AADT is 6,400 vehicles with a DHV of 770 vehicles and a PHV of 820 vehicles and 17.1% commercial traffic.

This preliminary design for the replacement of the Key River Bridge recommends the improvement plan illustrated on drawings that are contained at the end of the body of this report. The features of this improvement plan are listed below:

### Detour:

1. Provide a detour located on the west side of the existing highway. The design speed of the geometric elements of the detour is 110 km/h. The posted speed through the construction area may be reduced during construction. This issue will be reviewed further during detail design.
2. Install a three-span Temporary Modular Bridge (TMB) that is skewed to the existing highway alignment, with a minimum clearance between the existing structure and the detour structure of approximately 3.0 m. The length of the TMB is 70.1 m. The width of the deck is 9.14 m to provide two 3.75 m wide lanes on the structure.
3. Construct embankments on the detour alignment using rock fill. The rock fill within Key River will be removed when the detour is removed.
4. Provide a detour cross section that consists of the following:  
Pavement width: 7.5 m (2 lanes at 3.75 m)  
Shoulder width: 2.5 m (fully paved)  
Shoulder rounding: 1.0 m
5. Provide full illumination on the detour and on the TMB.

### New Construction:

6. Maintain the existing horizontal alignment.
7. Provide pavement widening through the horizontal curve south of the structure to accommodate the design vehicle WB 17.5.

8. Improve the existing vertical alignment by replacing the deficient sag curve (K=40) south of the structure with a new sag curve (K=50 for 110 km/h design speed). Raise the grade at the south and north ends of the structure by approximately 1.0 m and 0.8 m respectively, to provide positive drainage and navigational clearance beneath the new structure.
9. Construct the new horizontal and vertical alignment on a new platform consisting of two 3.75 m wide lanes with 3.0 m full paved shoulders and 1.0 m roundings.
10. Re-instate the southbound passing lane on the new alignment when the detour is removed.
11. Arrange for the relocation of the Bell Canada/Hydro One pole line that involves approximately seven poles on the west side of the highway.
12. Obtain temporary limited interest property on the west side of the highway. This property is required for the construction of the detour alignment, detour bridge and detour approach embankments.
13. Cut back the existing rock cut between stations 21+750 and 21+825 RT to meet clear zone standards for the new highway alignment.
14. Replace the existing structure with a three-span slab-on-steel girder bridge. The new structure width is 14.64 m and consists of two 3.75 m lanes, two 3.0 m wide shoulders and two PL-3 barriers.

This project is being carried out in accordance with the Class Environmental Assessment for Provincial Transportation Facilities (2000) as a Group "B" undertaking. A Transportation Environmental Study Report (TESR) will be prepared during detail design and filed with the Ministry of Environment prior to construction.

The estimated cost to replace the Key River Bridge and construct the recommended roadway improvements for this section of Highway 69 is approximately \$4.2 Million.

Construction duration is expected to be 2 seasons. The anticipated schedule for the work is as follows:

- |          |   |
|----------|---|
| Season 1 | Construct detour embankments and the piers for the TMB. The embankments will be surcharged for a period of approximately 6 months.  |
| Season 2 | Erect TMB in spring and move traffic to the detour. Remove existing structure in late spring. Commence construction of new bridge after removal of existing and complete in the fall. Removal of TMB and detour will take place during late fall. |

## 2.0 Introduction

Highway 69 within the limits of this study area is a rural arterial undivided, two-lane, north-south King's Highway that connects Sudbury to Parry Sound. The highway runs through relatively level to rolling terrain and lies within the Henvey Inlet Indian Reserve No. 2 (south of Key River) and an unorganized Township (north of Key River), within the District of Parry Sound. The study area limits are from station 21+475 to 22+560 (i.e., from 580 m south of the structure to 450 m north of the structure).

The posted speed is 90 km/h. The design speed is 110 km/h. Highway 69 is part of the Trans Canada Highway and serves commercial traffic and seasonal tourists and travellers from Sudbury to Parry Sound and beyond. Commercial vehicle traffic is approximately 17.1% of the AADT (6400 vpd in 2003).

The Ministry of Transportation intends to replace the Key River Bridge due to the extensive deterioration of the structure. The Key River Bridge, Site 44-04, carries Highway 69 over Key River, which is located about 2.4 km south of Secondary Highway 522. The structure was originally constructed in 1951 as an eight-span steel stringer and concrete deck bridge, founded on timber pile bents. The total length of the structure is 48 m with each span being 6.0 m long. The roadway width is 13.4 m and the overall structure width is 14.4 m.

## 3.0 Location

This project is located on Highway 69 between Sudbury and Parry Sound. The Key River Bridge is located on Highway 69, approximately 2.4 km south of Secondary Highway 522. The project location is illustrated on Figure 3.1. The project is identified as GWP 87-86-00.

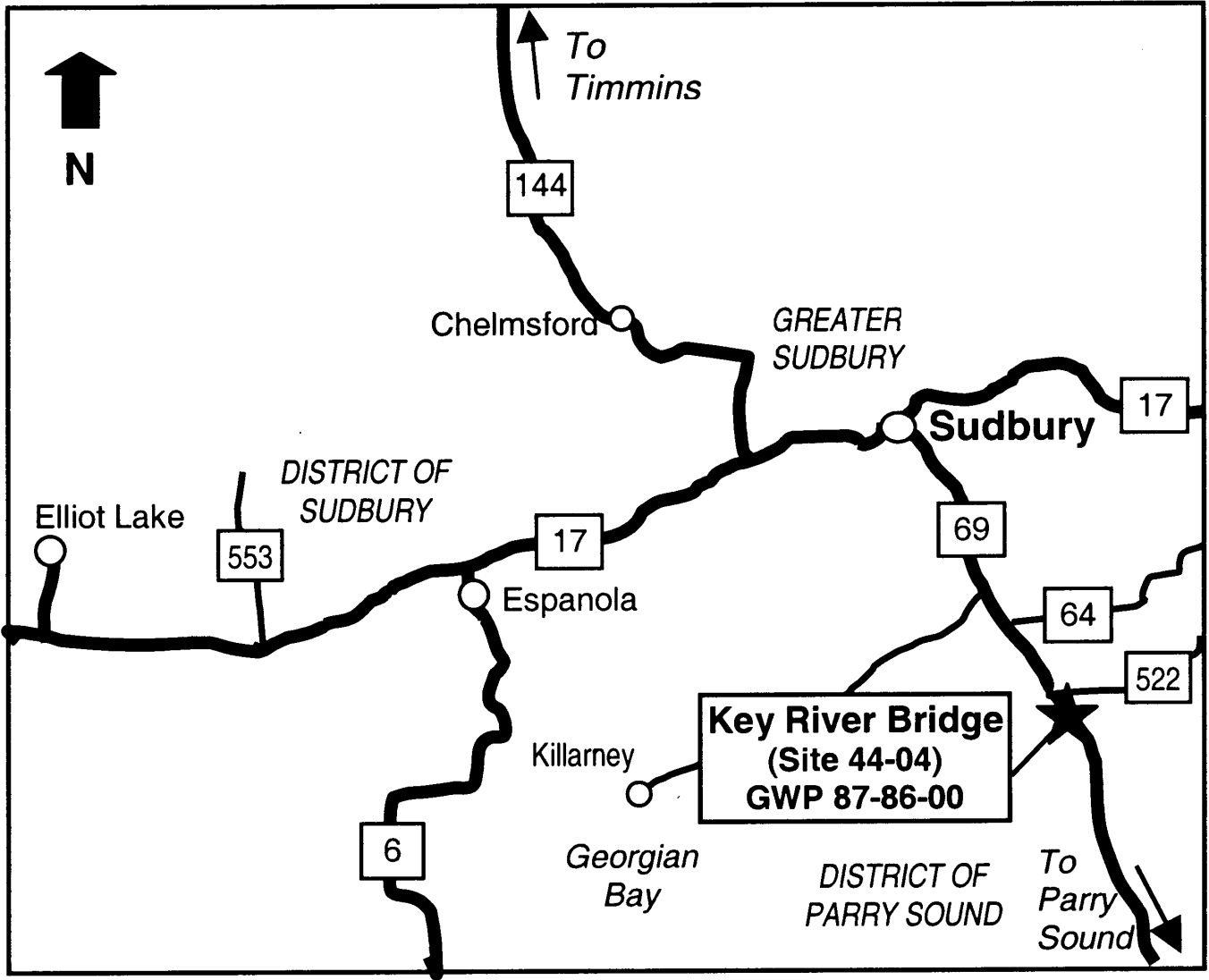


FIGURE 3.1: LOCATION PLAN

## 4.0 Existing Conditions

### 4.1 HORIZONTAL ALIGNMENT

The horizontal geometric features of this section of Highway 69 were reviewed to identify recommendations for individual curves that are below the standard for a design speed of 110 km/h. In this section of Highway 69 there is one horizontal curve; its radius exceeds the minimum standard for a design speed of 110 km/h. However, this horizontal curve does not have spiral transition curves. This curve (PI Station 21+777.978) requires spirals with A=220, to meet the requirements for a design speed of 110 km/h.

The horizontal curve is listed in Table 4.1 below. Information on the design standard spiral transition curve is also provided.

| TABLE 4.1: SUMMARY OF HORIZONTAL CURVE ON HIGHWAY 69 |            |            |                     |            |                                |   |
|--|------------|------------|---------------------|------------|--------------------------------|---|
| Curve No.  | PI Station | Radius (m) | Design Speed (km/h) | Spiral (m) | Design Speed for Spiral (km/h) | Spiral Required for 110 km/h Design Speed |
| 1  | 21+777.978 | 598.757    | 115                 | none       | n/a                            | A=220                                     |

### 4.2 VERTICAL ALIGNMENT

There are five vertical curves within the project limits, three crest and two sag curves, as summarized in Table 4.2.

| TABLE 4.2: SUMMARY OF VERTICAL CURVES ON HIGHWAY 69 |                         |            |     |         |                                |
|---|-------------------------|------------|-----|---------|--------------------------------|
| Curve No.   | Approximate VPI Station | Curve Type |     | K Value | Equivalent Design Speed (km/h) |
|   |                         | Crest      | Sag |         |                                |
| 1   | 21+116                  | ✓          |     | 100     | 113                            |
| 2   | 21+644                  | ✓          |     | 100     | 113                            |
| 3   | 21+924                  |            | ✓   | 40      | 90                             |
| 4   | 22+258                  | ✓          |     | 100     | 113                            |
| 5   | 22+480                  |            | ✓   | 80      | 140                            |

For a 110 km/h highway design speed, the required vertical crest curve K value is 90 and the required vertical sag curve K value is 50.

All three vertical crest curves meet the minimum design standard for a design speed of 110 km/h.

One of the vertical sag curves meets the design standard for a design speed of 110 km/h. One vertical sag curve is substandard for a design speed of 110 km/h:

- sag curve at VPI Station 21+924 meets the requirement for a 90 km/h design speed

### 4.3 CROSS SECTION

The highway has the following existing cross-section as illustrated in Figure 4.1:

- Pavement width: 7.3 m (between Sta 21+100 to 21+950 there is an additional 3.5 m wide southbound passing lane)
- Shoulder width: 3.0 m granular (fully paved northbound Sta 21+965 to Sta 22+210 and Sta 22+890 to 22+980 and southbound Sta 21+600 to 22+400)
- Shoulder rounding: 1.0 m
- Existing R.O.W. width: 46 – 60 m

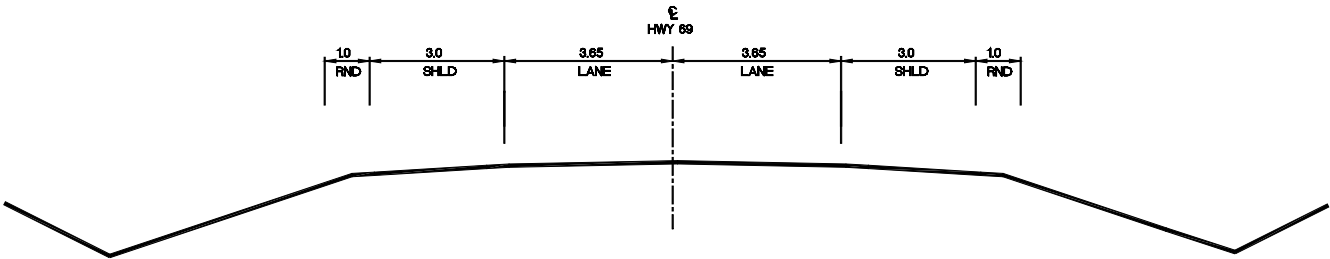


FIGURE 4.1: TYPICAL EXISTING CROSS SECTION

The existing roadway crossfall and superelevation are summarized in Table 4.3.

| TABLE 4.3: EXISTING ROADWAY CROSSFALL AND SUPERELEVATION |           |       |                             |
|--|-----------|-------|-----------------------------|
| Station  | Crossfall |       | Horizontal Alignment        |
|  | Left      | Right |                             |
| 21+100   | -2.1%     | -1.7% | Tangent                     |
| 21+200   | -2.1%     | -1.7% | Tangent                     |
| 21+300   | -2.3%     | -2.2% | Tangent                     |
| 21+400   | -2.3%     | -2.6% | Tangent                     |
| 21+500   | -2.3%     | -1.1% | Tangent                     |
| 21+600   | -6.6%     | +4.4% | 598.757 m radius curve left |

EXISTING CONDITIONS

| TABLE 4.3: EXISTING ROADWAY CROSSFALL AND SUPERELEVATION |           |       |                      |
|--|-----------|-------|----------------------|
| Station  | Crossfall |       | Horizontal Alignment |
|  | Left      | Right |                      |
| 21+700   | -6.1%     | +6.6% |                      |
| 21+800   | -6.2%     | +6.3% |                      |
| 21+900   | -6.2%     | +6.6% |                      |
| 22+000   | -2.7%     | -0.9% |                      |
| 22+200   | -3.0%     | -3.5% |                      |
| 22+300   | -2.8%     | -0.9% | Tangent              |
| 22+400   | -3.0%     | -1.7% | Tangent              |
| 22+500   | -2.2%     | -2.5% | Tangent              |
| 22+600   | -2.6%     | -1.3% | Tangent              |
| 22+700   | -4.3%     | -1.8% | Tangent              |
| 22+800   | -2.7%     | -1.9% | Tangent              |
| 22+900   | -2.2%     | -2.1% | Tangent              |
| 23+000   | -3.0%     | -1.7% | Tangent              |
| 23+100   | -2.8%     | -1.8% | Tangent              |

4.4 CLEAR ZONE ROCK CUTS

There are two rock outcrop (steeply sloping rock face) locations adjacent to Highway 69 within the study area. These locations range in average height from 2.0 m to 4.0 m and are offset from 6.7 m to 7.4 m from the existing edge of pavement. The rock cut (outcrop) locations are listed below in Table 4.4 in the order of chainage.

The recommended clear zone width to rock cuts on tangent highway sections is 9.0 m from the edge of pavement of the travelled lane for a design speed of 110 km/h. Total clear zone width for horizontal curves is obtained by multiplying this distance by the appropriate curve correlation factor. Rock cuts that are within the clear zone are noted in the table in ***bold and italics***.

| Table 4.4: Summary of Existing Rock Cuts |            |                    |   |   |   |
|--|------------|--------------------|---|---|---|
| Station to Station                       | Length (m) | Average Height (m) | Offset from Existing Highway Centreline (m) | Offset from Existing Edge of Pavement (m) | Required Clear Zone Width (from edge of pavement) (m) |
| 21+758 to 21+906                         | 148        | 4.0                | <b><i>8.9 right</i></b>                     | <b><i>6.7 right</i></b>                   | 12.3<br>(horizontal curve R=598 m)                    |
| 22+365 to 22+423                         | 58         | 2.0                | <b><i>7.5 left</i></b>                      | <b><i>7.4 left</i></b>                    | 9.0   |

4.5 GUIDE RAIL

There is 468 m of existing 3-cable guide rail and 301 m of existing steel beam guide rail within the study area. The guide rail locations and conditions are listed below in the order of chainage.

| TABLE 4.5 SUMMARY OF EXISTING GUIDE RAIL |            |            |               |           |                            |
|--|------------|------------|---------------|-----------|----------------------------|
| Station                                  | Length (m) | Type       | Terminal End  | Condition | Offset from Highway CL (m) |
| 21+301 to 21+455                         | 154        | 3 Cable    | Anchor        | Good      | 9.3 Left                   |
| 21+921 to 22+015                         | 94         | 3 Cable    | Anchor        | Good      | 7.1 Left                   |
| 21+980 to 22+138                         | 118        | Steel Beam | Loader/Bridge | Good      | 7.3 Right                  |
| 22+010 to 22+193                         | 183        | Steel Beam | Loader/Bridge | Good      | 6.2 Left                   |
| 22+188 to 22+308                         | 120        | 3 Cable    | Anchor        | Good      | 6.4 Left                   |
| 22+895 to 22+995                         | 100        | 3 Cable    | Anchor        | Good      | 6.2 Left                   |

4.6 SIDE ROADS AND ENTRANCES

There are no side road intersections within the study areas. All private entrances and commercial entrances are listed in Table 4.6. Visibility criteria for commercial and private entrances are based on the requirements contained in the *Corridor Management Manual*. Sight distance measurements are as follows:

- For commercial entrances, a minimum sight distance of 250 m was applied, measured from an eye height of 1.05 m to an object 1.3 m high.
- For private entrances, a minimum sight distance of 180 m was applied, measured from an eye height of 1.05 m to an object 1.3 m high.

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| Table 4.6: Summary of Existing Sight Distance at Entrances (Design Speed 110 km/h) |               |                                 |                                 |  |              |                           |
|--|---------------|---------------------------------|---------------------------------|--|--------------|---------------------------|
| Station and Side   | Entrance Type | Sight Distance to the South (m) | Sight Distance to the North (m) | Sight Distance Meets MTO Criteria<br>Private (180 m)<br>Commercial (250 m) |              | Remarks                   |
|  |               |                                 |                                 | To the North   | To the South |                           |
| 21+093 RT  | private       | 390                             | +400                            | yes  | yes          |                           |
| 21+178 RT  | private       | +400                            | +400                            | yes  | yes          |                           |
| 21+433 RT  | private       | 350                             | +400                            | yes  | yes          |                           |
| 21+929 RT  | private       | +400                            | +400                            | yes  | yes          |                           |
| 22+221 RT  | commercial    | +400                            | +400                            | yes  | yes          | Double access to one site |
| 22+275 RT  | commercial    | +400                            | +400                            | yes  | yes          |                           |
| 22+316 LT  | commercial    | +400                            | +400                            | yes  | yes          | Double access to one site |
| 22+352 LT  | commercial    | +400                            | +400                            | yes  | yes          |                           |
| 22+574 RT  | private       | +400                            | +400                            | yes  | yes          |                           |

All of the entrances meet the minimum sight distance criteria.

4.6.1 Auxiliary Lanes

There is a southbound right-turn taper at the first access of the commercial double access on the west side of Highway 69 (i.e., marina and Camp Dore launching, Station 22+352). The taper is approximately 85 m long, which satisfies the design standard for a commercial access on a highway with a design speed of 110 km/h.

The commercial double access on the east side of Highway 69 (i.e., gas station, restaurant, store, and marina, Station 22+221) does not have auxiliary lanes. An 85 m long right-turn taper is justified at this access, based on the traffic volumes that this type of commercial development would generate. However, the northbound approach has a fully paved shoulder that can be used for right-turning vehicles accessing the commercial site.

There is a southbound passing lane that starts near Station 21+900 and extends southerly up a 3.5% upgrade beyond the south limit of this project.

4.7 TRAFFIC AND COLLISION HISTORY

The existing and projected mainline traffic volumes are summarized in Table 4.7.

| TABLE 4.7: SUMMARY OF EXISTING AND PROJECTED TRAFFIC VOLUMES |                    |                         |       |        |
|--|--------------------|-------------------------|-------|--------|
| Location<br>LHRS Reference, Road Name                        |                    | Time Period of Analysis |       |        |
|  |                    | 2003**                  | 2013  | 2023   |
| 35510 – 0.0 Secondary Highway 526                            | AADT               | 6,400                   | 7,700 | 9,000  |
|  | SADT               | 7,900                   | 9,500 | 11,100 |
|  | DHV                | 770                     | 920   | 1,080  |
|  | PHV                | 820                     | 980   | 1,150  |
|  | % Comm             | 17.1%                   |       |        |
|  | AR 1.3 (PAR 0.7) * |                         |       |        |
| 35523 – 0.0 Secondary Highway 522                            | LOS                | C                       | D     | D      |

\* AR (Accident Rate) and PAR (Provincial Accident Rate) are the 5-year average ending with the base year of the data. AR's are calculated for only the portion of the highway that lies within the limits of the project.

\*\* Traffic volumes projected from year 2000 traffic volumes.

The growth in traffic from year 2003 to 2023 is forecast to be 1.7% per annum from Secondary Highway 526 to Secondary Highway 522.

The level of service noted in Table 4.7 was calculated based on the available traffic volume information and geometric elements for this section of Highway 69. Within the limits of the project, Highway 69 will operate at level of service C to the year 2003 and level of service D to the year 2023.

4.7.1 Collisions

A review of the collision data for the five-year period from 1994 to 1998 in the vicinity of Key River Bridge, i.e., Highway 69 one kilometre before and after the structure (Station 21+100 to Station 23+100), was conducted. The collision data provides information such as LHRS location, road condition, type of collision, driver actions and collision event. The collision information was plotted on the existing base plans by year, location, type, road condition and injury/fatality. These plans along with a detailed summary (spreadsheet) are contained at the end of the body of this report.

A summary of the collisions by type and classification is provided in Table 4.8. There were 29 collisions on the two kilometre section of Highway 69 in the vicinity of the Key River Bridge during the five-year period from 1994 to1998.

EXISTING CONDITIONS

| TABLE 4.8: SUMMARY OF COLLISION RECORDS BY TYPE AND CLASSIFICATION FOR THE TIME PERIOD 1994 TO 1998 |                          |                  |          |        |         |
|---|--------------------------|------------------|----------|--------|---------|
| Collision Type  | Collision Classification |                  |          | Total  |         |
|   | Property Damage Only     | Non Fatal Injury | Fatality | Number | Percent |
| Single Motor Vehicle—Strikes Wild Animal  | 7                        |                  |          | 7      | 24%     |
| Turning Movement  | 1                        | 1                |          | 2      | 7%      |
| Sideswipe   | 3                        |                  |          | 3      | 10%     |
| Rear End  | 1                        |                  |          | 1      | 4%      |
| Single Motor Vehicle  | 10                       | 6                |          | 16     | 55%     |
| Total Number  | 22                       | 7                | 0        | 29     | 100%    |
| Percent of Total  | 76%                      | 24%              | 0%       | 100%   |         |

The collision rate for this two kilometre section of Highway 69 in the vicinity of Key River Bridge is 1.3 acc/Mvkm and is provided in Table 4.9.

| TABLE 4.9: HIGHWAY 69 COLLISION RATE (5-YEAR PERIOD 1994 TO 1998)   |             |                 |                   |                           |
|---|-------------|-----------------|-------------------|---------------------------|
| Section of Highway 69   | Length (km) | 2000 AADT (vpd) | No. of Collisions | Collision Rate (Acc/Mvkm) |
| From 1 km west of Key River Bridge to 1 km east of Key River Bridge | 2.0         | 6,100           | 29                | 1.3                       |

The Ministry’s Provincial average accident rate is 0.7 collisions per million vehicle-kilometres of travel (acc/Mvkm) for this type of highway. The collision rate for this section of Highway 69 within the project limits is above the Ministry’s Provincial Average Rate (PAR) for this type of highway.

Of the 29 collisions reported, one was rear end type, two were turning movement, three were sideswipe, sixteen were single motor vehicles, and seven were single motor vehicles involving wild animal type collisions.

In examining the collision data, it was noted that thirteen (45%) of the 29 collisions occurred on snow, ice, or wet pavement conditions; nine of these were single motor vehicle type collisions. Twelve (41%) of the 29 collisions occurred on or within 100 m of the structure.

Thirteen (45%) of the twenty-nine collisions occurred at night.

One of the collisions involved an impaired driver.

There were seven collisions along this section of Highway 69 that resulted in one or more injuries.

There were no collisions resulting in a fatality.

The Traffic and Collision Report is contained in Appendix H.

4.8 STRUCTURE

The Key River Bridge, Site 44-04, carries Highway 69 over the Key River, which is located about 2.4 km south of Secondary Highway 522. The structure was originally constructed in 1951 as an eight-span steel stringer and concrete deck bridge, founded on timber pile bents. The total length of the structure is 48 m with each span being 6.0 m long. The roadway width is 13.4 m and the overall structure width is 14.4 m.

A detailed inspection of the timber bents found that many of the piles exhibit various degrees of decay. Several have been previously reinforced. Diagonal braces are split at connections to the pile.

A photograph depicting the west elevation of the structure follows.



4.9 DRAINAGE AND HYDROLOGY

Key River flows westerly into Georgian Bay approximately 10 km west of Highway 69. The total contributing drainage area upstream of the Highway 69 crossing is approximately 18,775 hectares. The site lies within the Canadian Shield and the watershed is characterized by numerous rock outcrops with numerous swamp/wetland pockets. The Key River watershed is relatively mild in gradient (0.07%



**EXISTING CONDITIONS**

---

average watershed slope). Lands within the drainage area are essentially undeveloped and consist of approximately 62% forest and 38% meadow, swamp and lake areas. The watercourse flows directly to Georgian Bay without major rapids therefore the 'normal' water level at the structure is directly related to the water level in Georgian Bay. There are no visible indicators that the existing highway structure significantly obstructs flow (i.e., erosion or scouring).

The Canadian Coast Guard has indicated that Key River is considered navigable and the vertical clearance of 4.938 m high and 6.0 m wide shall be maintained beneath the replacement structure.

Field investigations were carried out in April 2003 to review and document existing drainage conditions and deficiencies within the study limits. No major drainage deficiencies were identified and existing highway culverts within the study area were found to be in satisfactory structural condition. Extension of existing highway culverts can be carried out as necessary to accommodate the detour alignment and the final alignment. The Culvert Inspection Report is contained in Appendix G.

**4.10 UTILITIES**

Hydro One Networks Inc and Bell Canada plant is located on Highway 69 within the project limits. On the west side of the highway, Hydro One has overhead lines and Bell Canada has overhead copper cables. On the east side of the highway Bell Canada has overhead and buried fibre optic cable.

## 5.0 Environmental

This project is being carried out in accordance with the Class Environmental Assessment (Class EA) for Provincial Transportation Facilities (2000) as a Group "B" undertaking. A Transportation Environmental Study Report (TESR) will be prepared during detail design and filed with the Ministry of Environment prior to construction.

### 5.1 EXISTING ENVIRONMENTAL CONDITIONS

#### 5.1.1 Natural Environment

Highway 69 is the major north/south travel corridor between Parry Sound and Sudbury. The Key River Bridge on Highway 69 is north of Parry Sound, approximately 2.4 km south of Highway 522.

The natural environment through the general area is typical of the Canadian Shield, with rock outcrops, mixed forests, low wet areas and gently rolling terrain.

At Highway 69, Key River is wider on the west side of the highway, than on the east side. The adjacent photograph is taken on the west side of Highway 69, facing south.



##### 5.1.1.1 Fisheries

C. Portt and Associates carried out a Fisheries Assessment study, during preliminary design. A summary of findings is provided in this section of the PDR. The fisheries report (dated June 25, 2003) is on file with the Ministry of Transportation.

The Key River is the only watercourse in the project limits. The river banks are armoured with rock beneath and immediately upstream and downstream from the bridge. The river flows from east to west beneath the bridge and the channel is 22 to 24 m wide at that point. On the south side of the river and the upstream (east) side of Highway 69 the highway embankment slopes down to an area of wetland vegetation. On the north side of the river and the upstream side of the highway, the docks of a marina begin immediately adjacent to the right-of-way.

Downstream from the highway there are bays extending back from the channel on both sides of the river. On the north side of the river the bay extends approximately 200 m north. The shoreline along the highway is essentially formed by the highway embankment, with a narrow band of natural vegetation along the toe of the slope.

On the south side of the river and the downstream side of the highway, the bay extends south approximately 110 m from the bridge. The toe of the highway embankment has been armoured with rock, but most of it was above the water line during field investigations. The head of the bay was bordered by mud flats strewn with logs and other woody debris.

The substrate in the areas adjacent to the bridge are mostly coarse sand and gravel. Finer (mud/muck) substrate is present at the head of each of the bays on the downstream side of the highway and rock substrate is present along the edge of the channel beneath and in the immediate vicinity of the bridge.

The Key River is a tributary to Georgian Bay and there are no barriers to fish migration between Highway 69 and its mouth. The Ministry of Natural Resources (MNR) classifies the Key River as a coolwater stream. Thurston (1986) reported that 19 fish species were captured in a trap net survey of the lower Key River conducted in 1985. During the survey, a trap net was set in the bay on the south side of the Key River immediately downstream from Highway 69. Northern pike (*Esox lucius*), northern redhorse (aka shorthead redhorse, *Moxostoma macrolepidotum*), yellow perch (*Perca flavescens*), pumpkinseed (*Lepomis gibbosus*), gar pike (aka longnose gar, *Lepisosteus osseus*) and carp (*Cyprinus carpio*) were caught. A trap net set immediately upstream from the bridge on the south side of the river captured walleye (*Stizostedion vitreum*), black crappie (*Pomoxis nigromaculatus*), brown bullhead (*Ameiurus nebulosus*), northern pike, white sucker (*Catostomus commersoni*) and largemouth bass (*Micropterus salmoides*).

The Ministry of Natural Resources has identified the habitat at and immediately upstream and downstream from the Highway 69 bridge as Type 2 fish habitat (Ministry of Natural Resources, 1997). Type 2 habitat is defined as habitat that is moderately sensitive to the potential impacts of development and, although important to fish populations, does not limit the productivity of fish either directly or indirectly (Ministry of Natural Resources, 1997). The habitat within the general area that includes the study area is described as "Variable; non-specialized spawning areas for centrarchids (bass), cyprinids (minnows), yellow perch, etc.; nursery area for minnows, and bass, feeding areas for pike, bass, minnows, etc."

Given the Type 2 habitat classification of MNR and the documented presence of several fish species, including species that are sought by anglers, immediately upstream and downstream from the existing Highway 69 bridge, the fish habitat poses an intermediate level of constraint at this location.

The Key River Cottage Association expressed an interest in minimizing impacts to fisheries resources and water quality during construction.

##### 5.1.1.2 Wildlife

A bird's nest was observed on the underside of the existing bridge at Key River during field investigations. Swallows nests are relatively common on MTO bridges, but should be dealt with appropriately during construction.

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The Ministry of Natural Resources (Parry Sound) indicated that the Parry Sound area provides known habitat for Eastern Massassauga Rattlesnakes (EMR) which is a species at risk and possibly Eastern Fox snakes. Initially, MNR suggested that a habitat survey be carried out at the Key River crossing, to make sure that appropriate mitigation measures are used during construction and to minimize impacts to the species at risk.

MTO and MNR staff met at the site (on April 22, 2003) to review the proposed detour locations for the presence of EMR habitat. The primary area of concern for EMR habitat is on the northwest quadrant of the bridge. The northeast quadrant of the crossing is occupied by a commercial establishment. Habitat does not appear significant on the southeast and southwest sides of the bridge within the proposed alignment.

The rock outcrop on the northwest side of the bridge has the potential for EMR habitat, as well as the potential to be affected by detour construction in this area. There were several ‘table rocks’ that may provide suitable gestation sites, but due to the eastern exposure of the site, and the amount of tree cover, it was thought that the site would not receive enough heat from the sun to be suitable as a gestation site. As well, the rock outcrop drops off at a near vertical slope on the highway side, reducing the potential for movement of snakes in this area. Some potential for over wintering locations was identified farther to the west of the rock outcrop area, but would not likely be affected by the detour. MNR staff concluded that the northwest quadrant did not offer significant potential for EMR habitat. Therefore, MNR advised that a survey is not required to determine the presence of EMR gestation and overwintering sites. A pre-construction survey of the site may be required, if snakes are found in the area at a later date.

5.1.2 Social/Economic Environment

Highway 69 serves as the only continuous north/south route between Parry Sound and Sudbury. Therefore, the efficient and safe movement of goods and people is critical to this project, as there are no practical alternative north/south routes or connections between Parry Sound and Sudbury.

Key River provides water access to many seasonal residents and cottages in the area. The Key Marine Resort is located on the north side of the crossing and includes docking facilities, a restaurant, cabin rentals, store and gas station on the east side of Highway 69 and a boat show room and additional docking facilities on the west side of Highway 69. It is a year-round operation for boaters and snowmobilers. This facility is significant as a business operation and as a point of connection between land and water, that provides access to properties beyond the study area.

The adjacent photograph shows the Key Marine Resort (taken in non-tourist season) on the east side of Highway 69. Commercial entrances for the business operation are on both sides of Highway 69, immediately north of the bridge.



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There are no sideroads within the construction zone.

The Henvey Inlet First Nation owns lands on the south side of Key River, on both sides of Highway 69.

The DFO Coast Guard’s office has confirmed that Key River at Highway 69 is navigable. The Key River Area Cottage Association indicated that they use a barge to go under the bridge at Highway 69 and requested that the detour provide enough clearance space to enable its use during construction.

There is a Trans Ontario Provincial (TOP) snowmobile trail that parallels Highway 69 and serves as a major north/south link in this area. The Parry Sound Snowmobile District has indicated that snowmobile traffic is increasing due to snowmobile trail bridge projects north of Key River, at the Pickerel and French Rivers. The snowmobile club requested that the new bridge design incorporate an additional lane for use by snowmobiles and other user groups.

5.1.3 Cultural Environment

A Stage 1-2 Archaeological Assessment study was carried out by Archaeological Research Associates (ARA) Ltd. during preliminary design. The study is documented in a report on file with the Ministry of Transportation.

The archaeological assessment was conducted to determine if there are any known archaeological resources that might be impacted by proposed improvements in the study area.

No archaeological remains were noted or recovered during the survey. Areas surveyed showed disturbance due to roadway construction, bridge construction or highway engineering. In some locations, particularly north of the river, there was no soil at all. South of the river, it was clear that a tremendous quantity of gravel fill had been imported into the roadway to raise the grade for the bridge crossing. Further evidence that the natural state of the study area had been heavily altered came from observations of the river itself, which strongly suggested that the original watercourse had been engineered somewhat in order to facilitate highway and bridge construction. The combination of these factors suggest that it is highly unlikely that any archaeological remains that may have once been extant within the right-of-way were able to survive the construction process.

5.2 EXTERNAL AND PUBLIC INVOLVEMENT

5.2.1 Project Notification

Project notification for the Highway 69, Key River bridge replacement was carried out in conjunction with announcements for the Highway 144, Vermilion River (GWP 158-95-00) and Highway 17 Birch Creek (GWP 176-98-00) bridge replacements.

The public consultation program was carried out in French and English, in accordance with the French Language Services Act (FLSA). The first formal point of contact announced Commencement of Preliminary and Detail Design in the following newspapers:

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- Sudbury Star (French and English) - Friday, December 20, 2002 (located in Sudbury)
- Parry Sound Beacon Star (English) – Saturday, December 21, 2002 (located in Parry Sound)
- Le Voyageur (French) – Tuesday, December 24, 2002 (located in Sudbury)
- Espanola Mid North Monitor (English) – Wednesday, December 25, 2002 (located in Espanola)

Newspaper notices are contained in Appendix B.

In addition, letters announcing the start of the project were mailed on December 18, 2002 to external agencies and ministries. The following ministries/agencies were notified of the project.

- Department of Fisheries and Oceans (DFO) - Canadian Coast Guard
- Ministry of the Environment, Regional and District Offices
- Ministry of Natural Resources, District Offices
- Ministry of Tourism, Culture and Recreation, Region and Heritage Operations
- Ministry of Northern Development and Mines
- Ministry of Agriculture Food and Rural Affairs
- Ministry of Municipal Affairs and Housing
- Ontario Native Affairs Secretariat
- Department of Indian Affairs and Northern Development
- Henvey Inlet First Nation
- Magnetawan First Nation
- Whitefish Lake First Nation
- Whitefish River First Nation
- Sagamok Anishinawbek
- MPP Constituency Offices for Nickel Belt, Parry Sound-Muskoka and Algoma Manitoulin Ridings
- CN, CP and Huron Central Railways
- TransCanada Pipeline
- Ontario Provincial Police
- City of Greater Sudbury
- Township of Sables-Spanish Rivers
- Township of Archipelago
- Greater Sudbury Police Services, Emergency Services and Emergency Medical Services
- Britt Fire Department
- Parry Sound Ambulance Service
- Sudbury Student Services Consortium
- C & D Bus Lines
- Alouette Transportation
- Estaire Bus Lines
- Phil's Bus Line
- Nickel District Conservation Authority
- Ontario Federation of Snowmobile Clubs
- Parry Sound Snowmobile District
- Elliot Lake Snowbirds
- Broder Dill Snow Association
- Northbound Sno Drifters
- Sudbury Trail Plan Snowmobile Association
- Greater Sudbury Economic Development and Planning Services
- Sudbury Trail Plan
- Greater Sudbury Chamber of Commerce
- The Georgian Bay Association
- Key River Association
- Hydro One
- Greater Sudbury Hydro Plus
- Regional Cable Systems
- Bell Canada
- Union Gas
- Key Marine Resort

Notification letters included external agency comment sheets and requested input by January 30, 2003.

The purpose of the initial notification process was to inform the public and external agencies about the study and to seek input from users of the highway.

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5.2.1.1 Henvey Inlet First Nation

A presentation to Council members of the Henvey Inlet First Nation was conducted on Tuesday, September 2, 2003, to seek input on the preferred plan. Minutes of the meeting are contained in Appendix C.

5.2.1.2 Summary of Input Received and Responses Provided

A summary of the input received from external agencies and the public and the responses provided or action taken during preliminary design, for the Key River bridge replacement project, is provided in Appendix C. Correspondence is also included in Appendix C.

5.3 ENVIRONMENTAL IMPACTS AND MITIGATION

This section of the PDR describes the expected environmental impacts and recommends appropriate mitigation, at a preliminary design level of detail in accordance with the Class EA for Provincial Transportation Facilities.

5.3.1 Natural Environment

5.3.1.1 Fisheries

Impacts to fish and fish habitat can potentially occur as a result of three aspects of the project, namely:

- construction, operation and removal of temporary detours
- construction of the new bridge
- removal of the existing bridge

Impacts may occur due to:

- direct physical alteration of fish habitat (i.e. the channel)
- the addition of deleterious substances (i.e. sediment, demolition debris, slurry from concrete saws) to fish habitat
- the alteration of flow or flow patterns in a way that creates bank instability
- the alteration of bank vegetation in a way that creates bank instability

Mitigation measures to reduce the risk of harmful impacts during bridge construction/removal include:

- prevent alteration of the stream channels where possible and minimize the extent where it is necessary

- prevent debris, construction materials, demolition materials and potentially deleterious substances, such as fuels or slurry from concrete saws, from entering the river
- minimize the area over which vegetation is disturbed and soils are exposed
- develop, implement and maintain sediment controls during the project, and until re-vegetation of exposed soils has occurred
- restore vegetative cover as quickly as possible following disturbance of existing vegetation and, where appropriate, adjacent to the river banks following decommissioning of the existing roadway
- prevent if possible, and minimize otherwise, in-stream operation of heavy equipment and minimize operation of the same on the banks of the watercourse
- no in-stream work should be undertaken from April 1 to July 15 (MNR) in order to prevent harmful effects on spawning fish and developing embryos.

The Recommended Plan results in filling in of approximately 0.35 ha of the west side of the Key River crossing. It is expected that rock fill will be used for the detour embankment. A three-span, Temporary Modular Bridge (TMB) will be used for the detour. The rock fill for the detour could be removed after its use and the area restored to its natural state. Whether or not the fill is removed after use of the detour, will be confirmed during detail design and through discussions with MNR/DFO.

Because the bridge replacement results in a temporary harmful alteration or disruption of Type 2 fish habitat, it will be necessary to restore the altered habitat to a condition in which its productive capacity is equal to or greater than its productive capacity prior to its alteration. If, as a result of the proposed works, Type 2 habitat is permanently altered in a manner that reduces fish productive capacity or if it is eliminated it will be necessary to compensate for the loss of habitat and fish productive capacity.

MNR staff have indicated that as a result of the in-filling required for the detour, the Recommended Plan is expected to result in harmful alteration, disruption or destruction (HADD) of fish habitat. MNR has indicated that a proposed compensation agreement and letter of intent seeking 'authorization' for a HADD under Section 35(2) of the Fisheries Act will be required. They note that there may be an opportunity to do some walleye spawning bed creation and/or enhancement work in the vicinity.

Discussions with MNR/DFO will continue during detail design to confirm the final compensation design.

5.3.1.2 Wildlife

If Eastern Massassauga Rattlesnakes are observed by MNR at the Key River crossing before construction, then a pre-construction snake habitat survey may be required.

Birds (i.e., swallows) should be prevented from nesting under the bridge in the nesting season preceding construction. This could be achieved with the use of mesh or screening. If birds' nests are present during construction, they should be dealt in a manner that protects the young and in keeping with current MTO practice.



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**5.3.1.3 Erosion and Sediment Control**

Erosion protection and sediment control measures will be used to minimize impacts to water quality during construction.

New pier construction will require the use of standard measures (i.e., cofferdams, turbidity curtains etc.) to isolate the work area and permit construction in the dry, while minimizing impacts to water quality.

Existing piers will be cut off just below the stream bed to minimize instream disturbance. Piers for detours are expected to be pile driven and cut off after use of the detour bridge.

Standard mitigation measures (i.e., straw bale flow checks, silt fence barriers etc.) will be used to prevent sediment-laden flow from entering watercourse.

**5.3.1.4 Management of Excess Materials**

The proposed improvements will result in the generation of excess materials that require disposal. Excess materials will be managed according to OPSS 180.

**5.3.2 Social/Economic Environment**

**5.3.2.1 Community, Residential and Recreational**

The proposed improvements do not result in any residential or business buyouts.

The marina docks on the west side of Highway 69 may be impacted by the construction and use of the detour. Potential business impacts to the marina will be minimized through discussions with the property owner during detail design.

Residents, tourists, commercial truckers and the travelling public may experience some minor temporary delay during construction.

Navigability on the Key River will be maintained during and after construction. Approval for the new bridge from the DFO Coast Guard, in accordance with the Navigable Waters Protection Act will be obtained prior to construction.

The Ministry of Transportation has advised the Parry Sound Snowmobile District that the new bridge at Key River will not include an additional lane for snowmobilers and other user groups.

Both the Key River Cottage Association and the Parry Sound Snowmobile District should be notified of future study phases including detail design and construction.

The detour will be built on a temporary easement and will impact First Nation lands. Property related discussions associated with the temporary easement will be dealt with in advance of construction.

**5.3.2.2 Private Entrances**

Access to entrances in the study area will be maintained during construction.

The commercial entrances to Key Marine Resort, on either side of Highway 69, north of Key River, will be realigned to match the detour alignment and the Recommended Plan after construction.

**5.3.2.3 Traffic Interruptions and Delay During Construction**

Interruptions to traffic and delay during construction are expected to be minor. A detailed traffic management and staging plan will be finalized during detail design and included in the contract package.

During construction, traffic conditions will be monitored to make sure that unreasonable delays and back-ups are not occurring. Corrective action will be taken as required to remedy any potentially unsafe situations. The following measures will be used to maintain traffic flow during construction:

- Standard MTO construction signage, including the possible use of changeable message signs
- Flag persons to regulate traffic movements, where appropriate
- Reduced speed limits and increased enforcement through construction zones

These measures are expected to keep traffic delays to the travelling public and commercial truck traffic to a minimum while maintaining safety through the study area.

Emergency response agencies will be notified of the construction schedule.

**5.3.2.4 Construction Dust and Noise**

Construction noise impacts will be dealt with in accordance with MTO standards and in compliance with municipal noise bylaw(s), if any.

Standard MTO special provisions will be included in the contract to mitigate dust.

The contract package will include special provisions to properly manage the debris associated with removing the existing bridge and detour.

**5.3.3 Cultural Environment**

The archaeological survey concluded that there is no evidence that the alignment for the proposed bridge replacement was occupied, in any significant way, during either prehistoric or historic times.

The Stage 1-2 Archaeological Assessment will be submitted to the Ministry of Culture for 'archaeological clearance', in accordance with the Archaeological Protocol.

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The final contract package will include appropriate wording that requires the Contractor to contact the Ministry of Culture or the Registrar of Cemeteries Regulation Unit of the Ministry of Consumer and Business Service, in the event that any deeply buried archaeological materials are discovered on the property during construction.

5.4 FUTURE ENVIRONMENTAL WORK

Future environmental work and commitments are summarized in Table 5.1.

| Table 5.1: Future Environmental Work    |  |   |
|---|--|---|
| Environmental Concern                   | Source   | Future Work or Mitigation<br>(to be confirmed during detail design)   |
| Navigability                            | MTO<br>DFO Coast Guard<br>Key Marine Resort<br>Key River Cottage Association | <ul style="list-style-type: none"><li>▪ Maintain clearances for navigability and obtain approval under Navigable Waters Protection Act (NWPA) for detour and final design from DFO Coast Guard during detail design</li><li>▪ Notify marina owners in advance of construction, to deal with potential impacts to docking facilities at private marina, during construction and use of detour</li><li>▪ Keep Key River Cottage Association informed of proposed works, timing, etc.</li></ul>  |
| Fisheries Resources                     | MTO<br>MNR<br>DFO Fisheries  | <ul style="list-style-type: none"><li>▪ Deal with fisheries impacts, mitigation and/or compensation in accordance with MNR/MTO Fisheries protocol, during detail design and construction</li><li>▪ Timing restrictions for instream work will be included in contract package – no instream work from April 1 to July 15</li><li>▪ Confirm compensation for fill embankment, including whether or not it is required to be removed after construction and include details in final contract – get DFO Fisheries Branch approval for final design</li><li>▪ Include typical operational constraints used at watercourses with fisheries resources (i.e., prevention of debris from entering water, no refuelling near water, etc.) in contract package</li></ul> |
| Wildlife                                | MTO<br>MNR   | <ul style="list-style-type: none"><li>▪ Carry out pre-construction survey of Eastern Massassauga Rattlesnakes, if they are observed in study area prior to construction</li><li>▪ Prevent bird nesting in advance of bridge removal, as per current MTO practice or deal with nests (if they do occur) in a manner that minimizes impacts to wildlife, before and during construction</li></ul>   |
| Erosion Protection and Sediment Control | MTO<br>MNR   | <ul style="list-style-type: none"><li>▪ Develop erosion protection and sediment control plan during detail design</li><li>▪ Use erosion control blankets, rip rap, etc. on steep embankments</li><li>▪ Use standard measures (i.e., straw bale flow checks, silt fence barriers, etc.) during construction</li><li>▪ Use turbidity curtains and cofferdams to contain sediment during removal/construction of existing, new and detour bridges</li><li>▪ Minimize disturbance to stream beds when removing or cutting off piers</li><li>▪ Seed all new ditches and graded areas</li></ul>   |
| Management of Excess Materials          | MTO  | <ul style="list-style-type: none"><li>▪ Manage excess materials in accordance with OPSS 180</li></ul>   |

| Table 5.1: Future Environmental Work  |  |  |
|---|--|--|
| Environmental Concern   | Source   | Future Work or Mitigation<br>(to be confirmed during detail design)  |
| Private Entrances   | MTO<br>Private Property Owners   | <ul style="list-style-type: none"><li>▪ Maintain access through study area along Highway 69 at private/commercial entrances, during construction</li><li>▪ Extend and adjust profiles of connecting entrance to detour and final alignments</li></ul>  |
| Property  | MTO<br>Affected Owners   | <ul style="list-style-type: none"><li>▪ Deal with temporary easement required for detour, in accordance with MTO Property Section procedures</li><li>▪ Confirm and deal appropriately with potential business impacts (i.e., to marina operations and docking facilities on west side of Highway 69) during detail design</li><li>▪ Advise Henvey Inlet First Nation of detour timing and potential impacts to First Nation property</li></ul> |
| Traffic Interruptions/Delay<br>(including emergency access and school bus routes) | MTO<br>OPP<br>Municipality<br>Emergency Service Agencies,<br>School Boards and bus companies | <ul style="list-style-type: none"><li>▪ Notify emergency response agencies, OPP, school boards and municipality at the start of detail design and construction</li><li>▪ Maintain contact as required with OPP, municipality, agencies and public during construction</li><li>▪ Develop traffic management plan during detail design using standard measures (i.e., signage, flag people, reduced speeds, etc.)</li></ul>                      |
| Recreational activities<br>(including boating, snowmobiling etc.)                 | Key River Cottage Association<br>Parry Sound Snowmobile District<br>Key Marine Resort        | <ul style="list-style-type: none"><li>▪ Notify recreational users of Key River at Highway 69 of start of detail design</li><li>▪ Maintain contact in advance of and during construction, as required</li></ul>   |
| Construction Dust, Noise and Debris   | MTO<br>MOE   | <ul style="list-style-type: none"><li>▪ Use noise control measures (i.e., restricting hours of operation etc.)</li><li>▪ Include requirements of local noise bylaw (if appropriate) in contract document</li><li>▪ Include special provisions in contract wording to appropriately manage debris during removal of existing structure</li><li>▪ Use standard dust suppressants and emission controls during construction</li></ul>             |
| Archaeological Resources  | MTO<br>MCUL  | <ul style="list-style-type: none"><li>▪ Include special instructions in contract wording, in the event that archaeological resources are discovered during construction</li><li>▪ Obtain 'archaeological clearance' from MCUL for Stage 1-2 Report</li></ul>   |
| Utility Impacts   | MTO<br>Hydro<br>Bell   | <ul style="list-style-type: none"><li>▪ Consult with utility companies to confirm impacts and relocations required during detail design</li><li>▪ Deal with relocations as per standard MTO procedures</li></ul>   |

## 6.0 Alternative Review and Evaluation

The existing structure has undergone extensive deterioration. This structure requires replacement in the near future, as rehabilitation is not a feasible option (replacement of the structure is discussed in Section 7.14).

Five alternatives were considered for replacement of the structure:

- Option 1 - Construct a new bridge at the existing location with a detour east of the highway and a TMB alignment skewed to the existing alignment
- Option 2 - Construct a new bridge at the existing location with a detour east of the highway and a TMB alignment parallel to the existing alignment
- Option 3 - Construct a new bridge at the existing location with a detour west of the highway and a TMB alignment skewed to the existing alignment
- Option 4 - Construct a new bridge at the existing location with a detour west of the highway and a TMB alignment parallel to the existing alignment
- Option 5 - Construct a new bridge at the existing location using staged construction with a detour west of the highway

Plans of the alternatives are illustrated at the end of the body of the report.

All detours will maintain two-way traffic with one lane in each direction and will be fully illuminated.

For all alternatives, the existing horizontal alignment will be maintained. In addition the existing vertical alignment will be improved by replacing the deficient sag curve (K=40) south of the structure with a new sag curve (K=50 for 110 km/h design speed). The new structure will require a profile grade raise from the existing grade in order to provide the required navigational clearance at the structure. The length of the final road improvement will be approximately 800 m.

Table 6.1 below presents the evaluation of the alternatives, which considered advantages and disadvantages of each, as well as preliminary cost estimates.

TABLE 6.1: EVALUATION OF ALTERNATIVES

| Alternative   | Advantages  | Disadvantages   | Cost Estimate |
|---|---|---|---------------|
| <b>Option 1</b><br>Construct a new bridge at the existing location with a detour east of the highway and a TMB alignment skewed to the existing alignment                       | <ul style="list-style-type: none"><li>Horizontal geometrics of the detour alignment are slightly better than with a parallel structure (i.e., requires only one curve north of the structure to connect to the existing alignment)</li><li>Minor impact to fish habitat with rock fill on south-east corner of bridge</li></ul>   | <ul style="list-style-type: none"><li>Significant impact to the gas station/restaurant/marina facility north-east of structure</li><li>Requires underground and overhead Bell relocation (fibre optic)</li><li>Horizontal curve on detour south of structure is reduced from existing curve radius (i.e., 598 m to 525 m)</li></ul> | \$4.4 Million |
| <b>Option 2</b><br>Construct a new bridge at the existing location with a detour east of the highway and a TMB alignment parallel to the existing alignment                     | <ul style="list-style-type: none"><li>Horizontal curve on detour south of structure is not reduced from existing curve radius</li><li>Minor impact to fish habitat with rock fill on south-east corner of bridge</li></ul>  | <ul style="list-style-type: none"><li>Significant impact to the gas station/restaurant/marina facility north-east of structure</li><li>Requires underground and overhead Bell relocation (fibre optic)</li><li>Requires back-to-back (i.e., 'S' curve north of the structure to connect to the existing alignment)</li></ul>        | \$4.5 Million |
| <b>Option 3 Preferred Alternative</b><br>Construct a new bridge at the existing location with a detour west of the highway and a TMB alignment skewed to the existing alignment | <ul style="list-style-type: none"><li>Horizontal geometrics of detour alignment slightly better than with a parallel structure (i.e., requires only one curve north of the structure to connect to the existing alignment)</li><li>Horizontal curve on detour south of structure is not reduced from existing curve radius</li><li>Minimal impact to the gas station/restaurant/marina facility north-east of structure</li></ul> | <ul style="list-style-type: none"><li>Requires relocation of existing hydro and Bell poles on west side</li><li>Significant impact to fish habitat with rock fill along west embankment</li></ul>   | \$4.2 Million |



ALTERNATIVE REVIEW AND EVALUATION

| TABLE 6.1: EVALUATION OF ALTERNATIVES   |   |  |               |
|---|---|--|---------------|
| Alternative   | Advantages  | Disadvantages  | Cost Estimate |
| <b>Option 4</b><br>Construct a new bridge at the existing location with a detour west of the highway and a TMB alignment parallel to the existing alignment | <ul style="list-style-type: none"><li>Horizontal curve on detour south of structure is not reduced from existing curve radius</li><li>Minimal impact to the gas station/restaurant/marina facility north-east of structure</li></ul>                  | <ul style="list-style-type: none"><li>Requires relocation of existing hydro and Bell poles on west side</li><li>Significant impact to fish habitat with rock fill along west embankment</li><li>Requires back-to-back (i.e., 'S' curve north of the structure to connect to the existing alignment)</li></ul>  | \$4.4 Million |
| <b>Option 5</b><br>Construct a new bridge at the existing location using staged construction with a detour west of the highway                              | <ul style="list-style-type: none"><li>No Temporary Modular Bridge required</li><li>Minimal impact to the gas station/restaurant/marina facility north-east of structure</li><li>Possibility of using extra wide new bridge for passing lane</li></ul> | <ul style="list-style-type: none"><li>Requires relocation of existing hydro and Bell poles on west side</li><li>Significant impact to fish habitat with rock fill along west embankment</li><li>Requires back-to-back (i.e., 'S' curve north of the structure to connect to the existing alignment)</li><li>Two construction seasons required</li><li>New permanent bridge width is over-built to carry detour traffic</li><li>Longer new bridge required due to extra width</li><li>Existing timber piles may require bracing</li></ul> | \$4.5 Million |

Option 3 was selected as the preferred alternative because this option provides acceptable traffic operations and safety conditions for a fully illuminated detour, and minimizes the impact to existing properties and utilities, particularly the gas station/restaurant/marina facility north-east of the structure and the Bell Canada fibre optics line on the east side of the Highway.

# 7.0 Discussion and Recommendations

## 7.1 DETOURS AND TRAFFIC MANAGEMENT

### 7.1.1 Horizontal Alignment

The detour will be located on the west side of the highway and the detour structure will be skewed with the existing highway alignment, with a minimum clearance between the existing structure and the detour structure of approximately 3.0 m.

The detour tangent at the structure is skewed to the existing structure to match the existing alignment at the north with a single curve (R=2500 m) and spiral (A=390). Superelevation on this curve will be a maximum of 2.7%.

The detour alignment at the south end ties into the existing alignment with an R=600 m curve with spirals. Superelevation on this curve will be a maximum of 5.7%. The detour alignment at the south end will pass through an existing southbound passing lane for about 400 m. The passing lane will not be opened within the limits of the detour, but will be opened at the south end of the detour.

The detour alignment is illustrated on the accompanying plans.

### 7.1.2 Vertical Alignment

The detour profile has been established using sag and crest curves which satisfy minimum standards for 110 km/h design speed (headlight criteria, sag curve K=50, crest curve K=90). The detour profile at the south end of the Temporary Modular Bridge will be about 0.4 m above the existing road profile and will have a -0.5% grade to tie into the existing road profile north of the structure.

The detour profile is illustrated on the accompanying plans.

### 7.1.3 Traffic Management Plan

Two lanes of traffic will be maintained during construction. When the detour and Temporary Modular Bridge (TMB) is completed, traffic will be shifted to the detour. The existing structure will be removed and construction of the new bridge will commence. Upon completion of the new bridge and approach embankments, traffic will be shifted back to the new alignment and new bridge. The TMB and detour will then be removed.

A detailed traffic management plan will be confirmed during detail design and will include informing the public of the construction work and potential delays. Operational constraints will be required during construction periods and for specific construction operations.

### 7.1.4 Cross Section

The proposed cross section for the detour alignment is:

- Pavement width: 7.5 m (2 lanes at 3.75 m each)
- Shoulder width: 2.5 m (fully paved)
- Shoulder rounding: 1.0 m

### 7.1.5 Temporary Modular Bridge

A Temporary Modular Bridge (TMB) will be erected on the detour alignment to carry traffic while the existing structure is removed and a new bridge is constructed. A TMB with a 7.31 m roadway was considered, however, due to the high percentage of commercial traffic and the safety concerns at this location (i.e., downgrade with a horizontal curve on the northbound approach to the structure), a TMB with a 9.14 m roadway is recommended. The required length of 70.1 m is achieved through 3 spans and is based on the need for keeping the embankments sufficiently removed from the navigable channel beneath Highway 69.

### 7.1.6 Illumination

The detour will be in service for about six months. Full illumination of the detour and detour structure will be provided to alert drivers of the change in alignment. There is no navigational illumination required.

## 7.2 FINAL HORIZONTAL ALIGNMENT

The existing horizontal alignment will be maintained.

Pavement widening through the horizontal curve is recommended to provide an additional load-bearing surface and greater width for the tracking of the wheels of large vehicles (design vehicle WB 17.5) on curves. The amount of widening required to the pavement width based on the new curve radius is 0.75 m.

## 7.3 FINAL VERTICAL ALIGNMENT

The existing vertical alignment will be improved by replacing the deficient sag curve (K=40) south of the structure with a new sag curve (K=50 min. for 110 km/h design speed). The profile across the existing structure consists of approximately a -0.1% grade. To improve drainage on the structure, a grade of -0.5% will be provided. North of the structure a crest curve (K=220) will be required. The profile matches the existing grade approximately 280 metres south of the bridge and 140 metres north of the bridge.

The new structure will require a profile grade raise from the existing to maintain the existing navigation clearance at the structure. The proposed profile results in grade raises of approximately 0.9 m and

DISCUSSION AND RECOMMENDATIONS

0.7 m at the south and north approaches respectively. The length of the road improvement is approximately 800 m.

7.4 CROSS SECTION

The cross section elements for this project are based on a design speed of 110 km/h, King's Highway classification, AADT greater than 4,000 vpd, and commercial traffic greater than 10%.

The proposed cross section for the final alignment of Highway 69 at Key River as illustrated in Figure 7.1 is:

- Pavement width: 7.5 m (2 lanes at 3.75 m each) (re-instate the 3.5 m wide southbound passing lane between Sta 21+100 to 21+950)
- Shoulder width: 3.0 m fully paved with rumble strips (as per related project WP 5535-02-00 Hot Mix Paving of Shoulders and Rumble Strips)
- Shoulder rounding: 1.0 m

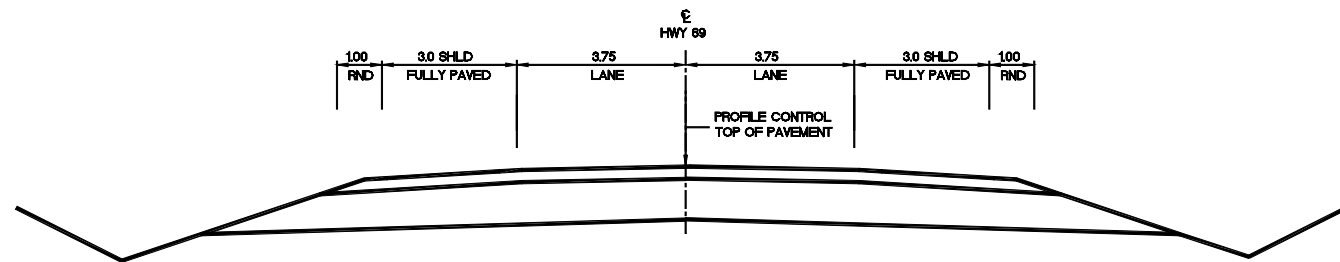


FIGURE 7.1: TYPICAL PROPOSED CROSS SECTION

Crossfall will be corrected to 2% on tangent sections of the highway and superelevation will be applied in accordance with Ministry standards.

7.5 CLEAR ZONE ROCK CUTS

There are two rock outcrop locations adjacent to Highway 69 within the project limits. Both of these rock cuts (stations 21+758 to 21+906 RT and 22+365 to 22+423 LT) are within the required clear zone. A comparison of clear zone width to a standard rock ditch is presented in Table 7.1. The standard rock ditch assumes a pavement structure of 140 mm of asphalt with granular 'A' depth of 150 mm and granular 'B' depth of 150 mm.

| Table 7.1: Summary of Rock Cut Clear Zone vs Standard Rock Ditch  |            |                    |   |   |
|---|------------|--------------------|---|---|
| Station to Station  | Length (m) | Average Height (m) | Required Offset for Standard Rock Ditch (from edge of new pavement) (m) | Required Clear Zone Width (from edge of new pavement) (m) |
| 21+750 to 21+825  | 75         | 4.0                | 7.9   | 12.3  |
| 22+365 to 22+425  | 60         | 2.0                | 7.1   | 9.0   |
| Total Estimated Rock Excavation   |            |                    | 910 m <sup>3</sup>  | 1250 m <sup>3</sup>                                       |
| Estimated Rock Excavation Cost  |            |                    | \$12,750  | \$17,500  |
| Note: The rock cut at station 22+365 to 22+425 will be cut back for the detour alignment. The new offset will be beyond the required clear zone for the final alignment. The cost estimate comparison is for the rock cut at station 21+750 to 21+825 only. |            |                    |   |   |

It is recommended that the rock cut at station 21+750 to 21+425 be cut back to achieve the required clear zone standards at a minor cost premium. Additional rock may be removed from this rock cut to be used as rock fill for the detour embankment.

7.6 CLEAR ZONE OTHER

The Ministry of Transportation Roadside Safety Manual 1993 defines the clear zone width as “the distance from the edge of the travelled roadway to the face of an unprotected hazard.” This width, which is dependent on design speed and roadway geometrics, must be traversable (3:1 slope or flatter) and clear of any hazards such as: rock faces, rigid sign supports, light standards, non-traversable drainage structures and steep slopes.

Obstacles within the clear zone offset will be treated in the following order of preference: remove the hazard; relocate the hazard outside the clear zone; minimize the hazard by making it traversable (i.e. slope flattening) or using breakaway devices; and shield the hazard (Roadside Safety Manual 1993).

The clear zone width for this section of Highway 69, which has a design speed of 110 km/h, is 9.0 m on tangent sections.

Roadside Safety design for Highway 69 will be fully reviewed during detail design.

7.7 GUIDE RAIL

Any hazards within the clear zone that cannot be removed or made forgiving will be protected by a guide rail system, including the appropriate end-treatments. The guide rail type will typically be cable or steel beam, depending on the location. Steel beam guide rail is required adjacent to water bodies and on fills greater than 6.0 m in height. The preferred end-treatment for steel beam guide rail is the eccentric loader.

**DISCUSSION AND RECOMMENDATIONS**

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Excess earth material should be used to flatten the side slopes to eliminate or reduce the length of guide rail required.

**7.8 SIDE ROADS AND ENTRANCES**

There is a southbound right-turn taper at the first access of the commercial double access on the west side of Highway 69 (i.e., marina and Camp Dore launching, Station 22+352). The taper is approximately 85 m long, which satisfies the design standard for a commercial access on a highway with a design speed of 110 km/h. This taper will be retained for the final alignment.

The commercial double access on the east side of Highway 69 (i.e., gas station, restaurant, store, and marina, Station 22+221) does not have auxiliary lanes. However, the northbound approach will have a fully paved shoulder re-instated that can be used for right-turning vehicles accessing the commercial site.

There is a southbound passing lane that starts near Station 21+900 and extends southerly up a 3.5% grade beyond the south limit of this project. This passing lane will be re-instated on the final alignment when the detour is removed.

Access to side roads and driveways will be maintained during construction. A Traffic Management Plan will be developed during detail design that identifies how traffic will access the side roads and entrances during construction.

**7.9 PROPERTY**

Detour cut and fill embankments will encroach on private property. Temporary construction easements will be required for the detour on the west side of Highway 69, from approximately 21+600 to 22+300.

**7.10 UTILITIES**

The detour alignment on Highway 69 will impact the existing overhead Bell Canada/Hydro One pole line on the west side of the highway. Approximately 7 poles will require relocation to the east side of the highway. Details of these relocations will be confirmed during detail design.

**7.11 DRAINAGE AND HYDROLOGY**

Stantec has undertaken a hydrologic/hydraulic analysis of the Key River. A Hydrology Report has been prepared and is included in Appendix F.

A 50-year design storm is required for the hydraulic study at this site. A design flow of 34 m<sup>3</sup>/s was computed for this event. The water level corresponding with the design discharge for the existing opening is 178.07 m. Since the crossing is considered a navigable waterway, the minimum soffit elevation for the replacement structure will be governed by the navigability requirements.

The average channel velocity during the 2-year event is 0.5 m/s. The channel banks will remain stable at these relatively low velocities. Rock protection should be utilized through the structure opening to protect against ice scour.

The number of piers for the replacement structure will be decreased from the existing number of piers (seven), to minimize the potential for ice jamming. The bridge piers will be designed to resist ice forces.

**7.12 GEOTECHNICAL**

The pavement design recommendations and geotechnical investigation will be undertaken during detail design.

**7.13 FOUNDATIONS**

Peto MacCallum Ltd. was retained by Stantec to carry out a foundation investigative program at the site and to provide input and recommendations into the design of new structures and embankments.

The subsurface stratigraphy is generally comprised of surficial fills overlying a massive deposit of sand. Discontinuous deposits of soft to very soft clay/clayey silt are present within the deposit of sand. Bedrock is located approximately 45 m below the roadway level.

The stabilized groundwater level is expected to be at the water level in Key River. Steel sheet piling will be required for excavations below water level, since the sandy soils are relatively pervious. The potential for basal heave will need to be addressed upon completion of the detailed foundation investigation.

Based on preliminary information, the recommended side slope for the detour embankments is 3:1. Reducing the slope to 2.5:1 should be considered upon completion of a detailed foundation investigation. Surcharging of the detour embankments will be necessary to allow for consolidation of the underlying clays. A six month pre-loading period will be required for the temporary embankments.

The proposed new structure and TMB will be founded on steel H-piles driven to bedrock. The design will be based on a ULS pile capacity of 1600 kN assuming HP310x110 piles.

The Preliminary Foundation Investigation and Design Report is included in Appendix E.

**7.14 STRUCTURE**

The existing structure is in fair to poor condition. In particular, the timber piles exhibit decay and require strengthening if the structure is not replaced in the near future. A Timber Inspection Report is contained on file with the Ministry.

The new structure will be constructed on the existing Highway 69 alignment. This alignment is on tangent in the vicinity of the structure.

**DISCUSSION AND RECOMMENDATIONS**

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To improve drainage on the structure a –0.5% grade will be introduced. The proposed profile results in grade raises of approximately 1.0 m and 0.8 m at the south and north approaches, respectively.

In order to keep the front slopes away from the waterway, it is recommended that new abutments be situated approximately 2 m in front of the existing abutments. The required structure length is 45 m. A three-span arrangement with integral abutments is recommended. Span lengths of 12.0 m, 21.0 m, and 12.0 m have been selected in order to position piers near to river banks.

The cross-section of the proposed structure consists of a slab-on-girder system utilizing five wide flange steel plate girders made composite with a 225 mm concrete deck. This site is appropriate for the use of atmospheric steel. The bridge deck will be waterproofed and paved. The required girder depth is 800 mm.

An analysis of barrier requirements indicates that a performance level of 2 is required at this site. However, PL-3 barrier walls without railings (conforming to Structural Standard Drawing SS110-61) are recommended as the absence of the steel railing results in less maintenance.

The resulting 14.64 m cross-section width on the structure is comprised of the following:

- Barrier Wall PL-3
- 3.0 m Shoulder
- 1 – 3.75 m NB Traffic Lane
- 1 – 3.75 m SB Traffic Lane
- 3.0 m Shoulder
- Barrier Wall PL-3

High performance concrete (50 MPa) will be used in all concrete components of new structures except footings according to Northeastern Region policy. Stainless steel reinforcement will be provided in barrier walls. Black and epoxy reinforcement will be used elsewhere as specified in the *Structural Manual*.

An analysis of deck drain requirements, performed in accordance with the MTO *Drainage Management Manual, Chapter 4*, indicates that deck drains are not required.

Two lanes of traffic will be maintained for the duration of construction by utilizing a temporary modular bridge.

It is anticipated that two construction seasons are required to complete the work. Detour embankments and the piers for the TMB will be constructed in Season 1. The embankments will be surcharged for a period of about 6 months. The TMB can be erected in early spring of Season 2. After paving of the detour, traffic will be shifted to the TMB. Removal of the existing structure will occur in the late spring. Construction of the replacement bridge will then take place and will be completed in the fall of Season 2. Traffic will be shifted back to the new alignment and removal of TMB and detour will take place during late fall of Season 2.

The estimated construction cost of the new structure is \$1,210,000. A summary of this cost estimate for the new structure is provided in Table 9.2. An additional \$60,000 is included in the preliminary cost estimate for the removal of the existing structure.

The Structural Design Report is included in Appendix D.





## DESIGN CRITERIA

WORK PROJECT NO: **87-86-00** DIST NO: **54** HWY NO: **69** TYPE OF PROJECT: **Grading, Drainage, Granular Base, Hot Mix Paving, Illumination and Structure Replacement**

LOCATION: **Key River Bridge, Site 44-04** LENGTH: **1.085 km**

LIMITS FROM: STA: 21+475 TOWNSHIP: Henvey Inlet Indian Reserve No.1 and Unorganized Twp  
TO: STA: 22+560 TOWNSHIP: Henvey Inlet Indian Reserve No.1 and Unorganized Twp  
PLAN: Plates 750/69-37-0 to 75/69-41-0

ELECTORAL DISTRICT: Parry Sound-Muskoka  
TOWNSHIPS: Henvey Inlet Indian Reserve No.1 and Unorganized Twp

|                                       | PRESENT<br>CONDITIONS | DESIGN<br>STANDARDS | PROPOSED<br>STANDARDS | RECOMMENDED BY:              |
|---------------------------------------|-----------------------|---------------------|-----------------------|------------------------------|
| HIGHWAY CLASSIFICATION                | RAU 110               | RAU 110             | RAU 110               |                              |
| MINIMUM STOPPING SITE DISTANCE        | 160                   | 215                 | 215                   | PROJECT MANAGER/ENGINEER     |
| EQUIVALENT MIN 'K' FACTOR (CREST/SAG) | 100/40                | 90/50               | 100 (a)/50 (b)        |                              |
| MAXIMUM GRADE                         | 3.6%                  | 6 to 7%             | 3.6%                  | MANAGER CONTRACTS            |
| MINIMUM RADIUS                        | 598.757               | 525                 | 598.757               |                              |
| PAVEMENT WIDTH                        | 7.3                   | 7.5 (2 @ 3.75)      | 7.5 (2@ 3.75) (c)     | MANAGER OPERATIONAL SERVICES |
| SHOULDER WIDTH                        | 3.0                   | 3.0                 | 3.0 (d)               |                              |
| SHOULDER ROUNDING                     | 1.0                   | 1.0                 | 1.0                   | MANAGER ENGINEERING          |
| MEDIAN WIDTH                          | N/A                   | N/A                 | N/A                   | APPROVED BY:                 |
| R.O.W. WIDTH                          | 46 – 60 m             | 45 m                | 46 – 60 m (e)         |                              |
| POSTED SPEED                          | 90                    | 90                  | 90                    | REGIONAL DIRECTOR            |
| MISCELLANEOUS                         |                       |                     |                       |                              |

DATE OF APPROVAL

### TRAFFIC

| DESCRIPTION                  | 2003*            | 2013*         | 2023* |
|------------------------------|------------------|---------------|-------|
| Highway 69, Key River Bridge |                  |               |       |
| 35510 – 0.0 Sec. Hwy 526     | AADT             | 6,400         | 7,700 |
|                              | SADT             | 7,900         | 9,500 |
|                              | DHV              | 770           | 920   |
|                              | PHV              | 820           | 980   |
|                              | % COMMERCIAL     | 17.1%         |       |
|                              | Level Of Service | C             | D     |
| 35525 – 0.0 Sec. Hwy 522     | Accident Rate    | 1.3 (PAR 0.7) |       |



## DESIGN CRITERIA

WORK PROJECT NO: **87-86-00** DIST NO: **54** HWY NO: **69** TYPE OF PROJECT: **Grading, Drainage, Granular Base, Hot Mix Paving, Illumination and Structure Replacement**

\* Traffic volumes are projected from year 2000 traffic volumes.

### NOTES:

- There are a total of 2 vertical crest curves each with a K value of 100. Both satisfy a design speed of 110 km/h. The southerly crest curve at VPI station 21+644 will be maintained, while the crest curve north of the new structure at VPI station 22+258 will be increased to K of 220, due to the proposed profile improvement.
- There are a total of 2 vertical sag curves each with a K value of 40 and 80. One is standard for a 90 km/h design speed, and the other is standard for a 140 km/h design speed. The sag curve at VPI station 21+924, K-40 south of the structure will be improved to a K-50, which is equivalent to a 110 km/h design speed. The other sag curve at VPI station 22+480, K-80 will be maintained.
- Pavement widening is required through the horizontal curve at PI station 21+777.978. The amount of widening is 0.75 m, which is based on the new curve radius (R=600 m), a WB-17.5 design vehicle and a design speed of 110 km/h. The 3.5 m wide southbound passing lane will be reconstructed from station 21+551 to 22+000 and will be connected to the existing passing lane at the south limit of construction.
- The shoulders on Highway 69 will be 3.0 m fully paved with rumble strips to coincide with related construction under W.P. 5535-02-00.
- Temporary construction easements will be required to accommodate detour construction. Property requirements will be determined during detail design.

### REMARKS:

- Project Scope and Environmental Assessment Status

This project is being carried out in accordance with the Class Environmental Assessment (EA) for the Provincial Transportation Facilities as a Group 'B' undertaking. A Transportation Environmental Study Report (TESR) will be prepared during detail design and filed with the Ministry of Environment prior to construction.

- Structures

The existing Key River Bridge, Site 44-04 will be replaced due to extensive deterioration. A cross section of the proposed bridge deck is attached.

- Pipeline and Railway Crossings

There are no existing pipeline or railway crossings within the limits of this project.

- Water Crossing

Highway 69 crosses Key River within the project limits.



## DESIGN CRITERIA

WORK PROJECT NO: **87-86-00** DIST NO: **54** HWY NO: **69** TYPE OF PROJECT: Grading, Drainage, Granular Base, Hot Mix Paving, Illumination and Structure Replacement

## 5. Auxiliary Lanes

There is an existing southbound passing lane which starts at station 22+000 and extends southerly (i.e., down chainage) beyond the limits of this project. This passing lane will be re-instated within the limits of this project.

## 6. Utilities Relocation

Existing Hydro One and Bell Canada poles are located on the west side of the highway. The proposed detour alignment on the west side of the highway will impact the existing utilities on this side. Approximately 7 poles will require relocation to construct the detour. The extent of the relocations required will be confirmed during detail design.

## 7. Property

Temporary construction easements will be required to the construct south side detour. Property requirements will be determined during detail design.

## 8. Construction Staging

- Relocate utilities in advance of contract
- Construct detour embankment
- Construct detour bridge abutments and install Temporary Modular Bridge (TMB)
- Construct detour pavement structure
- Move traffic to detour, remove existing bridge and construct new bridge
- Construct new embankments and new pavement structure
- Move traffic from detour to new final alignment
- Remove TMB and detour

9. Guide rail will be placed to meet current Ministry warrants and standards.

10. Superelevation and Crossfall will be improved to meet current Ministry design standards.

11. Rock cuts will be removed to clear zone requirements.

12. Fisheries impacts and mitigation will be dealt with in accordance with the MNR/MTO Fisheries Protocol and may require authorization under the Fisheries Act.

13. A Preliminary Design Report has been completed for this project.

14. Fully paved shoulders and rumble strips will be constructed under a related project WP 5535-02-00 Hot Mix Paving of Shoulders and Rumble Strips, from 0.3 km south of Hwy 526 northerly 25.4 km to French River Bridge and from Hwy 637 northerly 7.8 km.

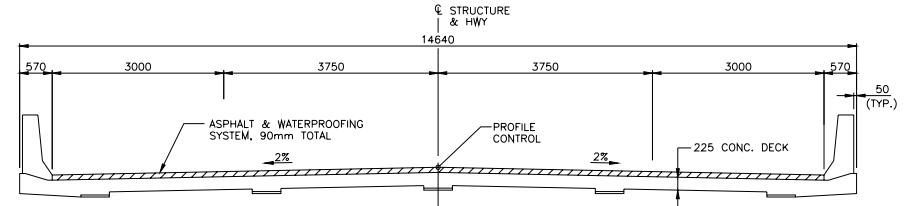


## DESIGN CRITERIA

WORK PROJECT NO: **87-86-00** DIST NO: **54** HWY NO: **69** TYPE OF PROJECT: **Grading, Drainage, Granular Base, Hot Mix Paving, Illumination and Structure Replacement**

**TYPICAL STRUCTURE CROSS SECTION:**

**Key River , Site 44-04**



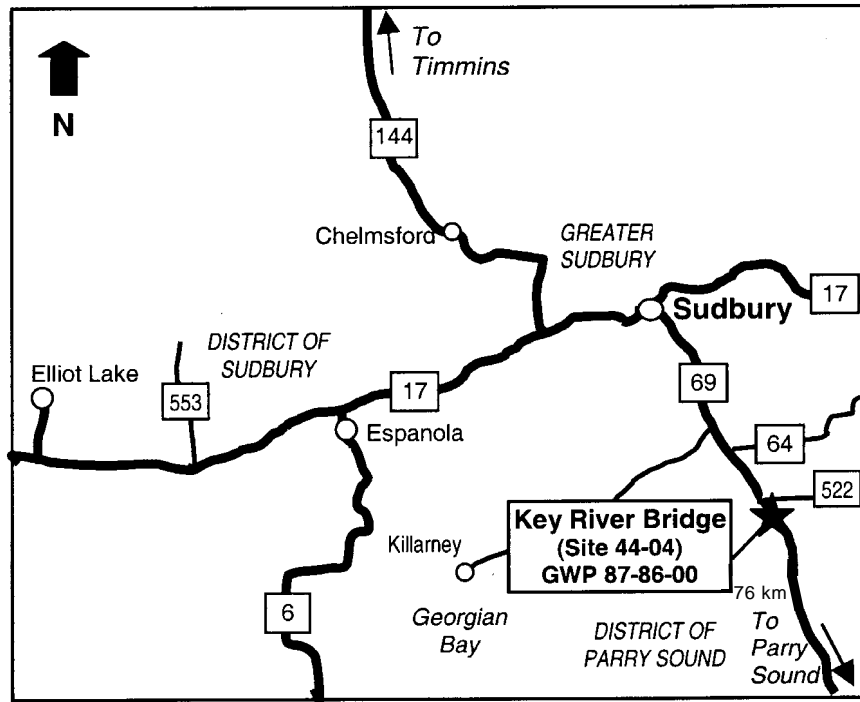




## DESIGN CRITERIA

WORK PROJECT NO: **87-86-00** DIST NO: **54** HWY NO: **69** TYPE OF PROJECT: Grading, Drainage, Granular Base, Hot Mix Paving, Illumination and Structure Replacement

### LOCATION MAP:



NOT TO SCALE

## 9.0 Preliminary Cost Estimate

The preliminary cost estimate for the Key River Bridge replacement is approximately \$4.2 Million and is summarized in Table 9.1 and Table 9.2.

| TABLE 9.1: KEY RIVER BRIDGE, SITE 44-04 BRIDGE REPLACEMENT COST ESTIMATES |                    |
|---|--------------------|
| ITEM  | COST               |
| <b>Detour Roadway</b>   |                    |
| Earth excavation  | \$22,000           |
| Rock excavation   | \$13,000           |
| Subgrade Material   | \$39,000           |
| Rock Borrow   | \$319,000          |
| Granular 'B'  | \$110,000          |
| Granular 'A'  | \$59,000           |
| Asphalt   | \$127,000          |
| Full Illumination   | \$100,000          |
| Fully Paved Shoulder (2.0 m)  | \$58,000           |
| <b>Permanent Roadway</b>  |                    |
| Earth Fill  | \$60,000           |
| Rock Excavation   | \$18,000           |
| Granular 'B'  | \$72,000           |
| Granular 'A'  | \$41,000           |
| Asphalt   | \$125,000          |
| Asphalt Removal   | \$37,000           |
| <b>Detour Roadway Removal</b>   |                    |
| Asphalt Removal   | \$38,000           |
| Grading   | \$249,000          |
| <b>Roadway Sub-Total</b>  | <b>\$1,487,000</b> |
| Allowance for other items (20%)   | <b>\$298,000</b>   |
| <b>Temporary Structure</b>  |                    |
| TMB bridge rental (70m)   | \$421,000          |
| Foundations, launching, etc.  | \$231,000          |
| Sheet Piling  | \$50,000           |
| <b>Permanent Structure</b>  |                    |
| Remove existing structure   | \$60,000           |
| 3 span steel girder (45 m)  | \$1,101,000        |
| <b>Structure Sub-Total</b>  | <b>\$1,863,000</b> |
| Allowance for other items (10%)   | <b>\$187,000</b>   |
| <b>Total Estimated Tender Cost</b>  | <b>\$3,835,000</b> |
| <b>Property Limited Interest</b>  | \$50,000           |
| <b>Utility Relocation</b>   |                    |
| Hydro (share of relocations approx. 50%)                                  | \$175,000          |
| Bell Canada (share of relocations approx. 50%)                            | \$100,000          |
| <b>Total Estimated Tender Cost</b>  | <b>\$4,160,000</b> |

| TABLE 9.2: PRELIMINARY COST ESTIMATE THREE-SPAN SLAB ON STEEL GIRDER BRIDGE |                                    |          |                |           |                    |
|---|------------------------------------|----------|----------------|-----------|--------------------|
| Item Code   | Item Description                   | Quantity | Unit           | Unit Cost | Cost               |
| 0902-0010   | Earth Excavation for Structure     | 435      | m <sup>3</sup> | \$30      | \$13,050           |
| 0902-0030   | Underwatering Structure Excavation | 1        | ea             | \$50,000  | \$50,000           |
| 0903-0010   | Supply Equipment for Driving Piles | 1080     | m              | \$25      | \$27,000           |
| 0903-0054   | H-Piles, HP 310x110                | 1080     | m              | \$120     | \$129,600          |
| 0903-0120   | Driving Shoes                      | 28       | ea             | \$180     | \$5,040            |
| 9999-0888   | HPConcrete in Substructure         | 350      | m <sup>3</sup> | \$600     | \$210,000          |
| 9999-0891   | HPConcrete in Deck                 | 225      | m <sup>3</sup> | \$850     | \$191,250          |
| 9999-0892   | HPConcrete in Barrier Walls        | 45       | m <sup>3</sup> | \$1,100   | \$49,500           |
| 9999-0890   | HPConcrete in Approach Slabs       | 41       | m <sup>3</sup> | \$450     | \$18,450           |
| 0905-0010   | Reinforcing Steel Bar              | 40       | t              | \$1,500   | \$60,000           |
| 0905-0020   | Coated Reinforcing Steel Bar       | 16       | t              | \$1,900   | \$30,400           |
| 0905-0025   | Reinforcing Stainless Steel Bar    | 4        | t              | \$12,500  | \$50,000           |
| 0906-0011   | Fabrication of Structural Steel    | 65       | t              | \$2,600   | \$169,000          |
| 0906-0020   | Delivery of Structural Steel       | 65       | t              | \$350     | \$22,750           |
| 0906-0030   | Erection of Structural Steel       | 65       | t              | \$600     | \$39,000           |
| 0911-0012   | Coating New Structural Steel       | 21       | m <sup>2</sup> | \$60      | \$1,260            |
| 0914-0011   | Bridge Deck Waterproofing          | 625      | m <sup>2</sup> | \$20      | \$12,500           |
| 0914-0031   | Form and Fill Grooves              | 54       | m              | \$50      | \$2,700            |
| 0922-0010   | Bearings                           | 20       | ea             | \$1,000   | \$20,000           |
|   |                                    |          |                |           |                    |
|   | Subtotal                           |          |                |           | \$1,101,500        |
|   |                                    |          |                |           |                    |
|   | Contingency Allowance              |          | 10%            |           | \$110,150          |
|   |                                    |          |                |           |                    |
|   | <b>TOTAL</b>                       |          |                |           | <b>\$1,211,650</b> |

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**PLANS AND PROFILES OF THE  
RECOMMENDED IMPROVEMENT PLAN  
AND ALTERNATIVE OPTION PLANS**

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# **GENERAL ARRANGEMENT DRAWING FOR THE RECOMMENDED PLAN**

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## **APPENDIX A: MEETING NOTES**

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## **APPENDIX B: NEWSPAPER NOTICE**

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## **APPENDIX C: INPUT RECEIVED AND CORRESPONDENCE**

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# **APPENDIX D:      STRUCTURAL DESIGN REPORT**

**Report Appendices are filed with the original document**

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# **APPENDIX E: PRELIMINARY FOUNDATION REPORT**

**Report Appendices are filed with the original document**

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# **APPENDIX F: HYDROLOGY REPORT**

**Report Appendices are filed with the original document**

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## **APPENDIX G: CULVERT INSPECTION REPORT**

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## **APPENDIX H:      TRAFFIC AND COLLISION REPORT**

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