

13 August 2012

Our File: 2111-02934-0

Ministry of Transportation & Infrastructure
South Coast Region
7818 Sixth Street
Burnaby BC V3N 4N8

Attention Steve Carney, P.Eng., PTOE
A/Manager Highway Design and Traffic Engineering

Proposed Highway 19 / Corcan Road Interchange – High Level Assessment

The Ministry of Transportation & Infrastructure (MoT) has received a request from the Corcan Meadowood Residents Association (CMRA) for construction of a new interchange on Highway 19 at Corcan Road, located approximately 9 km north of Qualicum Beach. This report provides a high level discussion on the potential benefits and technical merits that could warrant an interchange at this location. More specifically, this report provides the following information:

- Projected traffic volumes.
- A high level magnitude cost range for construction of an interchange.
- Approximate benefit in terms of travel time savings.
- Potential Staging Option
- Warrant guidelines for interchanges.

The location of the proposed Highway 19 / Corcan Road interchange and surrounding area is illustrated in Figure 1.

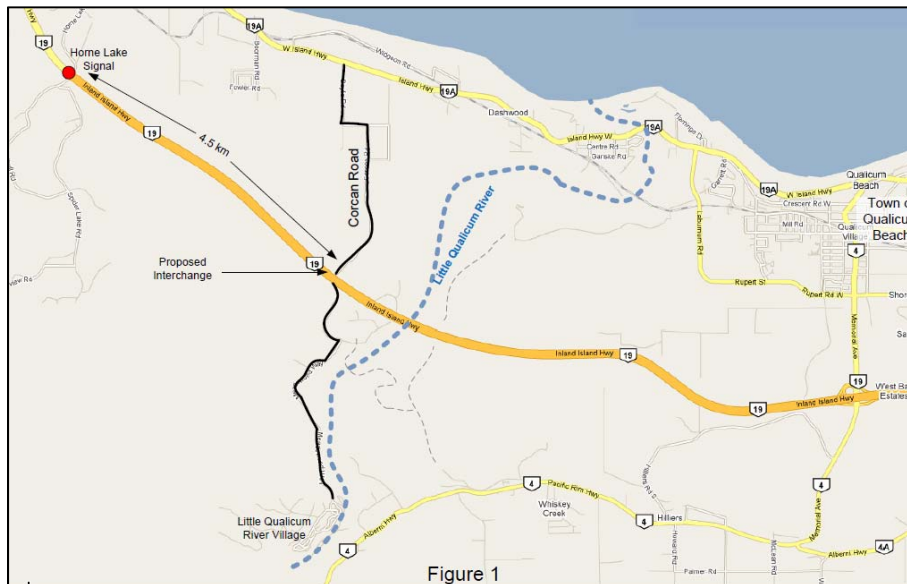


Figure 1 – Location of Proposed Highway 19 / Corcan Interchange

Proposed Interchange Configuration

In a letter to the Minister of Transportation, dated December 12, 2011, the CMRA has proposed an interchange as shown in Figure 2. This configuration takes advantage of the existing Corcan Road underpass at Highway 19 and adds on / off ramps on both sides of the highway, connecting directly to Corcan Road on the west side and to a new roundabout intersection on Nahmint Road on the east side, thereby providing full movement access to Highway 19.

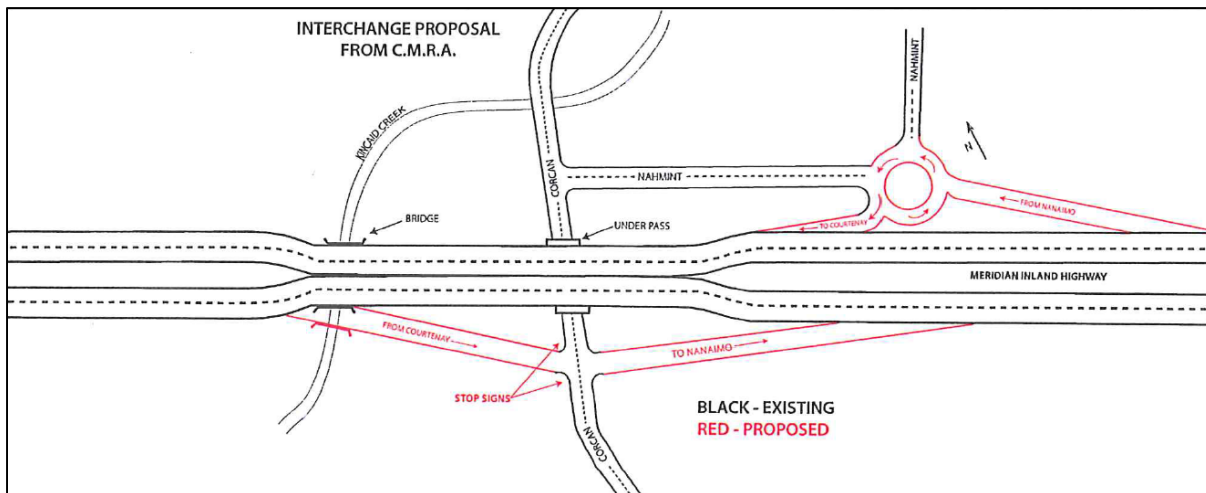


Figure 2 – Proposed Interchange Configuration

Further to advice from the Ministry's structural representative, widening of the existing bridge structure at Kinkaid Creek is not an option to accommodate the southbound off-ramp. The southbound off-ramp would require a new bridge structure at Kinkaid Creek, as well as sufficient ramp length to account for the elevation difference between Highway 19 and Corcan Road. The configuration generally appears to be feasible, but further study would be required to ascertain whether there is sufficient distance between the roundabout footprint and Highway 19 to accommodate the northbound on-ramp leg. An eastward shift in the roundabout footprint and associated re-alignment of the Nahmint Road approaches may be required, and may impact property.

Projected Interchange Traffic Volumes

Ramp volumes with an interchange at Corcan Road were estimated by reviewing available traffic count data at nearby intersections and back-checking against the expected trip generation from the number of residential units existing along the Corcan Road corridor between Highway 19A and Highway 4. Figure 3 shows existing PM peak hour traffic volumes at four intersections:

- Highway 19 / Horne Lake Road.
- Highway 19A / Baylis Road.
- Corcan Road / Nahmint Road.
- Highway 19 / Highway 4 (Memorial Road).

| | |
|-------------|---------|
| NB On-Ramp | 139 vph |
| NB Off-Ramp | 551 vph |
| SB On-Ramp | 515 vph |
| SB Off-Ramp | 145 vph |

High Level Order of Magnitude Cost Estimate

A high level order of magnitude cost estimate was prepared for the proposed interchange shown in Figure 2. The cost reflects a conceptual level estimate, where the range of precision is in the order of -25% to +75%. Table 1 summarizes the cost estimate, which was undertaken using the Wolski method, broken down by individual ramp. A cost estimate is also tabulated separately for improvements along Nahmint Road, including a single lane roundabout at the NB off-ramp terminal, and possible improvements to the Corcan Road / Nahmint Road intersection.

Table 1 – Construction Cost Estimate

| Description | NB Off-Ramp | NB On-Ramp | SB Off-Ramp | SB On-Ramp | Nahmint Road | Total |
|---|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| <i>Engineering & Project Management</i> | \$0.09 M | \$0.10 M | \$0.34 M | \$0.12 M | \$0.09 M | \$0.75 M |
| <i>Grade Construction</i> | \$0.25 M | \$0.29 M | \$0.28 M | \$0.31 M | \$0.23 M | \$1.36 M |
| <i>Other Construction (Environmental Mitigation)</i> | \$0.05 M | \$0.05 M | \$0.10 M | \$0.05 M | \$0.05 M | \$0.29 M |
| <i>Paving Construction</i> | \$0.17 M | \$0.19 M | \$0.21 M | \$0.19 M | \$0.20 M | \$0.95 M |
| <i>Structural Construction</i> | \$0.00 M | \$0.00 M | \$1.68 M | \$0.00 M | \$0.00 M | \$1.68 M |
| <i>Operational Construction (Lighting, Pavement Marking, Signing and Signal Improvements)</i> | \$0.10 M | \$0.11 M | \$0.13 M | \$0.10 M | \$0.10 M | \$0.54 M |
| <i>Utility Construction</i> | \$0.00 M | \$0.00 M | \$0.00 M | \$0.00 M | \$0.00 M | \$0.00 M |
| <i>Resident Engineering</i> | \$0.05 M | \$0.06 M | \$0.21 M | \$0.06 M | \$0.05 M | \$0.43 M |
| Total Eng., PM & Construction | \$0.71 M | \$0.80 M | \$2.96 M | \$0.81 M | \$0.71 M | \$6.00 M |
| Contingency (30%) | \$0.21 M | \$0.24 M | \$0.89 M | \$0.24 M | \$0.21 M | \$1.80 M |
| Management Reserve (5%) | \$0.05 M | \$0.05 M | \$0.19 M | \$0.05 M | \$0.05 M | \$0.39 M |
| TOTAL | \$0.97 M | \$1.09 M | \$4.04 M | \$1.11 M | \$0.97 M | \$8.19 M |

Cost Range

| | | | | | | |
|------------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|
| Lower | \$0.73 M | \$0.82 M | \$3.03 M | \$0.83 M | \$0.73 M | \$6.14 M |
| Estimated | \$0.97 M | \$1.09 M | \$4.04 M | \$1.11 M | \$0.97 M | \$8.19 M |
| Upper | \$1.70 M | \$1.91 M | \$7.07 M | \$1.94 M | \$1.70 M | \$14.32 M |



The Highway 19 / Corcan Road interchange is estimated to cost about \$8.2 M, with a range of precision varying between \$6.1 M and \$14.3 M. Costs for potential property acquisition associated with the roundabout and other project elements are not included. Also, further to a desktop review using Google Street View, no cost was applied for utility construction – a site visit would be required to ascertain any impact on utilities.

Approximate Benefit in Terms of Travel Time Savings

Travel time savings were evaluated from two centroid locations along the Corcan Road corridor - one on the west side of Highway 19 at Meadowood Way / Galvin Place (west centroid), and one on the east side of Highway 19 at Corcan Road / Grand Rose Road (east centroid) – to three origin / destinations:

- Memorial Avenue / 1st Avenue West in Qualicum Beach.
- Highway 19, immediately south of the Highway 4 interchange.
- Highway 19 / Horne Lake Road intersection.

The centroids and origin / destinations used for travel time savings analysis are illustrated in Figure 4.

Although road connections exist to Highway 4 via Melrose Road, and to Horne Lake Road on the west side of the highway via Ashling Road to Spider Lake Road, no traffic was assumed to travel these two corridors as portions of these roadways occur along private property.

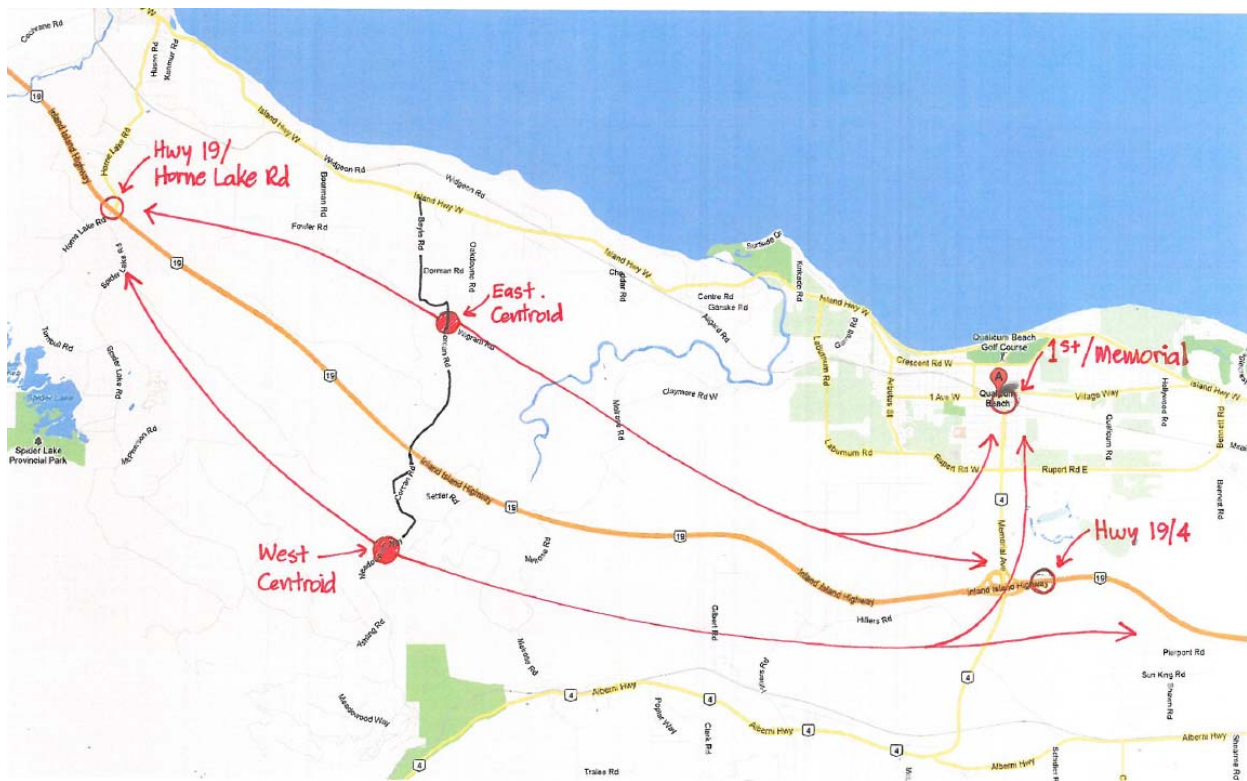


Figure 4 – Centroids and Origins / Destinations

Therefore, the vast majority of motorists from the Corcan Road corridor access the external road network via the Highway 19A / Baylis Road intersection, and the resulting travel distances and travel times are compared in Table 2 for existing conditions and with an interchange at Highway 19 / Corcan Road.

Table 2 – Travel Time Savings

| To/From | West Centroid | | East Centroid | |
|-------------------------------------|--------------------|-------|---------------------|-------|
| | Meadowood / Galvin | | Corcan / Grand Rose | |
| | (km) | (min) | (km) | (min) |
| Existing Condition | | | | |
| 1st / Memorial | 15.3 | 23 | 11.6 | 16 |
| Hwy 19 / 4 | 18.9 | 28 | 14.9 | 20 |
| Hwy 19 / Horne Lake | 13.7 | 22 | 9.8 | 14 |
| With Corcan Road Interchange | | | | |
| 1st / Memorial | 13.0 | 14 | 14.0 | 16 |
| Hwy 19 / 4 | 10.8 | 10 | 12.1 | 12 |
| Hwy 19 / Horne Lake | 8.7 | 9 | 9.1 | 9 |
| Difference | | | | |
| 1st / Memorial | -2.3 | -9.0 | 2.4 | 0.0 |
| Hwy 19 / 4 | -8.1 | -18.0 | -2.8 | -8.0 |
| Hwy 19 / Horne Lake | -5.0 | -13.0 | -0.7 | -5.0 |

Table 2 shows that an interchange at Highway 19 / Corcan Road would generally provide substantial travel time savings. Residents on the west side of the highway - which represent approximately 2/3's of the population living along the Corcan Road corridor - would benefit the most, with as much as 18 minute savings to/from Highway 19 / 4 in the south and 13 minute savings to the Highway 19 / Horne Lake Road intersection in the north.

Potential Staging Option

As the majority of traffic using an interchange at Corcan Road would be anticipated to travel to/from the south (75-80%), the interchange could be staged to initially include only the NB off-ramp and SB on-ramp, which would also include the roundabout on Nahmint Road. This initial construction stage would reduce the estimated construction cost to about \$2.3 M to \$5.3M. However, there are risks associated with staged construction, including:

- In the absence of ramps to/from the north, some motorists may be tempted to traverse the existing depressed, grassed median along Highway 19 to complete left turn manoeuvres to/from the north.
- Even phased improvements may not be warranted; however phased construction may unrealistically raise community expectations around completion of the full interchange.



Warrant Guidelines for interchanges

Warrant guidelines for interchanges are not very specific, and require an assessment of several factors. Typical factors to consider when planning for an interchange are listed in Table 3.

Table 3 Warrant Guidelines for Interchanges

| Criteria | Discussion | Relevance to Proposed Highway 19 / Corcan Road Interchange |
|------------------------|---|--|
| Traffic Volumes | Interchanges are generally more desirable at locations with high cross-street volumes, but may be considered at low volume locations where no suitable alternative access exists. | Estimated interchange ramp volumes are low. |
| Traffic Safety | The crash reduction benefits of an interchange may warrant its selection. | Crash benefits not computed, but benefit estimated to be low. |
| Road-user benefits | Reduced out-of-way travel time can contribute to an interchange warrant, particularly if the road-user benefits exceed costs over the service life of the interchange. | Although travel time benefits per vehicle are substantial, particularly for motorists on the west side of the highway, the number of affected motorists is low. |
| Cost | High construction costs may be prohibitive, especially if sufficient life cycle benefits are not realized. | \$8.2M |
| Interchange Spacing | The TAC Geometric Design Guide for Canadian Roads states that interchanges are normally spaced at between 3 km and 8 km in rural areas and between 2 km and 3 km in urban areas. | A distance of 13.5 km between the Hwy 4 interchange at Qualicum Beach and the Horne Lake Road intersection suggests there may be a future need for an interchange to improve mobility. |
| Topography | A grade-separated interchange may be more feasible than an at-grade intersection due to topographical conditions. | Topography does not appear to be a constraint and an underpass for Corcan Road already exists. However, the elevation difference between Hwy 19 and Corcan Road will require longer ramps. A detailed survey would confirm any topographical or other constraints. |
| Roadway Classification | Interchanges are normally only constructed at freeway (systems interchange) or arterial / collector (service interchange) junctions. | Corcan Road is a collector servicing a limited area. |

TAC Section 2.4.2.1 states, “Crossing roads interchanging with freeways are normally arterial roads; however, in some cases it is appropriate to develop interchange at collector roads or local roads where travel distance to adjacent arterial roads is excessive”. What is considered an “excessive” amount of travel distance is debatable. In this case, travel distances from the east centroid are probably not considered excessive, as travel time to Qualicum Beach would not be improved with an interchange, and



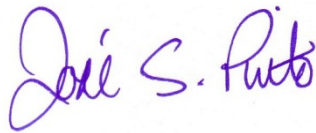
travel time savings to Highway 19 would only be about 5-8 minutes. Travel times from the west centroid are more pronounced, as the lack of an interchange incurs additional travel times of 9 minutes to Qualicum Beach and 13-18 minutes to Highway 19.

TAC Table 2.4.2.1 also provides a means for selection of interchanges, grade separations and intersections based on classification. For a freeway / collector crossing in a rural setting, the TAC recommendation states, “*normally grade-separation or alternatively the collector/local may be closed*”. TAC’s guidance does not provide a clear indication for an interchange requirement at Highway 19 / Corcan Road. In this case, the Ministry’s intent is not to close Corcan Road, but to investigate an interchange warrant. Further study to quantify financial benefits versus costs may be required to assist with the decision-making process.

Please call the undersigned if you have any questions.

Yours very truly,

McELHANNEY CONSULTING SERVICES LTD.



José S. Pinto, P.Eng., PTOE
Division Manager, Traffic & Transportation Planning

email: jpinto@mcelhanney.com
JSP:van