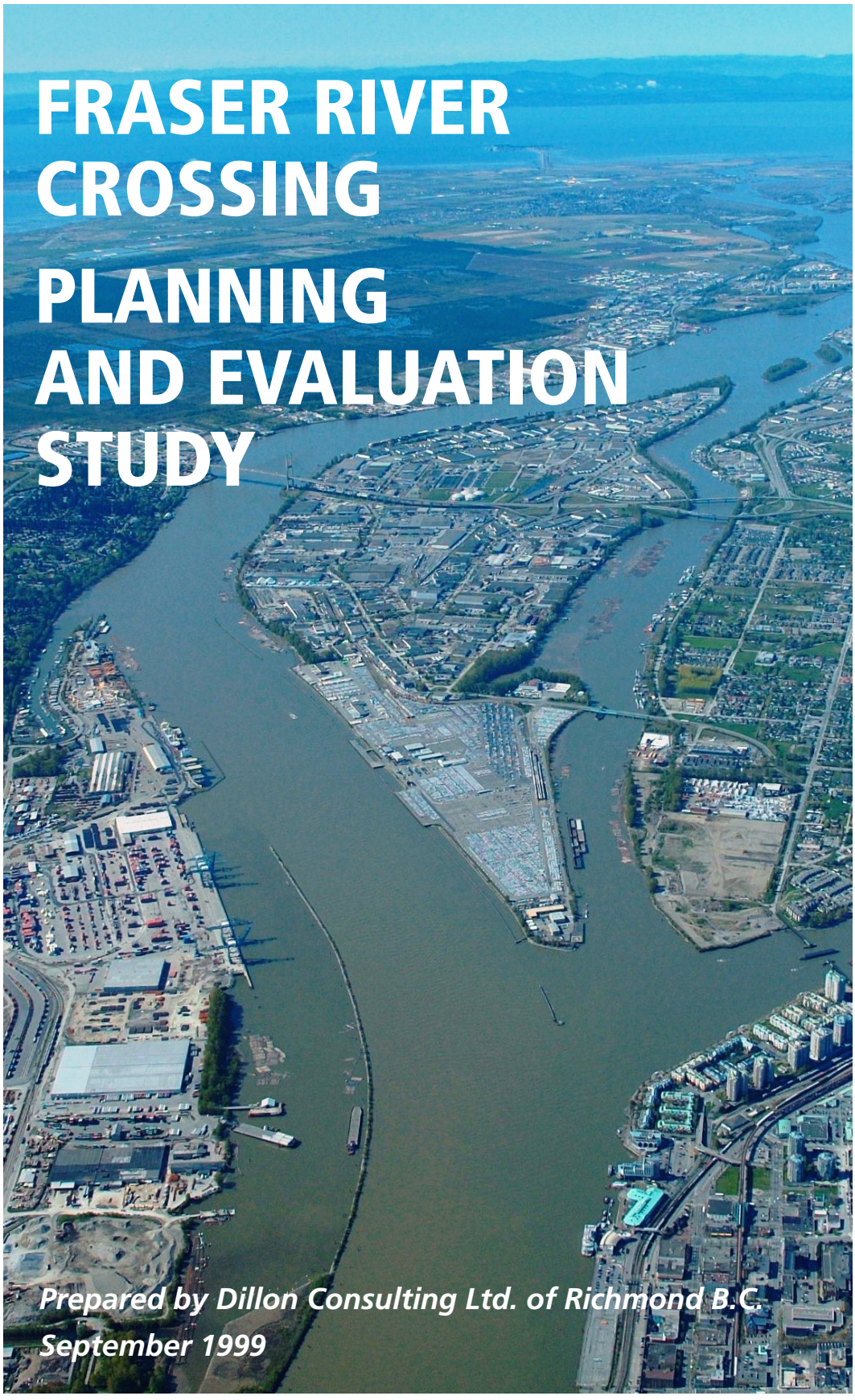
FRASER RIVER CROSSING PLANNING AND EVALUATION STUDY



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INTRODUCTION

The concept of an additional Fraser River Crossing better connecting the provincial and regional transportation network in Maple Ridge/Pitt Meadows and Surrey/Langley has been around for some time. Previous work completed for or by the Ministry of Transportation indicate conceptual development of alternatives for this crossing at the time when the Trans Canada Highway was being upgraded through this area (1960's). In the last decade, regional planning resulting in the GVRD Livable Region Strategic Plan and Transport 2021 has confirmed an additional crossing forms part of the long range plan for the lower mainland within the context of providing efficient movement of people and goods within a compact metropolitan area.

At this time, the Ministry of Transportation is studying several improvements to the provincial network recognizing guiding principles and policies of the South Coast Region Systems Plan and the GVRD. These include important projects such as addressing constraints and providing additional capacity along the Trans Canada Highway east and west of the Port Mann Bridge, addressing congestion through the Cape Horn interchange, and development of the South Fraser Perimeter Road. Progress on these programs may benefit from better definition of the long range concept for an additional Fraser River Crossing. Better definition of the crossing corridor may also assist regional and municipal planning interests prepare for the significant influence a new river crossing would be expected to generate.

In addition to building compatibility with other provincial, regional, and municipal transportation programs, the current crossing service within the physical study area (i.e., the Albion Ferry) has been down loaded from provincial to regional jurisdiction. This service, now operated by the GVTA, is considered to have high annual costs and the existing ferry vessels are approaching the end of their service life. Therefore, there exists an added interest in an additional crossing of the Fraser River as an ultimate replacement and upgrade to the existing ferry operation.

OBJECTIVES

To satisfy planning for the long term and apparent shorter term requirements, this study was developed with the following specific objectives.

- develop an understanding of the nature of demand for an additional Fraser River Crossing and determine the appropriate role and function for such a facility;
- conduct broad agency consultations for the purposes of acquiring current information and perspectives that would contribute to determination of role and function;
- incorporate high level planning policies of the Greater Vancouver Regional District with respect to land use growth and management in the lower mainland;
- organize the information and develop conceptual designs of high level facilities to an extent that would facilitate a comparative evaluation of the corridor options;
- develop and evaluate low cost, low level options as possible alternates to high level highway facilities; and
- prepare a comparative evaluation in a suitable framework that makes it possible to identify and evaluate important tradeoffs between the corridor options.

RESULTS

Based on the effort and results of this study, described in this report, we have concluded that many of the study objectives have been achieved. Existing documentation of an additional Fraser River Crossing concept has been assembled with more current information on land use and transportation in the overall study area to provide a consolidated foundation for consideration of the crossing. Liaison with relevant agencies has provided meaningful input and has started the process towards more comprehensive consultations.

This considerable background information and agency input has characterized an increasing travel demand between the North and South Fraser River communities within the GVRD. Upon review of employment and population growth trends, both historic and strategic, the background information supporting this characterization is sound.

Functionally, total probable traffic estimates indicate the need for a higher order facility. Within the context of the boundary conditions characterized by the TCH (Urban Freeway) and the Lougheed Highway (Urban Expressway/Arterial) the possible function of the additional Fraser River Crossing is framed. Based on the anticipated travel demand characteristics and the boundary conditions, the desired role for an additional Fraser River Crossing should be for regional/provincial mobility (with emphasis on the regional aspect). The function of the additional Fraser River Crossing should be Urban Expressway (Provincial Highway or GVTA Major Road) or a high order Arterial as a minimum.

Conceptual designs have been developed consistent with this desired role and function and to a level that permits issue identification, impact assessments, and probable cost/benefit assessment.

Several alternatives for each of the crossing location options were developed based on design criteria established to suit the desired role and function. Results of a preliminary evaluation, based on technical and environmental assessment activities associated with this study, permitted selection of alignments and facility configurations that reasonably reflect the opportunities at each of the crossing option locations. These can be described as follows:

- **Option 1 - Do nothing** - While not technically a crossing option, not completing a new link in the provincial/regional network represents a base case from which make relative comparisons. For these base case comparisons, most of the analysis and evaluation is completed for the horizon year 2021 and assumes 8 lanes on the Port Mann Bridge by that time.

HIGH LEVEL OPTIONS

High Level Options have been defined as those that meet the established Role and Function for an additional Fraser River Crossing, namely to serve regional and provincial mobility along an urban expressway. The configuration of this expressway includes 2 general purpose lanes in each direction and safely conveys traffic at a posted speed of up to 90 km/h. The crossing structures also meet regulated navigable water requirements, although in the case of one of the options (i.e., the Cottonwood crossing option) the regulated clearance chosen reflects a location just upstream of it's actual location with the assumption that this will gain approval. The High Level Options can be generally described as follows:

Option 2 - Barnston Crossing – Alignment A3 was developed as an Urban Expressway with 2 general purpose lanes in each direction and meeting navigable water clearance requirements (i.e., 45.7 m over Parson's Channel and tunneling beneath the main arm of the Fraser River).

Option 3 - 200th Street Crossing – Alignment B2 was developed as an Urban Expressway with 2 general purpose lanes in each direction and meeting navigable water clearance requirements (i.e., 45.7 m over the main arm of the Fraser River)

Option 4 - Cottonwood Crossing – Alignment C3 was developed as an Urban Expressway with 2 general purpose lanes in each direction and meeting navigable water clearance requirements within close proximity to the crossing location (i.e., 27.4 m over the main arm of the Fraser River)

LOW LEVEL OPTIONS

This study recognizes that the existing Albion Ferry operation has been transferred to the GVTA. Furthermore, it is understood that operating costs for this service run about $4 million per year, and that the ferry vessels are approaching the end of their service life. From this, the concept of a low level/low cost crossing is borne and considered to be a short to long term solution for replacing and improving the existing Albion Ferry service across the Fraser River.

To achieve economies, Low Level Options are defined in two ways:

- Low level options may employ smaller, less costly structures which may not conform to regulated marine clearance and/or they may employ moveable bridge spans to facilitate all marine movements; and
- Low level options may provide reduced capacity (i.e., two lane facility).
- Based on these defining characteristics, the low level options are not expected to serve an equivalent role and function to the high level options previously introduced. It is envisaged that these options would comprise two lane facilities and serve regional/municipal mobility.

The main constraint associated with the development of low level options is the marine navigation requirements (the vertical clearance requirement east of the Port Mann Bridge is constant at 45.7m up to Kanaka Creek, and at this point, the vertical clearance criteria to that at the Mission Bridge or about 27.4m). Unfortunately, there is very little marine traffic data readily available to perform any analysis of marine versus traffic conflict impacts to help optimize a crossing profile or configuration.

Low level options are not considered to be feasible at either the Barnston and 200th Street Crossing options due to an anticipated higher frequency of larger vessel marine movements. Marine traffic would have right-of-way and interruption of peak bridge traffic may create sizable queues that would take hours to discharge. Low level options may also be problematic at the Cottonwood location because of a similar probability of severe traffic delays, although the location is upstream of where high use by larger marine vessels has been reported. Therefore, and because the Cottonwood Crossing alignments are very close to Kanaka Creek, the geographic boundary where clearance requirements begin to relax, it is considered reasonable to expect that a lower clearance may be permitted.

Marine industry and traffic diminishes in the vicinity of, and upstream of Kanaka Creek. Therefore, based on the possibility river navigation requirements will be less, it is estimated that low level options are most feasible near this area which includes the Albion Crossing locations, and possibly the Cottonwood Crossing location as well.

The lowest cost of potential alignment alternatives would be one that maximizes the existing infrastructure serving as the approach to the existing Albion Ferry service. Therefore, low level options developed for this study include the following:

- **Option 5A - Albion Crossing** – Alignment D2 was developed as lower capacity roadway facility using predominantly existing infrastructure (including the existing bridge over Bedford Channel) and crossing the main arm of the Fraser River on a low profile structure (10 m clearance) with moveable bridge spans for facilitating passage of larger marine vessels.
- **Option 5B - Albion Crossing** –Alignment D5 developed as lower capacity roadway facility using existing infrastructure but including a substantial by-pass to the west and south of Fort Langley, and crossing the main arm of the Fraser River on a low level structure

(less than 27.4 m clearance) and Bedford Channel on a new structure with similar low profile to that of the existing Bedford Channel Bridge.

Traffic impacts to Fort Langley are expected to be significant under Alignment D2, and while some mitigation of these impacts and their associated costs have been incorporated into this alternative, operational difficulties are expected to remain.

As an alternate to the low profile Albion option, a comparable concept for a low profile crossing at the Cottonwood location has also been explored. It has been stated that low profile options at this location may be problematic. However, rationale for development of this alternative also relates to Cottonwood's proximity to the east, where large vessel marine traffic is expected to decline, and to an attempt to avoid significant traffic impacts to Fort Langley. Upgrading a low level facility to high level at Cottonwood is also a possibility that does not exist at the Albion location. This alternative can be generally described as follows:

Option 4B - Cottonwood Crossing – Alignment C3 Low Profile was developed as a lower capacity highway with 2 general purpose lanes (1 in each direction) at-grade intersections with the supporting road network, grade separation of the CPR lines, Haney Bypass, and Lougheed, and a low profile bridge using moveable spans crossing the Fraser River.

EVALUATION

In addition to development of the alignments and facility configurations, transportation analysis associated with this study tested the alternative crossing locations, through the use of the emme/2 transportation model, on their own and with various network, land use, and demand management sensitivity tests.

The base case modeling parameters selected for this transportation analysis was the 2021 horizon year assuming 8-lanes on the Port Mann bridge, the Historic Trend Scenario (HTS) land use scenario, and the GVRD tolling strategy for all bridge crossings. From this, important observations made about forecasted demand included the following:

- Forecasts for the base case indicate a significant and relatively consistent demand in the peak direction over each of the crossing options (i.e., about 3900 to 4450 vehicles per hour (vph) on the high level facilities and about 2250 vph on the low level facility).
- This demand is representative of the full capacity of the two (or single in the case of the low level) general purpose lanes per direction of travel adopted for this urban expressway.
- Peak direction is southbound across the Fraser River and predominantly comprises trips from Maple Ridge/Pitt Meadows to Surrey/Langley.
- Relief to other bridges in the area is not substantial.

Sensitivity testing was conducted to determine how robust our interpretation and/or conclusions were relative to the base case. These tests included consideration of the scenario where only 5 lanes would be available on the Port Mann bridge, that the Growth Management Strategy (GMS) land use projections are achieved instead of the HTS projections, and that the tolling strategy is not implemented.

The effects of limiting capacity on the Port Mann Bridge (i.e., to 5 lanes) does not alter these broad conclusions. The GMS land use assumptions strengthen the interaction between the observed predominant origin/destination pairs. And should tolling not be implemented, the increased travel demand is generated proportionally among origins.

Essentially, there appears to be a significant demand between the land uses on either side of the Fraser River, mainly between Maple Ridge/Pitt Meadows and north Surrey/Langley. We have concluded that these predominant origin/destination pairs account for up to 85 percent of the trip demand for the crossing. Furthermore, we have concluded that this demand is characteristic of intra-regional or inter-municipal travel, and in the setting described, this would be consistent with the GVRD's Livable Region Strategic Plan. Therefore, we find that this study supports a conclusion that an additional Fraser River Crossing is needed.

In terms of time frame, there appears support for the crossing in the near term. Forecasts indicate that demand in 2006 will be 55 to 60 percent of the 2021 demand. While this is significantly less traffic than anticipated in 2021, it still represents a substantial proportion of the proposed capacity

of the crossing. Therefore, subsequent planning efforts may wish to reconsider when supply can be provided. It has been acknowledged that acceleration of the project may be inconsistent with the LRSP and Transport 2021 which have identified an additional Fraser River Crossing as a long term priority. In this context, other regional transportation policies, plans, and priorities need to considered.

The results of the technical development of alternatives, environmental assessment, and transportation analysis have facilitated a comparative evaluation between the crossing options. This evaluation was structured into a Multiple Account Evaluation framework where the main accounts included Financial, Customer Service, Socio/Community, Economic Development, and Environmental.

HIGH LEVEL OPTIONS

With respect to this comparison, it is apparent to us that the 200th Street and Cottonwood options emerge as preferential High Level candidates for further consideration. This conclusion is based on acknowledgment of the substantial challenges associated with the Barnston option as follows:

Rejection of the Barnston High Level Option

We have concluded that the Barnston crossing option will be the most costly and risky from an implementation perspective. Furthermore, significant environmental issues confront the approvals associated with this option. It was hoped that the Barnston option would perform a superior provincial role than other options. Based on model results, this now does not appear to be the situation. Therefore, we have concluded that this location option should be dropped from further consideration.

Preferential High Level Candidates

By the process of setting aside the Barnston, we are left with the 200th Street and Cottonwood options. Each of these will serve the anticipated demand well. However, we have concluded that the 200th Street option is better aligned to a balanced north/south travel "desire-line" and also less likely to induce pressure to expand urban growth boundaries in Maple Ridge and Pitt Meadows. This option is also attractive due to it's avoidance of sensitive lands and probably less controversial, although more costly, land requirements. This option will probably be more costly overall than the Cottonwood option mainly due to the bridge structure, which meets a higher clearance requirement and is nearly twice as long to span a wider reach of the Fraser River.

The Cottonwood option is attractive because it may be achieved at lower costs and it serves the anticipated regional demand reasonably well. Staging opportunities were also identified here that could make use of reduced capacity fixed bridge structure or moveable bridge span technology. The later presents a viable alternative to the Low Level concept introduced at the Albion location. Risks cited, however, are that this location may contribute to longer trip making using the TCH (i.e., Mission to the TCH and west bound). This may represent an increase in pressure to expand urban growth boundaries in Maple Ridge and Langley, which may also impact upon existing ALR.

LOW LEVEL OPTIONS

The Albion options have been developed to a lower standard and with half the capacity of the other options. This is mainly because it was recognized that traffic impacts to MacMillan Island and Fort Langley would be significant. Additional assessment has also concluded that traffic operations under the reduced capacity scenario will still be difficult to manage without severe traffic impacts to Fort Langley.

An alternate to the low level/low profile alignment at Albion was developed at the Cottonwood location. Here, reduced capacity roadway and crossing is feasible and comparable in terms of cost to the Albion option. It can also be delivered in a manner that would not preclude upgrading to a high level facility at some future time frame.

Therefore, because the low level options at the Albion location will not meet, and/or facilitate staging for, the long term demand requirements, and they retain significant impacts to Fort Langley, this location should be dropped from further consideration. Should a low level/low profile alternative be pursued, then the Cottonwood C3Low Profile Alignment should be considered the preferential candidate.

RISKS AND OPPORTUNITIES

There are risks and opportunities in pursing any of the additional Fraser River Crossing options. Important considerations for future planning and engineering of this project should include the following;

HIGH LEVEL OPTIONS

Capital Costs

Probable capital costs prepared for this study are very preliminary and based on conceptual planning work. These were developed for comparison purposes only and should not be relied upon for budget purposes. For example, a key challenge/constraint in all of the options explored is the geotechnical conditions to support a major bridge. This challenge has not been adequately quantified to advise on the absolute cost implication for a particular option. It has been sufficient to assume that the risk is equal among options to facilitate comparison.

Marine Navigation Requirements and Bridge Capital Costs

The High Level crossing at Cottonwood has assumed qualified compliance with regulated marine navigational clearance requirements. Due to the proximity of the Cottonwood alignment to Kanaka Creek, the geographic boundary where navigable water requirements begin to relax, it has been assumed that the reduced regulated clearance could be applied for and approved. If approval of the regulated clearance criteria for upstream of Kanaka Creek can not be obtained for use at the

Cottonwood location, then apparent economies from the scale of bridge crossing dematerializes.

Some additional study into marine traffic would contribute to a better understanding of opportunities for lower profile structures, both at the high level and low level options. Furthermore, this data would be essential to evaluate operation feasibility of moveable bridge span options (i.e., impacts to both marine and vehicular traffic in the context of established service level requirements).

Staging of Project Development and Investment

Under an accelerated project scenario, opportunities for project staging may be desirable and key factors in the evaluation of the options. Opportunities may exist with the Cottonwood and 200th Street option as follows:

Cottonwood Staging – Land is currently owned for an interchange between a new Cottonwood Expressway with Haney By-pass/Lougheed Highway. Starting from the north, the corridor could be developed initially to 96th Avenue. Furthermore, and depending on marine clearance approvals, it may be possible to stage construction of the superstructure and provide a narrower crossing initially (i.e., build ultimate north bound lanes and use them for two-way traffic in the interim). We know the demand will be strong and the risk is that impacts to 96th Avenue may be significant requiring some widening of this municipal route to accommodate increased traffic.

The **200th Street** option has staging potential related to specific components. If pursued immediately, planning and design of the 200th Street interchange to accommodate this corridor could be completed as part of the current 200th Street interchange project. The arterial network on the south side of the Fraser River may also be adequate for an interim term until full upgrading to urban expressway standard can be achieved. Current municipal plans for upgrading and development of Maple Meadows Way and the supporting municipal network could also be modified to receive the proposed crossing in the future. However, with respect to cash flow, a more significant share of the full costs is tied to the main structure.

CUSTOMER SERVICE – FUTURE ECONOMIC DEVELOPMENT POTENTIAL

Among the preferred candidates, 200th Street possess better opportunities for expressway/urban arterial connectivity to the south. These extended corridors exist along 200th Street to the concept of a Highway 1 to Highway 99 Connector being developed by Surrey, and along Highway 15 (176th Street). There is better potential here for regional trips between the predominant origin/destination pairs to stay on regional/municipal facilities. The Cottonwood alignment terminates at the TCH which may promote short distance travel on the TCH when approaching or departing from the new Fraser River Crossing.

Customer Service - Regional and Municipal Road Network Planning

We have described the apparent attraction between the communities on the north and south sides of the Fraser River as an opportunity realized with the implementation of an additional Fraser River Crossing. Furthermore, from the analysis, it is apparent that this demand filters in to the municipal sub-sectors quickly after crossing the river. Impacts to the existing regional and municipal road network may be significant requiring upgrades and/or redistribution of existing capital programming within the municipalities most affected. This challenge is presented as a risk in terms of managing stakeholder participation. Some municipalities may have better resources to participate with network upgrading to fully realize the synergy between the north and south Fraser River communities.

LOW LEVEL OPTIONS

The chief opportunity with a low level/low cost facility is the prospect of delivering some capacity that is compatible with the LRSP sooner than later. Between the options identified, each will achieve a modified role and function with respect to mobility and capacity compared to the high level options. Risks can be summarized as follows:

- There are concerns with respect to the Albion through town alignments and impacts to the character of Fort Langley that may require consideration of more progressive traffic diversion from Fort Langley. Therefore, there is a risk in assuming that the low cost option through Fort Langley can be easily achieved.
- The magnitude of traffic demand forecasted, on a per lane basis, exceeds the capacity normally assigned for general purpose through lanes on a continuous facility. In a confined urban situation (i.e., Fort Langley) with cross street traffic and pedestrian movements, the forecasted demand will not be served on a two lane roadway. Therefore, the bridge crossing the Fraser River may be a two lane facility, but additional lanes will likely be needed on the approaches to both ends of the bridge to manage the converging and diverging movements.
- The through town option (D2) relies on the existing bridge over Bedford Channel. This is a narrow two lane bridge that also serves as pedestrian access to MacMillan Island. The intersection of the proposed 96th Avenue connector is squeezed between the abutment to this bridge, the CNR lines, and important commercial land uses. It will be very difficult to make traffic operations work along this configuration. It will be even more difficult to maintain safe pedestrian access to MacMillan Island and integrate transit priority measures along this option without substantial upgrading of this existing bridge.
- There is a risk that a low level fixed structure will not get approval (because of navigable water requirements) and a moveable bridge alternative is the only other low cost option available. With a moveable bridge, impacts to marine traffic and probable delays to road traffic have not been addressed.

In summary, while a low level option in the vicinity of the Albion location appears technically feasible either through town or on a by-pass, significant traffic impacts to Fort Langley and capacity limitations for the future consideration present unfavorable evaluation results. Furthermore, while

the through town alignment appears very attractive from an equivalent investment perspective relative to the existing ferry service, proper acknowledgment of probable impacts and mitigation planning may increase costs significantly. Consultations with Fort Langley and the Township of Langley will be necessary to fully assess these risks and the opportunity.

An alternate to the low cost Albion, located along the Cottonwood alignment is also feasible at a moderate and more predictable premium in overall costs. Should a low level/low profile option be pursued, the Cottonwood C3 Low Profile location should be considered.

IMPLEMENTATION SCENARIOS

Given the assessment of these low level alternatives, and considering the long term demand for a high level crossing of the Fraser River, the following implementation scenarios are recommended for further review:

- 200th Street B2 High Level by 2021
- Cottonwood C3 High Level by 2021
- 200th Street B2 High Level (Stage 1: High Level Crossing with arterial functioning route between TCH and Lougheed) before 2006 and Upgrade (Stage 2: Urban Expressway function between TCH and Lougheed) by 2021
- Cottonwood C3 High Level (Stage 1: Lougheed to 96th Avenue) before 2006 and Upgrade (Stage 2: 96th Avenue to TCH) by 2021
- Cottonwood C3 Low Profile before 2006 and High Level Upgrade in 2021
- Cottonwood C3 Low Profile before 2006 and 200th B2 High Level by 2021

In each of the above, the need for a high level facility in 2021 is based on the projected demand determined from the Transportation Analysis activity. This demand is significant and even exceeds the probable effective capacity of the stipulated four lane divided expressway facility used in the transportation model. Therefore, while investment in an interim or staging strategy accommodates the apparent immediate demand, it does not defer the ultimate need for assured north/south capacity across the Fraser River in the vicinity of Pitt Meadows/Maple Ridge and Surrey/Langley.

Among the next stages to pursue in development of an additional Fraser River Crossing Project and implementation strategy, municipal and public consultations, investment strategies, and marine socio-economic analyses are required to frame final planning and design of the best alternatives, and selection of the preferred implementation scenario.

CLOSURE

This study provides detailed information from which to distinguish these options. However, as consultations have not yet been completed, it is premature for us to assign weights and rankings to adjudicate a preferred option for a positive single solution recommendation. Instead, we offer the following:

- It is recommended that the need for an additional Fraser River Crossing described in this report be acknowledged and that the role and function be confirmed as providing for regional/provincial long term mobility along a High Level facility;
- It is recommended that should a low level facility be pursued to serve the interim demand, then one of the staging scenarios involving the Cottonwood alignment be considered; and
- It is further recommended that all options developed as part of this study be maintained for the purposes of sharing this process in more comprehensive consultations but that additional investment in planning and engineering recognize that the 200th Street and Cottonwood options are the only viable candidates examined in this study that will satisfy the long term demand