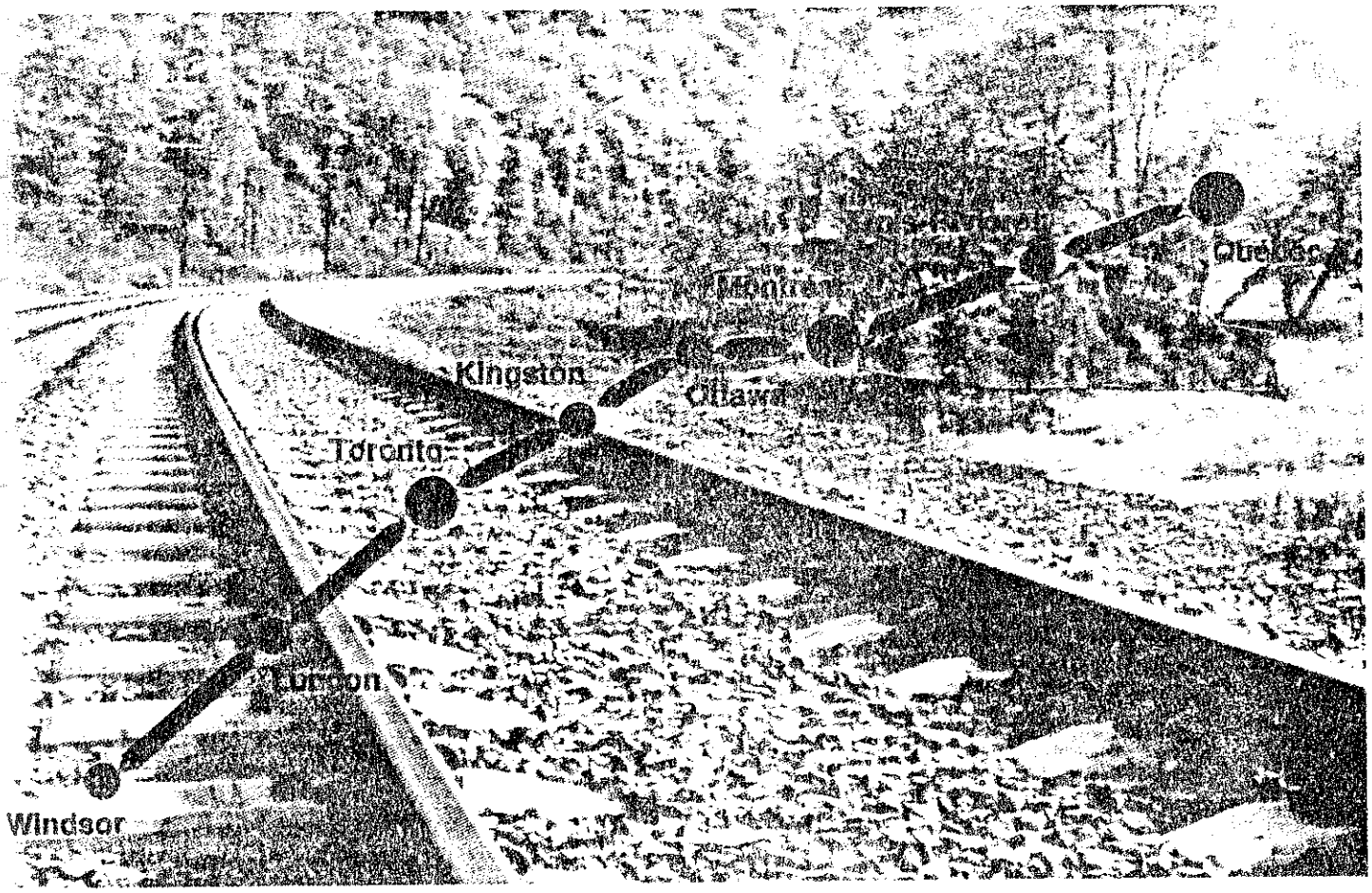
Quebec-Ontario High Speed Rail Project

Preliminary Routing Assessment and Costing Study

Interim Report No. 1

February, 1993



SNC-LAVALIN and DELCAN

in association with:

- **CANARAIL**
- **SOFRERAIL**
- **SWEDERAIL**

DELCAN ENGINEERS PLANNERS ARCHITECTS

March 4, 1993

Our Ref: 01-3164-A00
File Ref: LE:054

Mrs. Carmen Hall
Director, Executive Services
Transport Canada
Policy and Coordination
Place de Ville
Tower "C" - 19th Floor
Ottawa, Ontario
K1A 0N5

Dear Mrs. Hall:

Re: Quebec-Ontario High Speed Rail Project
Preliminary Routing Assessment and Costing Study
Interim Report #1

Pierre Asselin has requested that we forward one unbound copy of Interim Report #1 so that the necessary copies for distribution to Committee Members can be made by your office.

The location of the large exhibits is identified by blank sheets with exhibit numbers placed in the document.

If you have any questions please do not hesitate to call Muriel Rodrigues at (416) 441-4111 ext. 180.

Yours sincerely,

for R.W. Bowes
Study Manager

LE:mr

REÇU
MAR 17 1993
BUREAU DU SOUS-MINISTRE
TRANSPORTS

DELCAN CORPORATION
133 WYNFORD DRIVE, NORTH YORK, METROPOLITAN TORONTO CANADA, M3C 1K1 • (416) 441-4111
TELEX 06-9666-89 • FAX: (416) 441-4131
ST. JOHN'S, MONTREAL, OTTAWA, HAMILTON, NIAGARA FALLS, LONDON, THUNDER BAY, WINNIPEG, REGINA, SASKATOON, CALGARY, VICTORIA, VANCOUVER

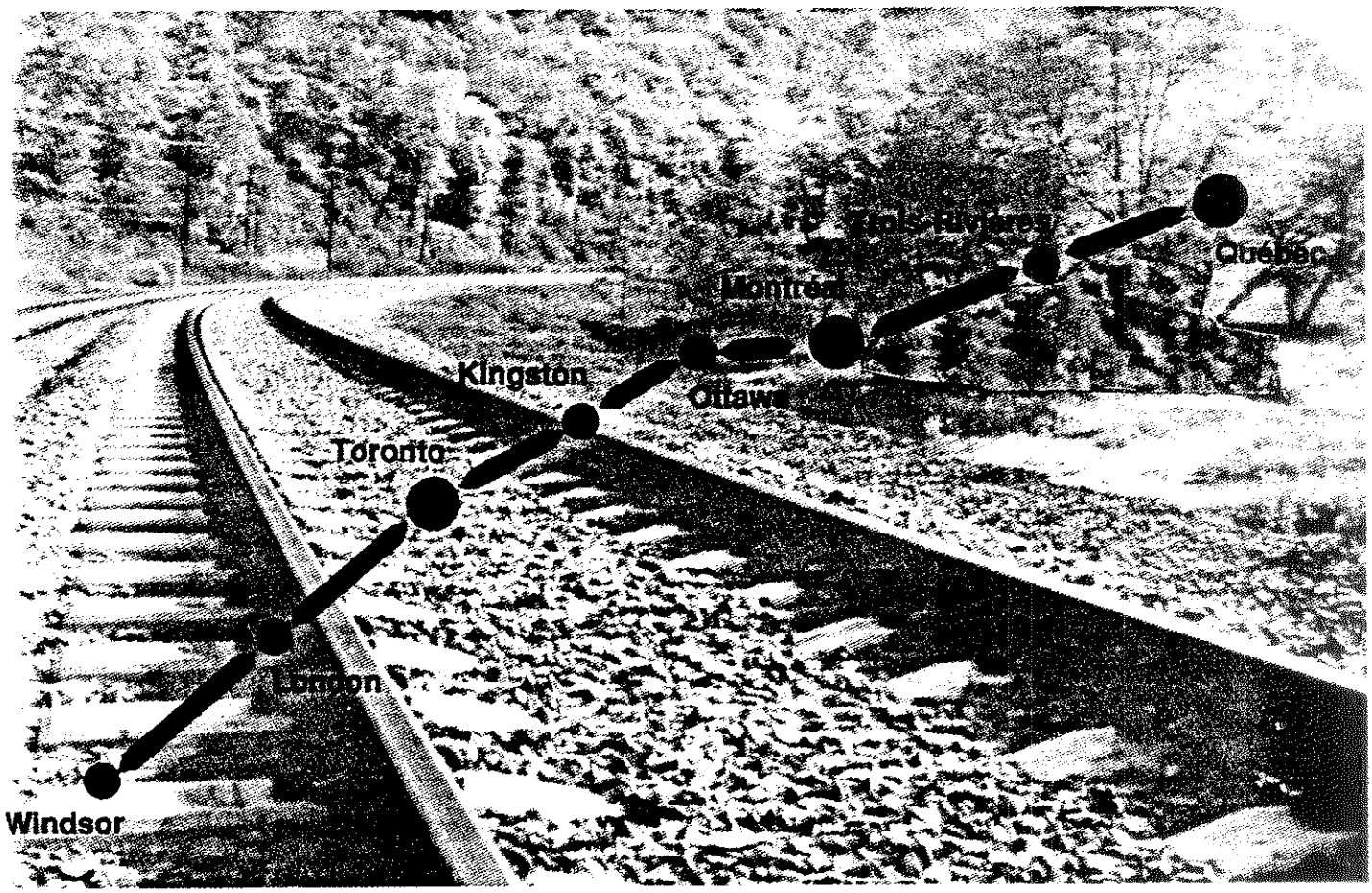
CONFIDENTIAL

Quebec-Ontario High Speed Rail Project

Preliminary Routing Assessment and Costing Study

Interim Report No. 1

February, 1993



SNC-LAVALIN and DELCAN

in association with:

- CANARAIL
- SOFRERAIL
- SWEDERAIL

Table of Contents Page

1 EXECUTIVE SUMMARY 1-1
1.1 REPRESENTATIVE ROUTE - OVER 300 kph TECHNOLOGY IN A NEW RIGHT-OF-WAY 1-1
1.2 REPRESENTATIVE ROUTE - OVER 300 kph TECHNOLOGY USING EXISTING RIGHTS-OF-WAY 1-2
1.3 REPRESENTATIVE ROUTE - 200 - 250 kph TECHNOLOGY USING EXISTING RIGHTS-OF-WAY 1-3
1.4 URBAN OPTIONS 1-3
1.5 ISSUES 1-4

2 INTRODUCTION 2-1
2.1 STUDY PROGRAM 2-1
2.2 PROGRESS TO DATE 2-1
2.3 OBJECTIVES OF INTERIM REPORT #1 2-2

3 ROUTING ASSESSMENT 3-1
3.1 DIVISION OF CORRIDOR 3-1
3.2 PROCESS FOLLOWED IN ANALYSES 3-1
3.3 EVALUATION CRITERIA 3-3
3.4 TECHNOLOGY ISSUES AND JOINT OPERATIONS 3-4

4 QUÉBEC CITY URBAN AREA 4-1
4.1 CONTACT WITH MUNICIPALITIES 4-1
4.2 STATION OPTIONS 4-1
4.3 ROUTING OPTIONS 4-2
4.4 ISSUES 4-2
4.5 REPRESENTATIVE STRATEGY 4-3

5 CORRIDOR SECTION 1 - QUÉBEC CITY TO MONTRÉAL 5-1
5-1
5.1 EXISTING RAIL CORRIDORS 5-1
5.2 ROUTES IDENTIFIED IN PREVIOUS STUDIES 5-2
5.3 ROUTES IDENTIFIED IN THIS STUDY 5-2
5.4 CONTACTS WITH MUNICIPALITIES 5-3
5.5 EVALUATION 5-4

5.6 SELECTION OF REPRESENTATIVE CORRIDOR FOR COSTING 5-11

6 MONTRÉAL URBAN AREA 6-1
6.1 CONTACT WITH MUNICIPALITY 6-1
6.2 STATION OPTIONS 6-1
6.3 ROUTING OPTIONS 6-2
6.4 ISSUES 6-3
6.5 REPRESENTATIVE STRATEGY 6-4

7 CORRIDOR SECTION II - MONTRÉAL TO OTTAWA 7-1
7.1 EXISTING RAIL CORRIDORS 7-1
7.2 ROUTES IDENTIFIED IN PREVIOUS STUDIES 7-1
7.3 ROUTES IDENTIFIED IN THIS STUDY 7-2
7.4 CONTACTS WITH MUNICIPALITIES 7-3
7.5 EVALUATION 7-3
7.6 SELECTION OF REPRESENTATIVE CORRIDOR FOR COSTING 7-9

8 NATIONAL CAPITAL REGION 8-1
8.1 CONTACT WITH AREA MUNICIPALITIES 8-1
8.2 STATION OPTIONS 8-3
8.3 ROUTING OPTIONS 8-4
8.4 ISSUES 8-4
8.5 REPRESENTATIVE STRATEGY 8-5

9 CORRIDOR SECTION III - NATIONAL CAPITAL REGION TO TORONTO 9-1
9.1 EXISTING RAIL CORRIDORS 9-1
9.2 ROUTES IDENTIFIED IN PREVIOUS STUDIES 9-2
9.3 ROUTES IDENTIFIED IN THIS STUDY 9-3
9.4 CONTACTS WITH MUNICIPALITIES 9-5
9.5 EVALUATION 9-5
9.6 SELECTION OF REPRESENTATIVE CORRIDOR FOR COSTING 9-9

10 METROPOLITAN TORONTO 10-1
10.1 CONTACT WITH MUNICIPALITIES 10-1
10.2 STATION OPTIONS 10-1
10.3 ROUTING OPTIONS 10-3
10.4 ISSUES 10-4
10.5 REPRESENTATIVE STRATEGY 10-5

11 CORRIDOR SECTION IV - METRO TORONTO TO LONDON 11-1
11.1 EXISTING RAIL CORRIDORS 11-1
11.2 ROUTES IDENTIFIED IN PREVIOUS STUDIES 11-1
11.3 ROUTES IDENTIFIED IN THIS STUDY 11-2
11.4 CONTACTS WITH MUNICIPALITIES 11-3
11.5 EVALUATION 11-4
11.6 SELECTION OF REPRESENTATIVE CORRIDOR FOR COSTING 11-7

12 LONDON URBAN AREA 12-1
12.1 CONTACT WITH MUNICIPALITIES 12-1
12.2 ROUTING OPTIONS 12-1
12.3 REPRESENTATIVE ROUTES 12-2

13 CORRIDOR SECTION V - LONDON TO WINDSOR 13-1
13.1 EXISTING RAIL CORRIDORS 13-1
13.2 ROUTES IDENTIFIED IN PREVIOUS STUDY 13-1
13.3 ROUTES IDENTIFIED IN THIS STUDY 13-1
13.4 CONTACTS WITH MUNICIPALITIES 13-2
13.5 EVALUATION 13-2
13.6 SELECTION OF REPRESENTATIVE CORRIDOR FOR COSTING 13-5

14 WINDSOR URBAN AREA 14-1
14.1 CONTACT WITH MUNICIPALITIES 14-1
14.2 STATION OPTIONS 14-1
14.3 ROUTING OPTIONS 14-1

1 EXECUTIVE SUMMARY

This Interim Report #1 is intended to identify the representative routes, (chosen as a result of the evaluation of several alternatives) to be carried forward into Phase 2 of the Study Work Program for detailed review and costing. Confirmation of these routes is now required.

The routes included in the analyses were identified from previous studies, including the Carman - Bujold Report, VIA Studies, existing railway corridors or newly developed alignments.

The evaluation process was conducted using the available information to the maximum extent and incorporated Transportation Service, Natural and Socio-Economic Environment, and Cost elements.

For the purposes of this study, a "Representative" route for Financial Analysis is a route or alignment selected because it contains physical design attributes consistent with the technical criteria, provides opportunities for stations to be located in the urban areas in reasonable proximity to the market and represents a potentially cost-effective environmentally acceptable solution. They do not represent the overall "Best" alignment, nor the possible "preferred" alignment. The 3 alignments are chosen to provide a reasonable representative range of costs given the topography, technology and political constraints.

1.1 REPRESENTATIVE ROUTE - OVER 300 kph TECHNOLOGY IN A NEW RIGHT-OF-WAY

This route is illustrated in Exhibits E.S.1 (a) and (b). The alignment geometry in the rural section is consistent with at least a 350 kph operating speed. The new ROW utilizes the North Shore option between Québec City and Montréal. The route passes through Montréal on one of several corridors yet to be assessed in detail and discussed in Chapter 6.

Between Montréal and the National Capital Region (NCR) the over 300 kph route is located along the north shore, bypassing existing villages and penetrating the NCR through the existing rail corridor. It passes the existing abandoned Hull station and crosses the Ottawa River along

the alignment of the Chaudiére Bridge, to the west of the proposed redevelopment area of Lebretton Flats. The corridor options through the NCR are very limited, due to the mature urban development and are discussed further in Chapter 8.

South of Ottawa the selected representative route continues directly south-west to Smiths Falls, where it then turns south towards Kingston. Between Kingston and Toronto the route will make use of new ROW optimized from the Lakeshore/401 corridor and the parallel southern alignment, both shown on the Exhibit E.S.1 (a).

Route options through the Greater Toronto area are outlined in Chapter 10 and vary depending upon whether a downtown station or a suburban/airport station site is desirable.

Between Toronto and London the new ROW follows the 401 corridor south of Guelph, passing between Kitchener and Cambridge, with an opportunity for a station stop and then continues westward to London.

London urban area route options are outlined in Chapter 12. Between London and Windsor, representative new ROW generally follows the Highway 401 corridor.

1.2 REPRESENTATIVE ROUTE - OVER 300 kph TECHNOLOGY USING EXISTING RIGHTS-OF-WAY

This route is set out in Exhibits E.S.2 (a) and (b). The strategy was to make maximum use of existing rail corridors, upgrading the geometrics where necessary to meet the required standards. The route is briefly described as follows:

From Québec City, it uses the North Shore CP route to Montréal. Montréal options are described in Chapter 6. Between Montréal and the National Capital Region, there are several exit opportunities from Montréal, depending on the City station locations, and on the need to serve Mirabel. All options however focus on the use of the abandoned M&O subdivision to Ottawa. Ottawa options are set out in Chapter 8. Between Ottawa and Toronto the CN route to Smiths Falls and Kingston is used, and the CN route along the Lakeshore is followed into Toronto. Toronto options are described in Chapter 10.

Between Toronto and Windsor the CN Oakville and Dundas Subdivisions are followed to the north and west of Hamilton, and then to London. The CP Windsor subdivision is used between London and Windsor.

EXHIBIT E.S 1 (a)

EXHIBIT E.S.1 (b)

EXHIBIT E.S.2 (a)

1.3 REPRESENTATIVE ROUTE - 200 - 250 kph TECHNOLOGY USING EXISTING RIGHTS-OF-WAY

This alternative is much the same as the over 300 kph option, except for the geometrics required. With the less demanding geometric requirements more use of existing alignment was possible. The route is shown on Exhibits E.S.3 (a) and (b) described briefly as follows:

The CP North Shore is used between Québec City and Montréal. From Montréal the CP Windsor and CN Alexandria subdivisions are used to Ottawa. The CN Smiths Falls route is used and then the CP Brockville subdivision followed to the Lakeshore, where the route joins the CN Kingston subdivision along the Highway 401 corridor to Toronto. West of Toronto, the CN Oakville corridor is used to get to the CP Dundas subdivision to London. Between London and Windsor the CP Windsor sub is used.

1.4 URBAN OPTIONS

In all of the main urban centres, Windsor, London, Toronto, Ottawa/Hull, Montréal and Québec City, options for station locations were identified. In some cases, preference was expressed for central urban stations (i.e. Union Station - Toronto) and in some cases a suburban or suburban/airport related station location was favoured. The station location to some extent will be a function of the demand forecasts. In other cases the selected rail corridor entry points may determine what station locations are eligible. For each of the main urban centres that could have a station, several options were identified and will be carried into Phase 2 for further evaluation. It is in the Toronto and Montréal urban area that significant conflicts are present in all urban station/rail corridor options:

- narrow, heavily used corridors
- heavy commuter traffic
- expensive ROW
- requirements to develop major multi-modal interface
- expensive construction solutions i.e. bridges, tunnels

EXHIBIT E.S.3 (a)

EXHIBIT E.S.3 (b)

Also, in Montréal and Toronto, there is a stated preference to have both a central station and an airport station.

For this Interim Report #1, it was the intention of the study team to preserve as much flexibility as possible going into Phase 2 and accordingly no urban routing/station options have been selected at this point in the study program.

1.5 ISSUES

The outstanding issue that affects the Phase 2 work plan, and ultimately the costs is the issue of the joint ROW sharing by UIC and AAR equipment. As developed in the text, the need for the physical barrier between operation of UIC and AAR equipment will require more ROW, create a barrier problem, present conflicting barrier locational problems, and complicate construction activities. Because it has such a large potential impact, it should be addressed as soon as possible. The problem is more acute in the urban section, and on the sections where the ROW sharing is in a restricted corridor.

2 INTRODUCTION

2.1 STUDY PROGRAM

This study, Preliminary Routing Analysis and Costing is one of a number of concurrent studies contributing to examination of the feasibility of a High Speed Rail (HSR) service between Québec City and Windsor. The total study program is managed by a Project Management consortium responsible for coordinating the studies.

This study is being conducted by a Joint-Venture of SNC-Lavalin and Delcan Corporation in association with Canarail, Sofrerail and Swederail.

The study examines alternative routes for three HSR technology and ROW combinations; i.e. over 300 kph on a new ROW; over 300 kph on an existing (modified) ROW; and 200-250 kph on an existing (modified) ROW, with the objective of identifying "representative" alignments for costing purposes. Also included is an overview of the potential environmental impacts.

For the purposes of this study, a "Representative" route for Financial Analysis is a route or alignment selected because it contains physical design attributes consistent with the technical criteria, provides opportunities for stations to be located in the urban areas in reasonable proximity to the market and represents a potentially cost-effective environmentally acceptable solution. They do not represent the overall "Best" alignment, nor the possible "preferred" alignment. The 3 alignments are chosen to provide a reasonable representative range of costs given the topography, technology and political constraints.

Exhibit 2.1 illustrates the general work program of which, Work Package 1, the subject of this interim report, is the initial phase.

2.2 PROGRESS TO DATE

As indicated by shading on the study work program, Exhibit 2.1, the study has advanced work on a broad front. The primary emphasis to date has been to review and utilize, to the

EXHIBIT 2.1

maximum extent possible, all the information contained in previous study reports. As shown, the study work program has a reporting requirement on October 15, 1992, when the Interim Report #1 is presented. To date, all aspects of the study are on schedule.

2.3 OBJECTIVES OF INTERIM REPORT #1

The objectives of this report, are the following:

- to identify the candidate routes for HSR between Québec City and Windsor, for each of the technology/ROW combinations;

- to describe the evaluation process used to screen the routes, and identify representative route options to carry forward into phase 2 for detailed analysis and costing;

- to document all major assumptions used in the evaluation; and

- to identify any major issues affecting the Phase 2 work program where action may be required by the Steering Committee.

3 ROUTING ASSESSMENT

3.1 DIVISION OF CORRIDOR

For purpose of analysis, the total Québec-Windsor corridor was divided into segments as follows:

- Québec City
- Québec City to east of Montréal
- Montréal Urban Area
- West of Montréal to the National Capital Region
- National Capital Region
- National Capital Region to east of Toronto
- Greater Toronto Area
- West of Toronto to London
- London Urban Area
- London to Windsor
- Windsor Urban Area

This division of the corridor facilitated the work of the different teams addressing the various parts of the corridor, expedited contacts with municipal authorities, and enabled extensive analysis and evaluation to be done in a short period of time.

Exhibits 3.1 (a) and (b) shows the existing transportation systems in the Study Area and also provides an indication of the major environmental sensitivities identified in the study corridor and considered in the development and evaluation of routing options.

3.2 PROCESS FOLLOWED IN ANALYSES

There were a number of interrelated and coordinated activities carried out in the Phase I work program. Briefly the major steps were:

EXHIBIT 3.1 (a)

EXHIBIT 3.1 (b)

- obtain and review all previous reports and extract relevant data
- assemble appropriate mapping (1:50,000) and plot previously identified routes and existing rail ROWs
- Define geometric criteria
- Describe route options on base mapping
- Develop evaluation criteria
- Evaluate route options
- Develop costing methodology
- Describe Work Package 1 findings

Environmental sensitivities were identified on the basis of previous high speed rail investigations, studies pertaining to linear facilities in or adjacent to the study corridor, and recent topographic and resource inventory mapping for the corridor prepared by federal, provincial and municipal agencies. To provide a level of detail consistent with the activities related to the development and assessment of routing options by the Routing and Infrastructure Team, major environmental constraints were mapped at 1:50,000 scale (where such information was available) and superimposed on the alternatives in order to assess the degree of potential impacts. It should be noted that the environmental analysis was limited to the regions located outside the major urban nodes since the available data base and technology descriptions are not currently sufficiently detailed to permit a meaningful assessment within built-up areas. The primary objective of the environmental overview was to provide the Routing and Infrastructure Team with an indication of major environmental implications which could influence decisions made in the selection of representative routes.

This process involved a close working relationship with team members, the Project Manager, the Technology Consultant, the railways, Transport Canada, municipalities, and all agencies who supplied data on very short notice.

We acknowledge the support and cooperation received.

3.3 EVALUATION CRITERIA

The alternative routes were evaluated in a multi-criteria matrix format using criteria illustrated in the following tables.

In the evaluation process, three technology/ROW combinations were identified.

- over 300 kph non tilting on New ROW
- over 300 kph non tilting on Existing ROW
- 200-250 kph tilting on Existing ROW

For the purposes of analyzing and evaluating routing options, major environmental constraints were aggregated as sub-factors within two major factor groups Natural Environment and Socio-Economic Environment - as shown in Table 3.3.1. At a disaggregated level, the sensitivities were ranked on the basis of perceived sensitivity as shown in Table 3.3.2. This assisted in the development of routing options (i.e. attributes identified as exhibiting an extreme level of sensitivity were in many instances used as exclusionary criteria) and subsequently the weighting of sub-factors for the purposes of evaluation.

It should be noted that while factor weightings determined for the Transportation Services, Natural Environment and cost components were the same for all sections in the Québec-Windsor corridor, the weightings for Socio-Economic factors varied due to the additional significance afforded rural communities and related agricultural resources in the Québec-Montréal section of the corridor.

The ratings used in the evaluation tables were multiplied by the weights to arrive at the weighted rating. It is important to note that these ratings & weighting were used to compare routing options within one set of factors, i.e. weighted rating of Transportation Service factor could be compared for Option 5-4, vs option N-4 (See Table 5.3.1) but the Transportation Service weighted rating was not used to compare against Natural Environment weight ratings.

Various options within each combination were compared to establish a preferred option for the technology/ROW combination. No evaluation was done across combinations. Furthermore, emphasis was placed on comparative indicators, as opposed to absolute measures to highlight

PRELIMINARY ROUTING ANALYSIS
WORK PACKAGE 1

PROPOSED EVALUATION CRITERIA — **Table 3.3.1**

FACTOR	SUB-FACTOR	MEASURES/INDICATORS
1. **TRANSPORTATION SERVICE**	1.1 Population Centres served by route	Population of urban centre/region e.g., Trois-Rivière, Kitchener-Waterloo.
	1.2 Flexibility of route to access potential station sites	No. of potential station sites accessed (primarily for urban sectors).
	1.3 Accessibility of Station site by intermodal means	Subjective assessment of ease of access/egress to station site by considering modes available, e.g.; freeways, commuter rail, metro/subway, etc.
	1.4 Ability of route to access airports	Length of diversion from most direct route to achieve hard interface with airport.
	1.5 Anticipated travel time based on maximum possible operating speed	Calculation of approximate travel time from acceleration/braking data and distance at maximum operating speed (or restricted speed).
2. **NATURAL ENVIRONMENT**	2.1 Provincially Significant Wetlands, Provincial/Regional Areas of Natural and Scientific Interest (ANS's) and Environmentally Significant Areas (ESA's)	Length of encroachment/severance through Class 1-3 wetlands/wetland complexes, recognized earth/life science ANS's and ESA's designated by Conservation Authorities or Municipalities.
	2.2 Ecological Reserves	Length of encroachment/severance through federal wildlife reserves, migratory bird sanctuaries, protected waterfowl nesting areas and fisheries sanctuaries and recognized sensitive wildlife habitat.
	2.3 Significant Fisheries/Aquatic Habitat	No. of crossings of recognized cold/cool and warm water fisheries.

PRELIMINARY ROUTING ANALYSIS
WORK PACKAGE 1

PROPOSED EVALUATION CRITERIA — **Table 3.3.1**

FACTOR	SUB-FACTOR	MEASURES/INDICATORS
2. NATURAL ENVIRONMENT (CONT'D)	2.4 Significant Forests/Woodlots	Length of encroachment/severance through recognized rare forest areas.
	2.5 Major Watercourse Crossings	General hydrologic/hydraulic sensitivities of crossings requiring spans greater than 50 m. (over 50m of bridge span may require a pier in water
	2.6 Floodplain/Geotechnical Hazards	Incidence of wetland areas and recognized potential areas of erosion/instability on major valley walls, river banks and railway embankments.
3. SOCIO-ECONOMIC ENVIRONMENT	3.1 Provincial/National parks and Historic Sites	Number of existing/candidate sites; length of encroachment/severance.
	3.2 Major Tourism/Recreation/Conservation Areas	Number/type of sites; length of encroachment/severance.
	3.3 Urban Perimeters	Length of new/existing ROW required in defined settlement areas.
	3.4 Federal Reserves	Number/type of sites; length of encroachment/severance through military bases/Indian reserves.
	3.5 Rural Communities	Proximity to rural communities; length of encroachment/severance on designated (zoned) agricultural lands, major experimental farms/seed plantations/specialty crop areas, recognized agricultural communities.

PRELIMINARY ROUTING ANALYSIS
WORK PACKAGE 1

PROPOSED EVALUATION CRITERIA — **Table 3.3.1**

FACTOR	SUB-FACTOR	MEASURES/INDICATORS
3. SOCIO-ECONOMIC ENVIRONMENT (CONT'D)	3.6 Major Productive Natural Resource Areas	Length of encroachment/severance of forested areas of economic significance including sugar bushes in zoned agricultural areas (Quebec), Class 1 upland hardwood woodlots and recognized Crown/Agreement forests; major aggregate resource areas; oil/gas well concentrations.
	3.7 Major Waste Management Sites	Length of encroachment/severance on existing/candidate sites.
4 COST	4.1 Order of magnitude cost of capital works	Capital cost including property, from spreadsheets provided by D. Gillstrom.
	4.2 Influence on operating and maintenance cost	Length of route (to reflect annual train-km element of operating cost). Total deviation angle for alignment over section (to reflect influence of curvature on maintenance cost).
	4.3 Percentage of route with high level of uncertainty in cost estimate	Subjective assessment based on the perception of the constructability or institutional complexities associated with implementation of each sector.
	4.4 Percentage of route involving difficult ROW acquisition	Subjective assessment based on the perception of the institutional complexities of the acquisition process.
	4.5 Percentage of route involving difficult ROW sharing	Subjective assessment based on the perception of the complexity of integration with existing railway plant and subsequent operations.

PRELIMINARY ROUTING ANALYSIS
WORK PACKAGE 1

ENVIRONMENTAL CRITERIA/SENSITIVITY SCALE — **Table 3.3.2**

EXTREME LEVEL OF SENSITIVITY	VERY HIGH LEVEL OF SENSITIVITY	HIGH LEVEL OF SENSITIVITY
• Provincial and National Parks • Conservation Areas • Environmentally Significant Areas[1] • Provincially Significant Wetlands[2] • Provincial Areas of Natural and Scientific Interest (Earth/Life Science ANSI) • Provincial and National Historic Sites • Ecological Reserves[3] • Military Bases • Urban Perimeters (for new rights-of-way) • Indian Reserves	• Regional ANSI's • Significant Cold/Cool Water Fisheries • Recognized Rare Forest • Major Agricultural Experimental Farms/Seed Plantations • Major Agricultural Specialty Crop Areas • Large Recreational or Tourist Centres • Urban Perimeters (for existing rights-of-way)	• Designated (zoned) Agricultural Areas (Quebec) • Recognized Significant Agricultural Communities • Special Interest/Highly Productive Forests[4] • Major Watercourse Crossings[5] • Significant Warm Water Fisheries • Major Oil/Gas Well Concentrations • Recognized Geotechnical Hazards[6] • Major Waste Management Sites

Notes:

1. ESA's designated by Conservation Authorities or Municipalities.
2. Class 1-3 in Ontario.
3. Includes federal wildlife reserves, migratory bird sanctuaries, protected waterfowl nesting areas and fisheries sanctuaries.
4. Includes sugar bushes in zoned agricultural areas (Quebec) and Class 1 upland hardwood woodlots.
5. General hydrologic/hydraulic sensitivity.
6. Includes wetland areas, areas of major valley wall instability, major areas of erosion along river banks/railway embankments.

differences between the options. The objective was to identify a "representative" route for each combination for costing purposes.

For all the options, basic geometric alignments and ROW upgrades were plotted to conform to required design criteria, but further refinements are still necessary to optimize the geometry, and to minimize some environmental conflicts identified and plotted.

The application of the evaluation criteria was carried out by the study teams and reviewed in a joint workshop with the Advisory Committee. The results of the evaluation are displayed in tabular form and each section is more thoroughly discussed in the following chapters.

3.4 TECHNOLOGY ISSUES AND JOINT OPERATIONS

There is one major issue with a significant influence on the routing analysis, and one that has the potential to greatly affect the costs of all technology/ROW options. This is the issue of the joint operation of UIC and AAR standard equipment in the same ROW.

Several comprehensive memos on the subject have been prepared by the Technology Consultant based on meetings held with Transport Canada and US Federal Railway Administration officials.

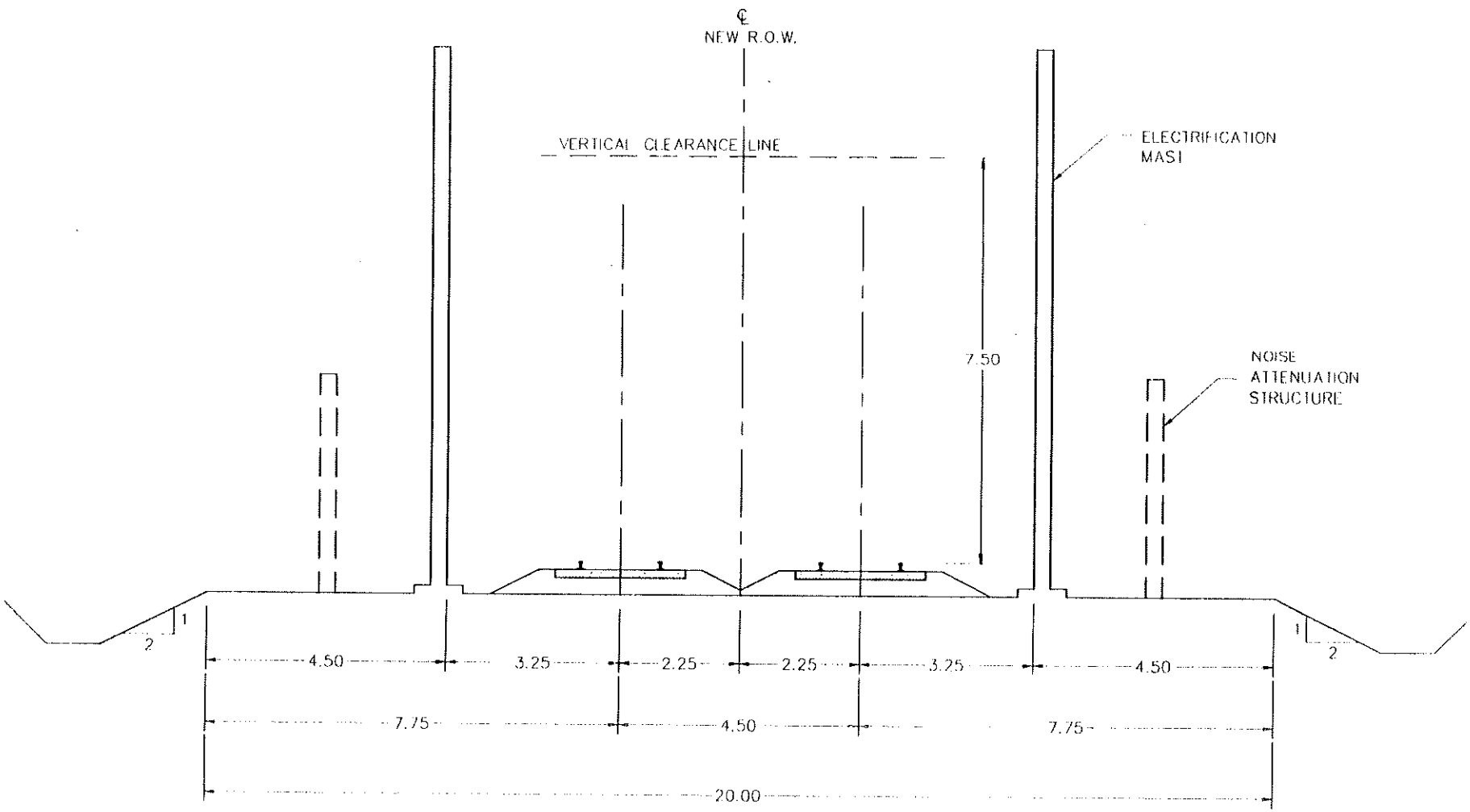
It is the position of Transport Canada that because the UIC type equipment does not meet the AAR buff loading criteria, (the way impact resistance is measured by AAR) then it may not be possible for the two equipment types to share or impinge on each other's clear zone. To achieve the separation desired it is necessary to either:

- construct new ROW sufficiently remote from existing tracks; or
- build a physical barrier separating the two rail systems; or
- operate with a temporal separation.

All of the options present real problems for the anticipated HSR method of operation along potential routes. In the rural sections of the alignment, the requirement to put in place a

physical barrier will expand the ROW needed. The major problems are associated with the urban and suburban sections where the available rail corridors are usually heavily used by conventional freight and/or commuter equipment, and the corridors are already very narrow and constrained in by adjacent development. In addition, these existing rail corridors are generally grade separated with older bridges that cannot easily be widened.

For the purposes of the first phase leading up to this report it has been assumed that the cross sections required are as shown in Exhibit 3.2 for exclusive ROW, and Exhibit 3.3 for shared ROW.



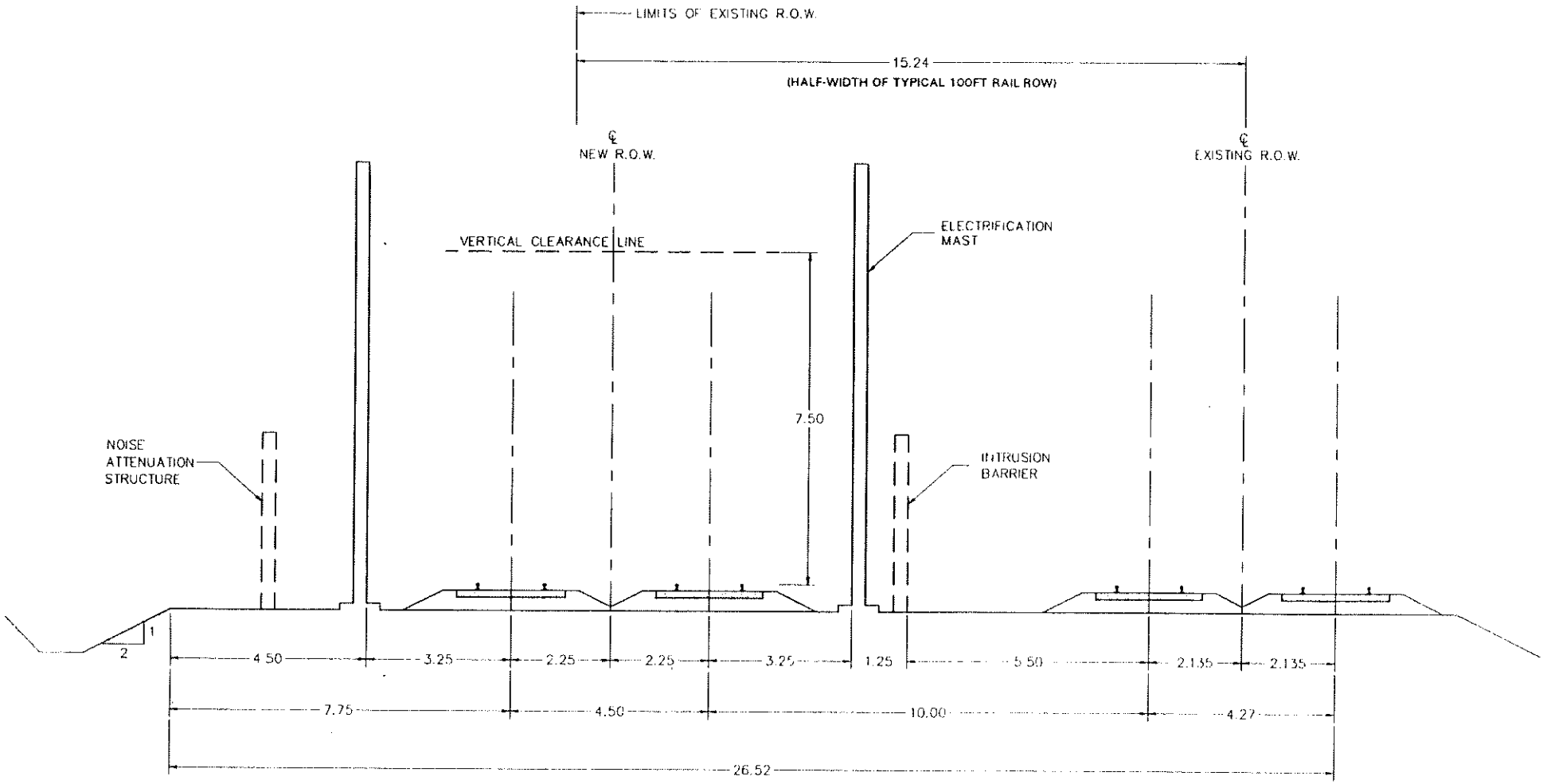
NOTE – ALL DIMENSIONS ARE IN METRES.

QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT
PRELIMINARY ROUTING ASSESSMENT AND COSTING STUDY

INTERIM REPORT No. 1

ASSUMED CROSS SECTION HIGH SPEED RAIL IN EXCLUSIVE ROW

EXHIBIT 3.2



NOTE – ALL DIMENSIONS ARE IN METRES.

QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT
PRELIMINARY ROUTING ASSESSMENT AND COSTING STUDY

INTERIM REPORT No. 1

ASSUMED CROSS SECTION HIGH SPEED RAIL IN SHARED ROW

EXHIBIT 3.3

4 QUÉBEC CITY URBAN AREA

4.1 CONTACT WITH MUNICIPALITIES

A meeting with Québec City representatives was convened to discuss planning and transportation issues affecting potential HSR routes in the urban area. Those in attendance expressed the opinion that it was necessary to serve Gare du Palais station. Consideration of any additional crossings of the Saint-Laurent River for HSR routes was not favoured. The study team met with Communauté Urbaine de Québec (CUQ) representatives and the City of Sainte-Foy on October 20, 1992 prior to commencing detailed analysis in Phase 2.

Representatives of CUQ indicated that Gare du Palais should be served by HSR, that a station located in the vicinity of CP tunnel entrance does not appear to be desirable and that a station located near the Québec Airport is not a necessity.

4.2 STATION OPTIONS

4.2.1 Urban Options

It is assumed that one possible urban station site would be the existing Gare du Palais in Québec City. Access to Gare du Palais is assumed to be necessary for all inter-city options. A second potential site at Charest Boulevard on the CP Wolfe's Cove Spur has also been identified. This site is easier to reach from inter-city routes and could be shown to be close enough to downtown Québec to meet this criterion. However, this site has not been retained for further evaluation based on the results of discussion with municipalities.

4.2.2 Suburban Options

Possible suburban station sites, with reasonable access by other modes, are in Ancienne-Lorette for the North Shore inter-city options and Sainte-Foy for South Shore options.

4.2.3 Airport Access

For the North Shore options, a station could be located in Ancienne-Lorette, approximately 1-1,5 km from Québec Airport. This station would also serve as a suburban station for these options. The routes would pass immediately south of Québec airport and could continue along existing rail ROWs to Gare du Palais. Under these options, Sainte-Foy would be served from Ancienne-Lorette.

South Shore options offer a possible suburban station located in the area of the actual Sainte-Foy station, however this site is located approximately 8 km from Québec Airport and would not provide direct intermodal access.

Access to the Québec Airport is not considered an important factor in the choice of station site in the region of Québec City.

4.3 ROUTING OPTIONS

Two routing options to exit the Québec urban area were considered, one leading to the North Shore Québec-Montréal routes and the other serving South Shore options.

For North Shore options, the routing would begin at Gare du Palais and generally follow the existing CN Bridge Subdivision up to Allenby Junction where it would join the existing CP Trois-Rivières Subdivision leading to Ancienne-Lorette.

For the South Shore options, the routing would again begin at Gare du Palais and utilize the existing CN Bridge Subdivision to reach Pont de Québec and then cross the Saint-Laurent River; however the Bridge subdivision takes a circuitous route around Cap Rouge and through Sainte-Foy.

4.4 ISSUES

Issues influencing access to Québec City and requiring refinement in Phase 2 are the following:

EXHIBIT 4.1

- the difficulties associated with the availability of land in urban area for improvements to existing rail ROWs;

- the difficulties associated with the use and sharing of existing ROW in the urban area; its feasibility and cost;

- the speed restrictions imposed by the alignment and by other rail operations in urban areas.

4.5 REPRESENTATIVE STRATEGY

In order to provide costs and implementation considerations for access to downtown Québec from the North Shore, the detailed analysis in Phase 2 will develop and optimize the basic urban route between Ancienne-Lorette and Gare du Palais.

5 CORRIDOR SECTION 1 - QUÉBEC CITY TO MONTRÉAL

5.1 EXISTING RAIL CORRIDORS

Three rail corridors exist between Montréal and Québec City: one uses the CN ROW on the South Shore of the Saint-Laurent River and the two others, use the CP ROW and the CN ROW on the North Shore.

The South Shore corridor begins at Gare du Palais on the CN Bridge Subdivision, passes through Sainte-Foy, crosses the Saint-Laurent River at Pont de Québec, goes through Charny and then uses CN's Montmagny and Drummondville Subdivisions to go through Drummondville and reach Sainte-Rosalie. The corridor then follows the CN Saint-Hyacinthe Subdivision from Sainte-Rosalie up to Victoria Bridge in Montréal where it uses CN's Montréal Subdivision to access Central Station. The total length of this corridor is approximately 270 km.

The CP North Shore corridor also begins at Gare du Palais on the CN Bridge Subdivision but joins CP's Trois-Rivières Subdivision at Allenby Junction. It then follows CP Trois-Rivières Subdivision, through Trois-Rivières and joins CP Park Avenue Subdivision at Saint-Martin Junction in Laval. The CP Park Avenue Subdivision is used up to Jacques-Cartier Junction where it joins CN's Saint-Laurent and Mont-Royal Subdivisions to reach Central Station through the Mont-Royal tunnel. Its total length is approximately 275 km.

The CN North Shore corridor begins at Gare du Palais on the CN Bridge Subdivision and joins CN Saint-Raymond Subdivision up to Rivière-à-Pierre where it then joins CN Lac Saint-Jean Subdivision up to Triage Garneau where it joins CN Joliette Subdivision. From there it goes up to CN Saint-Laurent and Mont-Royal Subdivisions up to Central Station. The total length of this corridor is approximately 338 km. This route does not appear to be of any interest for HSR due to its greater length and due to the fact that it is currently used by CN for its main freight operations on the North Shore.

5.2 ROUTES IDENTIFIED IN PREVIOUS STUDIES

The most recent studies relating to High Speed Rail in the Québec-Windsor Corridor were made by VIA Rail in 1989 as part of their "Review 89" and the Carman - Bujold Report (May 31, 1991). This study confirmed earlier findings that the preferred corridor between Montréal and Québec City would be on the North Shore along CP's Trois-Rivières ROW. This corridor was selected mainly due to the fact that it is "... much more compatible with access to the Gare du Palais than the present south shore CN route", that "... use of this route would avoid the more severe freight interference associated with the heavily-used south shore CN line through Drummondville, ..." and that "The alignment itself is also more compatible with high-speed operations than is that of the south shore line."

Table 5.1 summarizes the routes studied previously for this section of the corridor.

5.3 ROUTES IDENTIFIED IN THIS STUDY

5.3.1 North Shore

The North Shore options evaluated consist of three possible routes shown on Exhibits 5.1, 5.2 and 5.3.

- over 300 kph technology using a new ROW (option N4) located generally north of the existing CP Trois-Rivières Subdivision and paralleling Hydro ROW's over part of its length.

- over 300 kph technology using the existing CP ROW with some alignment and curve corrections (option N1);

- 200-250 kph technology using the existing ROW with some alignment and curve corrections (option N5).

CORRIDOR SECTION I: QUÉBEC CITY TO MONTRÉAL

Table 5.1

Routes Identified and Investigated		Routes Eliminated in Initial Screening	Routes selected for Comparative Evaluation of following Technology/Row Combinations		
Route Description	Source		+- 300 kph on New ROW	+ 300 kph on Existing ROW	200-250 kph on Existing ROW
NORTH SHORE ROUTE					
CN Bridge/CP Trois-Rivières/CP Park Avenue/CN St-Laurent/CN Mont-Royal Subdivisions between Gare du Palais in Québec City and Central Station in Montréal.	Use of existing Subdivisions with alignment corrections			*	*
ROW North of CP ROW between Québec City and Montréal plus CN/Bridge (from Gare du Palais) and CP Park Avenue, CN St-Laurent and CN Mont-Royal Subdivisions (in Montréal)	VIA High Speed Rail Study 1984 and portions of New Route identified in this study.		*		
SOUTH SHORE ROUTE					
CN Bridge/CN Montmagny/CN Drummondville/ CN St-Hyacinthe/CN Montréal Subdivisions between Gare du Palais in Québec City and Central Station in Montréal	Use of Existing Subdivisions with alignment corrections			*	*
ROW South of CN ROW between Québec City and Montréal plus CN/Bridge (from Gare du Palais) and CN Montréal Subdivision (in Montréal)	New Route identified in this study		*		

The existing ROW routes would leave from Gare du Palais and follow the existing CN Bridge Subdivision up to Allenby Junction and then use CP Trois-Rivières Subdivision up to Saint-Martin Junction in Laval. They would then follow CP Park Avenue Subdivision up to Jacques-Cartier Junction where they would join CN's Saint-Laurent and Mont-Royal Subdivisions at East Junction, and pass through the Mont-Royal tunnel to access Central Station.

5.3.2 South Shore

The South Shore options evaluated consist of three possible routes shown on Exhibits 5.1, 5.2 and 5.3.

- over 300 kph technology using a new ROW (option S4);
- over 300 kph technology using the existing ROW with some alignment and curve corrections (option S1);
- 200-250 kph technology using the existing ROW with some alignment and curve corrections (option S5).

These routes would also leave from Gare du Palais and follow the existing CN Bridge Subdivision up to Sainte-Foy, cross Pont de Québec and pass through Charny from where they follow CN's Montmagny and Drummondville Subdivisions to Sainte-Rosalie Junction. They then use CN Saint-Hyacinthe Subdivision up to Saint-Lambert and Victoria Bridge where CN Montréal Subdivision is used to access Central Station.

5.4 CONTACTS WITH MUNICIPALITIES

The only municipal areas where station stops are contemplated in this corridor section are Trois-Rivières and Drummondville. At this stage of the study, focusing on a comparative evaluation of inter-urban routes, potential station sites in or near the urban areas are dictated by broader route planning considerations.

EXHIBIT 5.1

EXHIBIT 5.2

EXHIBIT 5.3

5.5 EVALUATION

The routing options were analysed with regards to the level of sensitivity for each natural and socio-economic element present on each route. However, the discussion will focus only on the most relevant elements. Two measures were used in this evaluation:

- Number of elements affected;
- Their respective lengths.

It is important to note that the Montréal and Québec urban areas were not included in the calculations because the speed will be significantly reduced in those areas. It minimises the impacts on socio-economic elements. Moreover, the weighting associated to rural communities located on protected agricultural land has been doubled to reflect adequately the very high level of sensitivity of these communities in Québec.

The results of the evaluation of route options for each of the three technology/ROW combinations are presented in Tables 5.5.1 to 5.5.3.

5.5.1 Transportation Service

From a transportation service perspective, the evaluation of new ROWs for over 300 kph technology (S4 and N4) indicates that the North Shore route (N4) serves a larger population through an intermediate stop than the South shore. (Drummondville 48,000, Trois-Rivières 118,400). For Drummondville, the figure includes the populations of Drummondville, Gratham-Ouest, Saint-Charles-de-Drummond and Saint-Nicéphore. For Trois-Rivières, this figure includes the populations of Trois-Rivières, Trois-Rivières-Ouest, Cap-de-la-Madeleine, Pointe-du-Lac and Sainte-Marthe-du-Cap-de-la-Madeleine. Although flexibility to serve stations in Québec and Montréal is similar for each option, the North Shore route offers good intermodal access to Québec Airport.

Travel time calculations were based on the following assumptions:

QUEBEC - ONTARIO H.S.R. STUDY: PRELIMINARY ROUTING ASSESSMENT AND COSTING

EVALUATION OF ROUTING OPTIONS

TABLE 5.5.1

TECHNOLOGY: 300 km/h plus ON NEW R.O.W.					ROUTE OPTIONS							
	Option S4 – South Shore				Option N4 – North Shore				OPTION C			
FACTORS & SUB-FACTORS BY SECTION	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating
SECTION: QUEBEC CITY – MONTREAL												
1. Transportation Service												
1.1 Population centres served by route	40–50,000	3	40	1.20	110–120,000	5	40	2.00				
1.2 Flexibility of route to access potential station sites	Quebec/3, Montreal/3	4	10	0.40	Quebec/3, Montreal/4	4.5	10	0.45				
1.3 Accessibility of station site by intermodal means	transit/highway	3	5	0.15	transit/highway	2.5	5	0.13				
1.4 Ability of route to access Toronto/Montreal airports	not applicable	0	15	0.00	not applicable	0	15	0.00				
1.5 Anticipated travel time based on max. operating speed	1 hr 28 min	4.5	30	1.35	1 hr 17 min	5	30	1.50				
				3.10				4.08				
2. Natural Environment												
2.1 ESA's, ANSI's, Prov. significant wetlands	0	5	25	1.25	0	5	25	1.25				
2.2 Ecological reserves	4 (4.0km)	3	25	0.75	0	5	25	1.25				
2.3 Significant fisheries / aquatic habitat	0	5	20	1.00	3 (0.5km)	2	20	0.40				
2.4 Significant forests / woodlots	0	5	10	0.50	0	5	10	0.50				
2.5 Major watercourse crossings	10 (4.0km)	2	10	0.20	10 (1.6km)	4	10	0.40				
2.6 Floodplain / geotechnical hazards	10 (14.0km)	2	10	0.20	16 (13.5km)	2	10	0.20				
				3.90				4.00				
3. Socio-Economic Environment												
3.1 Provincial / National Parks and historic sites	0	5	10	0.50	0	5	10	0.50				
3.2 Major tourism / recreation / conservation areas	4 (2.2km)	3	10	0.30	1 (0.2km)	5	10	0.50				
3.3 Urban perimeters	7.0km	4	15	0.60	2.5km	5	15	0.75				
3.4 Federal reserves	0	5	10	0.50	0	5	10	0.50				
3.5 Rural communities	80.0km	4	20	0.80	103.0km	2	20	0.40				
3.6 Major productive Natural Resource Areas	14.5km	2	30	0.60	1.9km	5	30	1.50				
3.7 Major Waste Management Sites	0	5	5	0.25	0	5	5	0.25				
				3.55				4.40				
4. Cost												
4.1 Order of magnitude cost of capital works	$1.150 billion	5	35	1.75	$1.295 billion	4	35	1.40				
4.2 Influence on operating cost	264.4km	5	20	1.00	273.6km	5	20	1.00				
4.3 % of route with high level of uncertainty in cost estimate	12%	4	25	1.00	12%	4	25	1.00				
4.4 % of route involving difficult ROW acquisition	12%	4	10	0.40	12%	4	10	0.40				
4.5 % of route involving difficult ROW sharing	16%	3.5	10	0.35	14%	4	10	0.40				
				4.50				4.20				

TABLE 5.5.2

TECHNOLOGY: 300 km/h plus ON EXISTING R.O.W.					ROUTE OPTIONS							
	Option S1 – South Shore				Option N1 – North Shore				OPTION C			
FACTORS & SUB–FACTORS BY SECTION	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating
SECTION: QUEBEC CITY – MONTREAL												
1. Transportation Service												
1.1 Population centres served by route	40–50,000	3	40	1.20	110–120,000	5	40	2.00				
1.2 Flexibility of route to access potential station sites	Quebec/3, Montreal/3	4	10	0.40	Quebec/3, Montreal/4	4.5	10	0.45				
1.3 Accessibility of station site by intermodal means	transit/highway	3	5	0.15	transit/highway	2.5	5	0.13				
1.4 Ability of route to access Toronto/Montreal airports	not applicable	0	15	0.00	not applicable	0	15	0.00				
1.5 Anticipated travel time based on max. operating speed	1 hr 27 min	4.5	30	1.35	1 hr 18 min	5	30	1.50				
				3.10				4.08				
2. Natural Environment												
2.1 ESA's, ANSI's, Prov. significant wetlands	0	5	25	1.25	0	5	25	1.25				
2.2 Ecological reserves	1 (1.2km)	4	25	1.00	0	5	25	1.25				
2.3 Significant fisheries / aquatic habitat	0	5	20	1.00	3 (0.4km)	2	20	0.40				
2.4 Significant forests / woodlots	0	5	10	0.50	0	5	10	0.50				
2.5 Major watercourse crossings	10 (4.0km)	2	10	0.20	10 (1.8km)	4	10	0.40				
2.6 Floodplain / geotechnical hazards	11 (16.0km)	2	10	0.20	4 (10.7km)	3	10	0.30				
				4.15				4.10				
3. Socio–Economic Environment												
3.1 Provincial / National Parks and historic sites	0	5	10	0.50	0	5	10	0.50				
3.2 Major tourism / recreation / conservation areas	2 (1.4km)	4	10	0.40	2 (1.0km)	4	10	0.40				
3.3 Urban perimeters	11.0km	3	15	0.45	7.0km	4	15	0.60				
3.4 Federal reserves	0	5	10	0.50	0	5	10	0.50				
3.5 Rural communities	73.0km	4	20	0.80	99.0km	3	20	0.60				
3.6 Major productive Natural Resource Areas	11.5km	2	30	0.60	3.2km	4	30	1.20				
3.7 Major Waste Management Sites	0	5	5	0.25	0	5	5	0.25				
				3.50				4.05				
4. Cost												
4.1 Order of magnitude cost of capital works	$1.200 billion	5	35	1.75	$1.285 billion	5	35	1.75				
4.2 Influence on operating cost	265.8km	5	20	1.00	272.6km	5	20	1.00				
4.3 % of route with high level of uncertainty in cost estimate	16%	3.5	25	0.88	12%	4	25	1.00				
4.4 % of route involving difficult ROW acquisition	16%	3.5	10	0.35	12%	4	10	0.40				
4.5 % of route involving difficult ROW sharing	25%	3	10	0.30	17%	3.5	10	0.35				
				4.28				4.50				

TECHNOLOGY: 200 km/h plus ON EXISTING R.O.W.	ROUTE OPTIONS											
	Option S5 – South Shore				Option N5 – North Shore				OPTION C			
FACTORS & SUB–FACTORS BY SECTION	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating
SECTION: QUEBEC CITY – MONTREAL												
1. Transportation Service												
1.1 Population centres served by route	40–50,000	3	40	1.20	110–120,000	5	40	2.00				
1.2 Flexibility of route to access potential station sites	Quebec/3, Montreal/3	4	10	0.40	Quebec/3, Montreal/4	4.5	10	0.45				
1.3 Accessibility of station site by intermodal means	transit/highway	3	5	0.15	transit/highway	3	5	0.15				
1.4 Ability of route to access Toronto/Montreal airports	not applicable	0	15	0.00	not applicable	0	15	0.00				
1.5 Anticipated travel time based on max. operating speed	1 hr 39 min	4.5	30	1.35	1 hr 30 min	5	30	1.50				
				3.10				4.10				
2. Natural Environment												
2.1 ESA's, ANSI's, Prov. significant wetlands	0	5	25	1.25	0	5	25	1.25				
2.2 Ecological reserves	1 (0.7km)	4	25	1.00	0	5	25	1.25				
2.3 Significant fisheries / aquatic habitat	0	5	20	1.00	3 (0.4km)	2	20	0.40				
2.4 Significant forests / woodlots	0	5	10	0.50	0	5	10	0.50				
2.5 Major watercourse crossings	10 (3.9km)	2	10	0.20	10 (1.4km)	4	10	0.40				
2.6 Floodplain / geotechnical hazards	10 (16.3km)	2	10	0.20	8 (5.8km)	4	10	0.40				
				4.15				4.20				
3. Socio–Economic Environment												
3.1 Provincial / National Parks and historic sites	0	5	10	0.50	0	5	10	0.50				
3.2 Major tourism / recreation / conservation areas	1 (0.3km)	5	10	0.50	0	5	10	0.50				
3.3 Urban perimeters	40.3km	1	15	0.15	28.0km	2	15	0.30				
3.4 Federal reserves	0	5	10	0.50	0	5	10	0.50				
3.5 Rural communities	73.8km	4	20	0.80	120.0km	1	20	0.20				
3.6 Major productive Natural Resource Areas	5.5km	4	30	1.20	3.0km	5	30	1.50				
3.7 Major Waste Management Sites	0	5	5	0.25	0	5	5	0.25				
				3.90				3.75				
4. Cost												
4.1 Order of magnitude cost of capital works	$1.230 billion	5	35	1.75	$1.190 billion	5	35	1.75				
4.2 Influence on operating cost	267.5km	5	20	1.00	273.6km	5	20	1.00				
4.3 % of route with high level of uncertainty in cost estimate	16%	3.5	25	0.88	12%	4	25	1.00				
4.4 % of route involving difficult ROW acquisition	16%	3.5	10	0.35	12%	4	10	0.40				
4.5 % of route involving difficult ROW sharing	45%	1	10	0.10	25%	3	10	0.30				
				4.08				4.45				

For the North Shore options:

- speed limitation of 60 km/h between Gare du Palais and Allenby Junction and 100 km/h between Allenby Junction and Ancienne-Lorette. This is consistent with actual speed restrictions on CN and CP ROW;

- an intermediate stop at Trois-Rivières;

- acceleration and deceleration performances based on 350 km/h HSR Technology data (Texas TGV). The same performances are assumed for both 350 and 250 km/h technologies;

- speed limitation of 100 km/h between Saint-Martin Junction and Central Station in Montréal. This is consistent with actual CP ROW speed restrictions, with the presence of a new tunnel between Laval (or Rivière-des-Prairies) and with Deux-Montagnes line speed restrictions envisioned for the upgrading of the line;

- since for all options, existing speed limitations due to small radius curves and low-speed switches would be eliminated by correcting curves and switches, no speed limitations are assumed between Ancienne-Lorette and Saint-Martin Junction.

For the South Shore options:

- speed limitation of 60 km/h between Gare du Palais and Charny since the costs assume the utilization of existing route and ROW between these two locations (no tunnel assumed in Sainte-Foy);

- an intermediate stop at Drummondville;

- acceleration and deceleration performances based on 350 km/h HSR Technology data (Texas TGV). The same performances are assumed for both 350 and 250 km/h technologies;

- speed limitation of 60 km/h between Saint-Lambert and Central Station in Montréal since it is assumed that, in Montréal, CN ROW would be shared;

- since for all options, existing speed limitations due to small radius curves and low-speed switches would be eliminated by correcting curves and switches, no speed limitations are assumed between Charny and St-Lambert.

Based on these assumptions, the revised travel times with intermediate stops would read as follows:

	350 km/h Existing Row	350 km/h New Row	250 km/h Existing ROW
North Shore	78 min	77 min	90 min
South Shore	87 min	86 min	99 min

Tables 5.5.1, 5.5.2, and 5.5.3 give travel time with stops and the North Shore route is shorter in time.

Comparison of the options using existing ROWs for 200-250 kph technology and over 300 kph technology shows that overall, the North Shore options achieve higher transportation service ratings. The travel time advantage of the North Shore route is in the 9 minute range.

5.5.2 Natural Environment

a) North Shore

All three routing options have been retained on the North Shore : the over 300 kph on new ROW, the over 300 kph and the 200-250 kph contiguous to the existing CP ROW. These

routing options affected the same natural elements, but not in the same way. The 300 kph on New ROW takes advantage of existing linear infrastructure running along beside Hydro-Québec distribution lines or CP lines over a large part of the corridor.

The three proposed routes do not cross any ESA's, ANSI's, provincially significant wetlands, ecological reserves or significant forests or woodlots. However, they will encounter three types of natural elements with a high level of sensitivity that cannot be avoided : major watercourse crossings, aquatic habitats, and geotechnical hazards. In the first category, nine major river crossings have been identified, totalling 1.6 km. The Rivière des Mille Iles and the Rivières des Prairies are of particular concern because they are navigable rivers. Also, it is important to take into account the Sainte-Anne, Batiscan and Jacques Cartier Rivers where aquatic habitats (Salmon management on the Jacques Cartier River) and fisheries (70,000 anglers catch more than 1 million spawning tomcod each winter on the Sainte-Anne and Batiscan rivers) are particularly sensitive. Other rivers are Saint-Maurice, L'Achigan, Maskinongé, Bayonne and L'Assomption.

The over 300 kph routes (N4) (N1) cross respectively 13.5 km and 10.7 km of geotechnically hazardous elements, namely two (2) wetlands representing 2.2 km. One of these wetlands is located on the east side of Cap-de-la-Madeleine. The candidate 200-250 kph CP route (N5) crosses 5.8 km of hazardous elements, including a wetland (2.0 km). Added to the wetlands are the areas with high erosion potential (8.5 km for route N1, 4.8 km for route N4 and 3.8 km for N5 route) where it is important to consider the soil instability as a technical constraint. Each route option takes advantage, as much as possible, of the proximity of the CP line. The 200-250 kph corridor is advantageous because it minimizes the potential impacts on physical elements.

b) South Shore

The candidate "new over 300 kph" route on the South Shore (S4) does not affect any of the following elements: ESA's, ANSI's, provincially significant wetlands, significant fisheries/aquatic habitat or any significant forests or woodlots. However, it crosses three sensitive elements that

are of concern: four (4) deer wintering habitats (4.0 km) located between Manseau and Daveluyville; nine (9) major watercourses that cannot be avoided (4.0 km), including the Saint-Laurent River (where crossing points at Québec and Montréal are required), the Saint-Laurent Seaway and the Chaudière (twice), Nicolet (twice), Saint-Francois, Bécancour, Yamaska and Richelieu (navigable river).

The "new over 300 kph" corridor also encounters 14.0 km of unstable geotechnical hazards, composed of eight (8) areas with high erosion potential (11.3 km) and two wetlands (2.7 km.) This new corridor is advantageous because it minimizes the impacts on physical elements. However, among all the route options, it is the only one that crosses significant terrestrial wildlife habitats (4.0 km).

Our preliminary tabular analysis of the three representative corridors between Québec City and Montréal indicates that none of the candidate routes present any major constraint in terms of the natural environment. However, the North Shore corridors appear to be preferable with respect to minimizing potential impacts on river crossings and geotechnical hazards (except N4 route). Several of the crossed rivers are subject to accelerated erosion processes and bank instability (presence of quick clays).

5.5.3 Socio-Economic Environment

a) North Shore

The over 300 kph route (N4) or (N1) options do not affect any Provincial/National Parks and historical sites, Federal reserves or any major waste management sites. However, they cross three sensitive elements, namely one and two recreational zones (0.2 km and 1.0 km), which can readily be avoided, a dozen urban areas representing a total of 2.5 km and 7.0 km and land protected by agricultural zoning. In the latter case they encroach on three elements particularly significant in Québec : 103.0 km and 99.0 km of rural communities, including 10.6 km and 9.5 km of specialty crops located mainly between L'Assomption and Berthierville (i.e. tobacco), 92.5 km and 89.5 km of Class A soil (best agricultural soil), mainly between Repentigny - Trois-

Rivières and Pont-Rouge - Québec. The major productive natural resource areas affected include respectively 1.8 km and 3.2 km of protected sugar bushes. The new route (N4) takes into account existing linear infrastructure over most of its course.

The 200-250 kph route on existing ROW (N5) does not affect any of the following elements: Provincial/National Parks, historical sites, major tourism/recreation/conservation areas, Federal reserves, or any of the major waste management sites. However, it crosses nineteen (19) urban areas totalling 28.0 kms, and encroaches on 120.0 km of rural communities including 14.0 km of specialty crops located in land protected by agricultural zoning mainly between L'Assomption and Trois-Rivières. It also affects 106.0 km of Class A soils.[1] The major productive natural resources areas include 3.0 km of protected sugar bushes. This corridor takes advantage of the proximity of the CP line which favours the consolidation of existing linear infrastructure.

b) South Shore

The candidate new over 300 kph corridor (S4) (not recommended to be carried forth) does not affect any Provincial/National Parks, historic sites, Federal reserves or any major waste management sites. However, it crosses four (4) recreational areas (2.2 km), five (5) urban areas (7.0 km) which cannot be avoided, and some of the most productive agricultural region in Québec, between Drummondville and Longueuil. Regarding this last element, it affects seven (7) specialty crop areas (representing a total of 4.5 km), 75.5 km of Class A soils. The major production natural resource area includes 14.5 km of protected sugar bushes.

The advantage associated with this new option is that it avoids most of the urban areas and it minimizes the crossing of protected agricultural land. However, during this evaluation the farmlands of the South Shore have been considered more productive and more vulnerable (due to the small size of the farms and the unevenly shaped lots) than those of the North Shore.

---

[1] Including Soils in Class 1, 2 and 3.

Thus, a more detailed analysis would tend to favour the North Shore over the South Shore despite the relatively greater distance through agricultural sensitivities on the North Shore.

The tabular analysis of socio-economic features also reveals that the three representative corridors are acceptable in terms of their potential impacts on the environment (urban problems, noise and vibration levels, land use and well-drained agricultural zoned lands). However, agricultural zoned land appears to be of most concern on the South Shore. It is expected that a more detailed analysis of the sensitivity and productivity of farmland on the North and South Shores would demonstrate that the North Shore routings are less prejudicial to agriculture. Such an analysis would take into account the size of farms, the orientation of property limits, the presence of tile drainage and the dynamism of the local farming community.

5.5.4 Costs

The cost and confidence level sub-factors in the evaluation of over 300 kph technology on new ROWs show that both North and South options have roughly similar cost and implementation consequences. The lower capital cost for option S4 is offset by higher uncertainty in implementing crossings of the Saint-Laurent River.

The evaluation of the two options for over 300 kph service on existing ROW (options S1 and N1), again shows no significant difference in overall rating against cost considerations. Although option N1 has a marginally higher cost, this is offset by potentially higher uncertainty in the cost estimate and greater difficulty in sharing ROW on option S1, the South Shore option.

For the options analysed for 200-250 kph on existing ROW, the North Shore option, option N5 has a slightly lower infrastructure cost, less uncertainty in estimating this cost and potentially less difficulty in sharing the existing ROW. Option S5 (200-250 kph ex. ROW) is marginally higher in infrastructure cost than S1, the equivalent over 300 kph option because the urban bypasses assumed for the higher speed option avoid some grade separation costs. Overall, option N5 has a higher rating from a cost and implementation viewpoint.

5.6 SELECTION OF REPRESENTATIVE CORRIDOR FOR COSTING

5.6.1 Over 300 kph - Technology on New ROW

All of the evaluation factors for the comparison of N4 vs S4 (North Shore vs South Shore) favour the North Shore Option N4, hence it has been retained for the next phase.

5.6.2 Over 300 kph - Technology on Existing ROW

The North Shore option N1 has been retained for further analysis since the CP ROW could become available for sharing and does not carry heavy freight traffic at present.

The South Shore option was not selected since it would have more severe interference with actual freight traffic associated with the Saint-Laurent crossings in Québec City and Montréal.

5.6.3 200-250 kph - Technology on Existing ROW

As for the preceding Technology/ROW combination, the North Shore option, N5 has been retained for further analysis for the same reasons.

Thus for the section between Québec City and Montréal, all three options are located essentially in the same corridor on, or near to the existing CP line. This configuration will provide an opportunity to demonstrate the cost differential between the two technologies and the relative cost of new existing ROW.

6 MONTRÉAL URBAN AREA

6.1 CONTACT WITH MUNICIPALITY

A meeting with transportation and planning officials from the Communauté Urbaine de Montréal (CUM) was held on October 16, 1992. At this meeting the study team provided background on the High Speed Rail Study and obtained information on planning or transportation issues which could influence the detailed analysis of the urban route options in Phase 2. Representative of the CUM indicated that Central Station should be served by high speed rail.

6.2 STATION OPTIONS

6.2.1 Urban Options

The necessity to access a downtown station in Montréal is assumed for all urban route options.

The two existing stations, CN Central and CP Windsor are potential locations for a downtown station however the latter does not allow connections to other intercity rail services since it is used only for commuter operations. Central Station would permit through moves if a South Shore route was selected to Québec City. However, if a North Shore route were selected, trains would enter Central Station through Mont-Royal Tunnel and would have to leave through the tunnel again when continuing to Mirabel and Hull or Ottawa.

A through move would also be achieved by combining a North Shore route between Québec City and Montréal with the use of the CN ROW through Dorval and Dorion to exit Montréal on route to Ottawa.

No other downtown sites, on potential corridors and with good intermodal access, were identified.

6.2.2 Suburban Options

Suburban stations could be located in Saint-Lambert for South Shore options, near Val Royal on the CN Deux-Montagnes line and a future Metro line extension and in Laval (near Saint-Martin Junction) for the North Shore options.

6.2.3 Airport Access

Station stops within or near Mirabel or Dorval Airports are possible for certain route options. Achieving an HSR station in Mirabel Airport requires an additional 11 km of route over the most direct route bypassing the airport. Dorval airport can only be reached by route options using the existing CN Montréal and Kingston Subdivisions. Cost and implementation consequences of airport access from the selected urban corridors will be investigated during Phase 2.

6.3 ROUTING OPTIONS

The numerous existing rail corridors traversing the Montréal urban are shown in Exhibit 6.1. The actual urban route through Montréal is dictated by the points at which the selected representative inter-city routes reach the urban perimeter. From the east, for North Shore options, Central Station can be reached by passing through Laval and using the CP Park Avenue Subdivision, CN Saint-Laurent and Mont-Royal Subdivisions and the Mont-Royal Tunnel. Another variant could use CN ROW from L'Epiphanie, then CN Saint-Laurent Subdivision, onto Mont-Royal Subdivision and through Mont-Royal Tunnel. South Shore routes would access Central Station by using the CN Saint-Hyacinthe Subdivision and crossing the Victoria Bridge (upgraded or replaced) onto the Montréal Subdivision.

There are two primary corridors for entry from the west. These are the CN Kingston and Montréal Subdivisions from Dorion through Dorval and CN's intermodal terminal to Central Station or one of the northern routes through Mirabel or Deux-Montagnes. The latter would use either CP's Lachute Subdivision or CN's Montfort and Mont-Royal Subdivisions.

EXHIBIT 6.1

6.4 ISSUES

Major issues influencing access to Montréal, to be addressed in Phase 2, are as follows:

- the difficulties associated with the availability of land in urban area for upgrading ROW;

- the difficulties associated with the use and sharing of existing ROW and possibly trackage in urban areas, particularly in terms of access through the Mont-Royal Tunnel;

- the speed restrictions imposed by the alignment and by operation of other commuter and freight trains in urban areas;

- the length of trackage in urban areas for North Shore options;

- as stated earlier, the South Shore options would use a ROW which would impose some freight interference due to the fact that the CN ROW on the South Shore is a main freight line. On the other hand, the North Shore options use a ROW that is currently under utilized and that could be more easily available for high-speed operations.

  In order to eliminate the alignment jog between CP ROW and CN ROW, i.e., the link between Jacques-Cartier Junction and East Junction, a tunnel has been considered between Laval (or Rivière-des-Prairies) and East Junction. This tunnel, for which the cost has been included in the cost estimates, still has to be further evaluated to assess its feasibility. Sharing of the CN Mont-Royal Subdivision between this tunnel and Mont-Royal Tunnel could be envisioned. Track sharing in Mont-Royal Tunnel is a matter that will have to be addressed in Phase 2 in order to evaluate if a new tunnel will or will not be required.

6.5 REPRESENTATIVE STRATEGY

In Phase 2 of the study, an analysis of the urban corridors serving the recommended rural routes will be carried out. This will lead to optimum representative routes through the urban area to link the entry points of the inter-city route options selected as representative for each technology. These optimum routes will address access to both a downtown and suburban station site as well as Dorval airport where feasible. The implications of the use of the Mont-Royal Tunnel will also be investigated.

7 CORRIDOR SECTION II - MONTRÉAL TO OTTAWA

7.1 EXISTING RAIL CORRIDORS

Existing rail corridors in this area include:

- CP Lachute Subdivision between Ste. Scholastique and Hull.
- CN Montfort Subdivision between St. Benoit and Calumet.
- CP M&O Subdivision between Dorion and Ottawa (abandoned).
- CP Winchester Subdivision between Dorion and Smiths Falls.
- CN Kingston Subdivision between Dorion and Kingston.
- CN Alexandria Subdivision between Coteau and Ottawa.

Other minor rail lines not oriented to facilitate Montréal - Ottawa travel have not been listed.

7.2 ROUTES IDENTIFIED IN PREVIOUS STUDIES

Previous studies of high speed rail alignments in this corridor have identified the following routes:

- CP M&O Subdivision between Dorion and Ottawa with local realignments to maintain required geometric standards.

CORRIDOR SECTION II: MONTREAL TO NATIONAL CAPITAL REGION

Table 7.1

Routes Identified and Investigated		Routes Eliminated in Initial Screening	Routes selected for Comparative Evaluation of following Technology/ROW Combinations		
Route Description	Source		+ 300 kph on New ROW	+ 300 kph on Existing ROW	200-250 kph on Existing ROW
1. CP Lachute Subdivision	Use of existing subdivision with local realignments identified in this study			*	*
2. CP Lachute subdivision and approximate auto-route 50 corridor	Identified in this study		*		
3. CP Lachute subdivision and new alignment to connect to CP M&O subdivision	Identified in this study		*		
4. CP M&O subdivision	VIA Montreal to Vankleek Hill Study - 1981	* (Service impacts on existing development)			
5. CP M&O subdivision with Hudson bypass along auto route 40 corridor	Use of existing abandoned ROW with realignment identified in this study				*
6. CN Kingston subdivision, CN Alexandria subdivision, and CP M&O subdivision	VIA Cedars to Caledonia Springs Study - 1983	* (Severe Agricultural and property impacts)		*	
7. CN Kingston subdivision and CN Alexandria subdivision	Use of existing subdivision with realignments identified in this study			*	
8. CN Montfort subdivision and new alignment to connect to CP	VIA Deux Montagnes to Vankleek Hill Study - 1981	Incompatible with Montreal entry options			
9. CP Winchester subdivision and CN Alexandria subdivision	Identified in this study			*	

- CN Kingston Subdivision with a connection to the CN Alexandria Subdivision and several new alternative alignments to connect to the CP M&O Subdivision.

- CN Montfort Subdivision connected via a new alignment crossing the Ottawa River to join the CP M&O Subdivision.

Table 7.1 summarizes the routes studied previously for this section of the corridor.

7.3 ROUTES IDENTIFIED IN THIS STUDY

Additional alignment alternatives for technologies with design speeds of up to 350 kph have been identified as described in the following sections.

7.3.1 North Shore

The following routes have been identified in this study north of the Ottawa River:

- CP Lachute Subdivision between Ste. Scholastique and Hull with local realignments to maintain required geometric standards. Bypasses of Lachute, Grenville Bay, Pointe-au-Chêne, and the major developed area of Papineauville.

- A new alignment basically following the Autoroute 50 corridor but joining the CP Lachute alignment in the vicinity of Ste. Scholastique and Gatineau.

7.3.2 South Shore

The following routes have been identified in this study south of the Ottawa River:

- A new alignment crossing the Ottawa River to connect to the CP Lachute Subdivision at Ste. Scholastique and to the CP M&O Subdivision at its crossing of Highway 417.

- A realignment of the CP M&O Subdivision to bypass Como, Hudson and Rigaud following very generally the Autoroute 40 alignment. This alignment would extend from Dorion to Ottawa.

- CN Kingston and Alexandria Subdivisions between Dorion and Ottawa with local realignments to maintain required geometric standards.

- CP Winchester Subdivision between Dorion and Monkland with a new alignment between Monkland and Casselman to connect to the CN Alexandria Subdivision into Ottawa.

7.4 CONTACTS WITH MUNICIPALITIES

Municipalities beyond the major urban centres have not been contacted.

7.5 EVALUATION

The results of the evaluation of route options for each of the three technology/ROW combinations are presented in Tables 7.5.1 to 7.5.3. The route options evaluated are shown on Exhibits 7.1, 7.2 and 7.3.

7.5.1 Transportation Service

- over 300 kph Technology on new ROW

Table 7.5.1 shows a comparative evaluation of a new ROW along the north shore between Mirabel and Hull (3M0A2) and two variations of a south shore option using the abandoned M&O subdivision (3M0B2 and 3M0C2). Although the latter could be considered existing ROWs for most of their route length their ratings have been included for comparison purposes. The only differences evident in transportation factors are a slightly longer travel time and marginally shorter diversion to Mirabel for the north shore option.

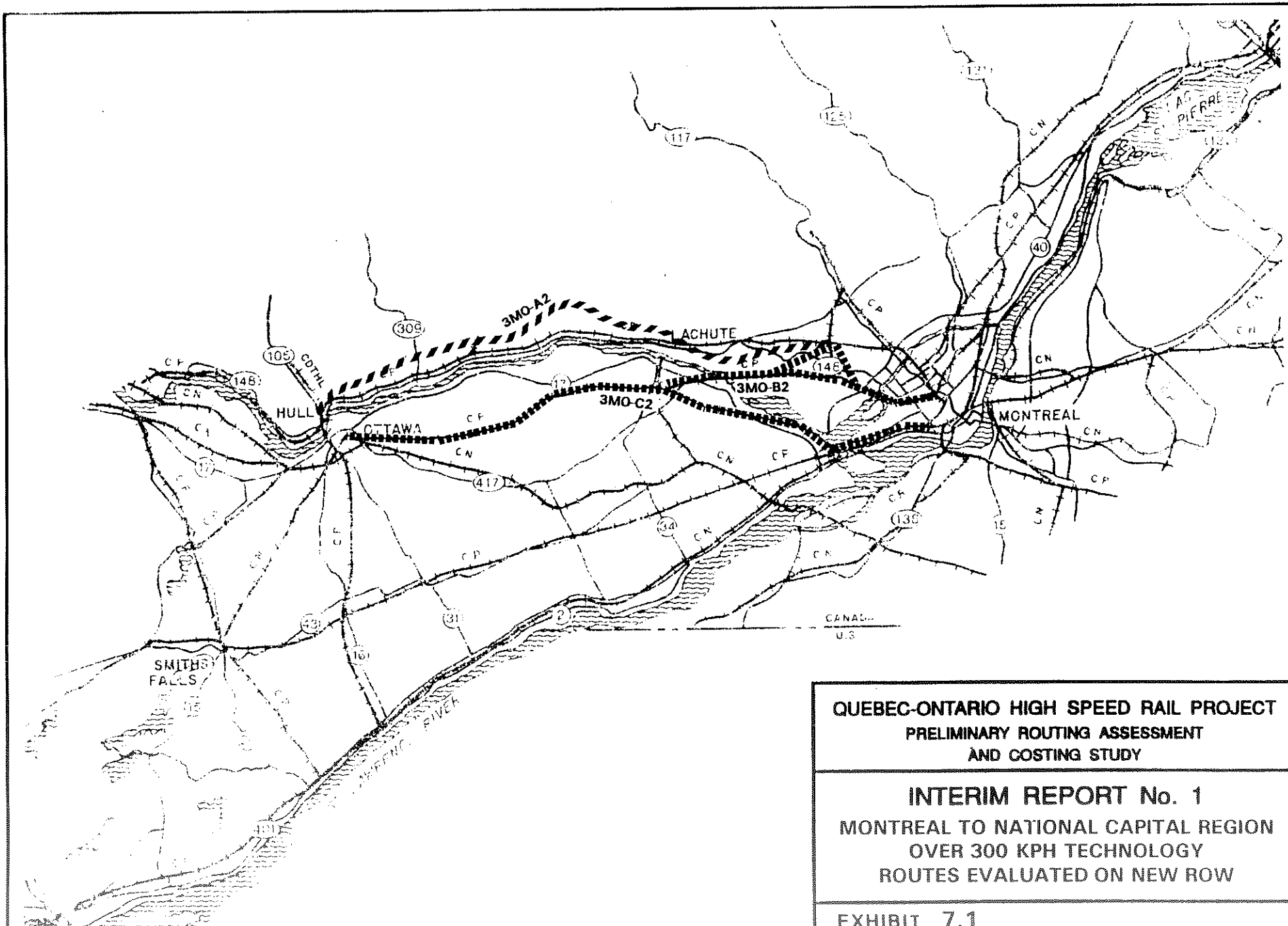
TABLE 7.5.1

TECHNOLOGY: 300 km/h plus ON NEW R.O.W.	ROUTE OPTIONS											
	3MOA2 – Mirabel to Hull				3MOB2 – Mirabel to Ottawa				3MOC2 – Vaudreuil to Ottawa			
FACTORS & SUB-FACTORS BY SECTION	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating
SECTION: MONTREAL – NATIONAL CAPITAL REGION												
1. Transportation Service												
1.1 Population centres served by route	920,000	5	40	2.00	920,000	5	40	2.00	920,000	5	40	2.00
1.2 Flexibility of route to access potential station sites	3 of 5	3	10	0.30	3 of 5	3	10	0.30	3 of 5	3	10	0.30
1.3 Accessibility of station site by intermodal means		3	5	0.15		5	5	0.25		5	5	0.25
1.4 Ability of route to access Toronto/Montreal airports	10.65km	5	15	0.75	11.65km	4.5	15	0.68	nil	1	15	0.15
1.5 Anticipated travel time based on max. operating speed	1 hr 1 min	4	30	1.20	58 min	4.5	30	1.35	54 min	5	30	1.50
				4.40				4.58				4.20
2. Natural Environment												
2.1 ESA's, ANSI's, Prov. significant wetlands	0	5	25	1.25	2.2km	1	25	0.25	2.2km	1	25	0.25
2.2 Ecological reserves	0	5	25	1.25	14.7km	2	25	0.50	14.7km	2	25	0.50
2.3 Significant fisheries / aquatic habitat	0	5	20	1.00	0.7km	4	20	0.80	0	5	20	1.00
2.4 Significant forests / woodlots	0	5	10	0.50	0	5	10	0.50	0	5	10	0.50
2.5 Major watercourse crossings	4	4	10	0.40	2	5	10	0.50	2	5	10	0.50
2.6 Floodplain / geotechnical hazards	3.8km	3	10	0.30	0	5	10	0.50	0	5	10	0.50
				4.70				3.05				3.25
3. Socio–Economic Environment												
3.1 Provincial / National Parks and historic sites	1	3	20	0.60	0	5	20	1.00	0	5	20	1.00
3.2 Major tourism / recreation / conservation areas	0	5	15	0.75	0	5	15	0.75	0	5	15	0.75
3.3 Urban perimeters	0	5	15	0.75	0	5	15	0.75	0	5	15	0.75
3.4 Federal reserves	0	5	20	1.00	0	5	20	1.00	0	5	20	1.00
3.5 Rural communities	17.7km	2	10	0.20	0	5	10	0.50	1.4km	3	10	0.30
3.6 Major productive Natural Resource Areas	0	5	15	0.75	0	5	15	0.75	0	5	15	0.75
3.7 Major Waste Management Sites	0	5	5	0.25	0	5	5	0.25	0	5	5	0.25
				4.30				5.00				4.80
4. Cost												
4.1 Order of magnitude cost of capital works	$0.635 billion	3	35	1.05	$0.525 billion	5	35	1.75	$0.505 billion	5	35	1.75
4.2 Influence on operating cost	145.9km	4.5	20	0.90	137.3km	5	20	1.00	138.1km	5	20	1.00
4.3 % of route with high level of uncertainty in cost estimate	50%	1	25	0.25	5%	5	25	1.25	15%	4	25	1.00
4.4 % of route involving difficult ROW acquisition	55%	1	10	0.10	20%	3.5	10	0.35	15%	4	10	0.40
4.5 % of route involving difficult ROW sharing	10%	4.5	10	0.45	5%	5	10	0.50	5%	5	10	0.50
				2.75				4.85				4.65

TABLE 7.5.2

TECHNOLOGY: 300 km/h plus ON EXISTING R.O.W.					ROUTE OPTIONS							
	3MOA1 – Mirabel to Hull				3MOF1 – Vaudreuil to Ottawa				3MOB2 – Mirabel to Ottawa			
FACTORS & SUB–FACTORS BY SECTION	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating
SECTION: MONTREAL – NATIONAL CAPITAL REGION												
1. Transportation Service												
1.1 Population centres served by route	920,000	5	40	2.00	920,000	5	40	2.00	920,000	5	40	2.00
1.2 Flexibility of route to access potential station sites	3 of 5	3	10	0.30	3 of 5	3	10	0.30	3 of 5	3	10	0.30
1.3 Accessibility of station site by intermodal means		3	5	0.15		5	5	0.25		5	5	0.25
1.4 Ability of route to access Toronto/Montreal airports	10.65km	5	15	0.75	nil	1	15	0.15	11.65km	4.5	15	0.68
1.5 Anticipated travel time based on max. operating speed	1 hr 1 min	4	30	1.20	55 min	5	30	1.50	58 min	5	30	1.50
				4.40				4.20				4.73
2. Natural Environment												
2.1 ESA's, ANSI's, Prov. significant wetlands	3.0km	2	25	0.50	0.7	4	25	1.00	2.2km	1	25	0.25
2.2 Ecological reserves	0	5	25	1.25	0	5	25	1.25	14.7km	2	25	0.50
2.3 Significant fisheries / aquatic habitat	0	5	20	1.00	0	5	20	1.00	0.7km	4	20	0.80
2.4 Significant forests / woodlots	0	5	10	0.50	0	5	10	0.50	2	3	10	0.30
2.5 Major watercourse crossings	4	4	10	0.40	2	5	10	0.50	2	5	10	0.50
2.6 Floodplain / geotechnical hazards	1.6km	3	10	0.30	0	5	10	0.50	0	5	10	0.50
				3.95				4.75				2.85
3. Socio–Economic Environment												
3.1 Provincial / National Parks and historic sites	0	5	20	1.00	1	4	20	0.80	0	5	20	1.00
3.2 Major tourism / recreation / conservation areas	0	5	15	0.75	0	5	15	0.75	0	5	15	0.75
3.3 Urban perimeters	0	5	15	0.75	0	5	15	0.75	0	5	15	0.75
3.4 Federal reserves	0	5	20	1.00	0	5	20	1.00	0	5	20	1.00
3.5 Rural communities	6.9km	4	10	0.40	0	5	10	0.50	0	5	10	0.50
3.6 Major productive Natural Resource Areas	0	5	15	0.75	0	5	15	0.75	0	5	15	0.75
3.7 Major Waste Management Sites	2	4	5	0.20	0	5	5	0.25	0	5	5	0.25
				4.85				4.80				5.00
4. Cost												
4.1 Order of magnitude cost of capital works	$0.680 billion	2.5	35	0.88	$0.560 billion	4.5	35	1.58	$0.525 billion	5	35	1.75
4.2 Influence on operating cost	145.9km	4.5	20	0.90	142.3km	5	20	1.00	137.3km	5	20	1.00
4.3 % of route with high level of uncertainty in cost estimate	35%	2	25	0.50	10%	4.5	25	1.13	5%	5	25	1.25
4.4 % of route involving difficult ROW acquisition	35%	2	10	0.20	15%	4	10	0.40	20%	3.5	10	0.35
4.5 % of route involving difficult ROW sharing	20%	3.5	10	0.35	5%	5	10	0.50	5%	5	10	0.50
				2.83				4.80				4.85

TECHNOLOGY: 200 km/h plus ON EXISTING R.O.W.					ROUTE OPTIONS							
	2MOA1 – Mirabel to Hull				2MOF1 – Vaudreuil to Ottawa				2MOC2 – Vaudreuil to Ottawa (Hudson Bypass)			
FACTORS & SUB-FACTORS BY SECTION	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating
SECTION: MONTREAL – NATIONAL CAPITAL REGION												
1. Transportation Service												
1.1 Population centres served by route	920,000	5	40	2.00	920,000	5	40	2.00	920,000	5	40	2.00
1.2 Flexibility of route to access potential station sites	3 of 5	3	10	0.30	3 of 5	3	10	0.30	3 of 5	3	10	0.30
1.3 Accessibility of station site by intermodal means		3	5	0.15		5	5	0.25		5	5	0.25
1.4 Ability of route to access Toronto/Montreal airports	10.65km	4	15	0.60	nil	1	15	0.15	nil	1	15	0.15
1.5 Anticipated travel time based on max. operating speed	1 hr 7 min	4.5	30	1.35	1 hr 1 min	5	30	1.50	1 hr 1 min	5	30	1.50
				4.40				4.20				4.20
2. Natural Environment												
2.1 ESA's, ANSI's, Prov. significant wetlands	3.0km	2	25	0.50	0.7	4	25	1.00	2.2km	1	25	0.25
2.2 Ecological reserves	0	5	25	1.25	0	5	25	1.25	14.7km	2	25	0.50
2.3 Significant fisheries / aquatic habitat	0	5	20	1.00	0	5	20	1.00	0	5	20	1.00
2.4 Significant forests / woodlots	0	5	10	0.50	0	5	10	0.50	0	5	10	0.50
2.5 Major watercourse crossings	4	4	10	0.40	2	5	10	0.50	2	5	10	0.50
2.6 Floodplain / geotechnical hazards	1.6km	3	10	0.30	0	5	10	0.50	0	5	10	0.50
				3.95				4.75				3.25
3. Socio-Economic Environment												
3.1 Provincial / National Parks and historic sites	0	5	20	1.00	0	5	20	1.00	0	5	20	1.00
3.2 Major tourism / recreation / conservation areas	0	5	15	0.75	0	5	15	0.75	0	5	15	0.75
3.3 Urban perimeters	0	5	15	0.75	0	5	15	0.75	0	5	15	0.75
3.4 Federal reserves	0	5	20	1.00	0	5	20	1.00	0	5	20	1.00
3.5 Rural communities	6.9km	4	10	0.40	0	5	10	0.50	1.4km	3	10	0.30
3.6 Major productive Natural Resource Areas	0	5	15	0.75	0	5	15	0.75	0	5	15	0.75
3.7 Major Waste Management Sites	2	4	5	0.20	0	5	5	0.25	0	5	5	0.25
				4.85				5.00				4.80
4. Cost												
4.1 Order of magnitude cost of capital works	$0.660 billion	2.5	35	0.88	$0.560 billion	4	35	1.40	$0.505 billion	5	35	1.75
4.2 Influence on operating cost	145.6km	5	20	1.00	145.9km	4.5	20	0.90	138.8km	5	20	1.00
4.3 % of route with high level of uncertainty in cost estimate	30%	2.5	25	0.63	10%	4.5	25	1.13	15%	4	25	1.00
4.4 % of route involving difficult ROW acquisition	35%	2	10	0.20	15%	4	10	0.40	20%	3.5	10	0.35
4.5 % of route involving difficult ROW sharing	15%	4	10	0.40	5%	5	10	0.50	5%	5	10	0.50
				3.10				4.33				4.00

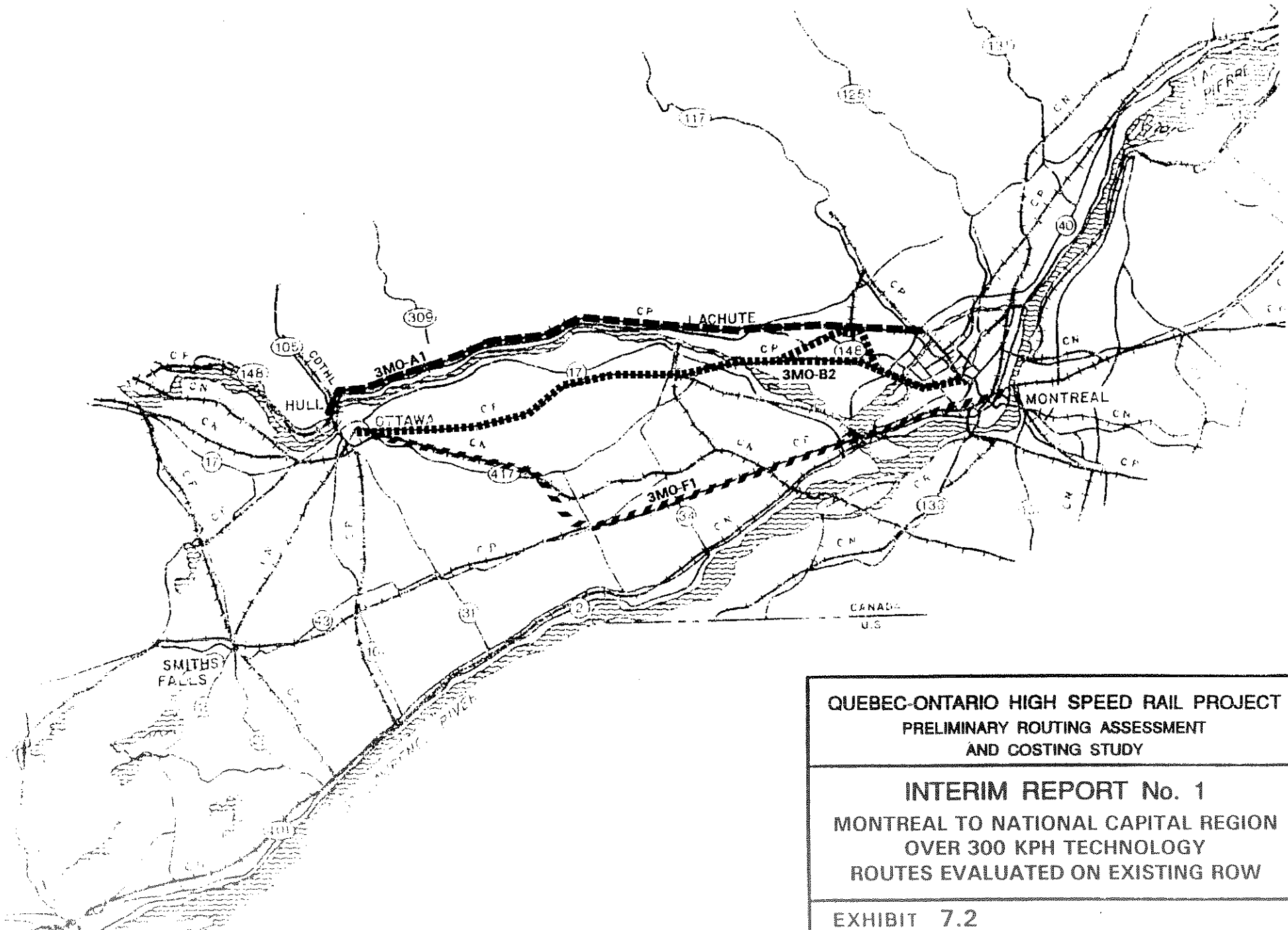


QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT
PRELIMINARY ROUTING ASSESSMENT AND COSTING STUDY

INTERIM REPORT No. 1

MONTREAL TO NATIONAL CAPITAL REGION
OVER 300 KPH TECHNOLOGY
ROUTES EVALUATED ON NEW ROW

EXHIBIT 7.1



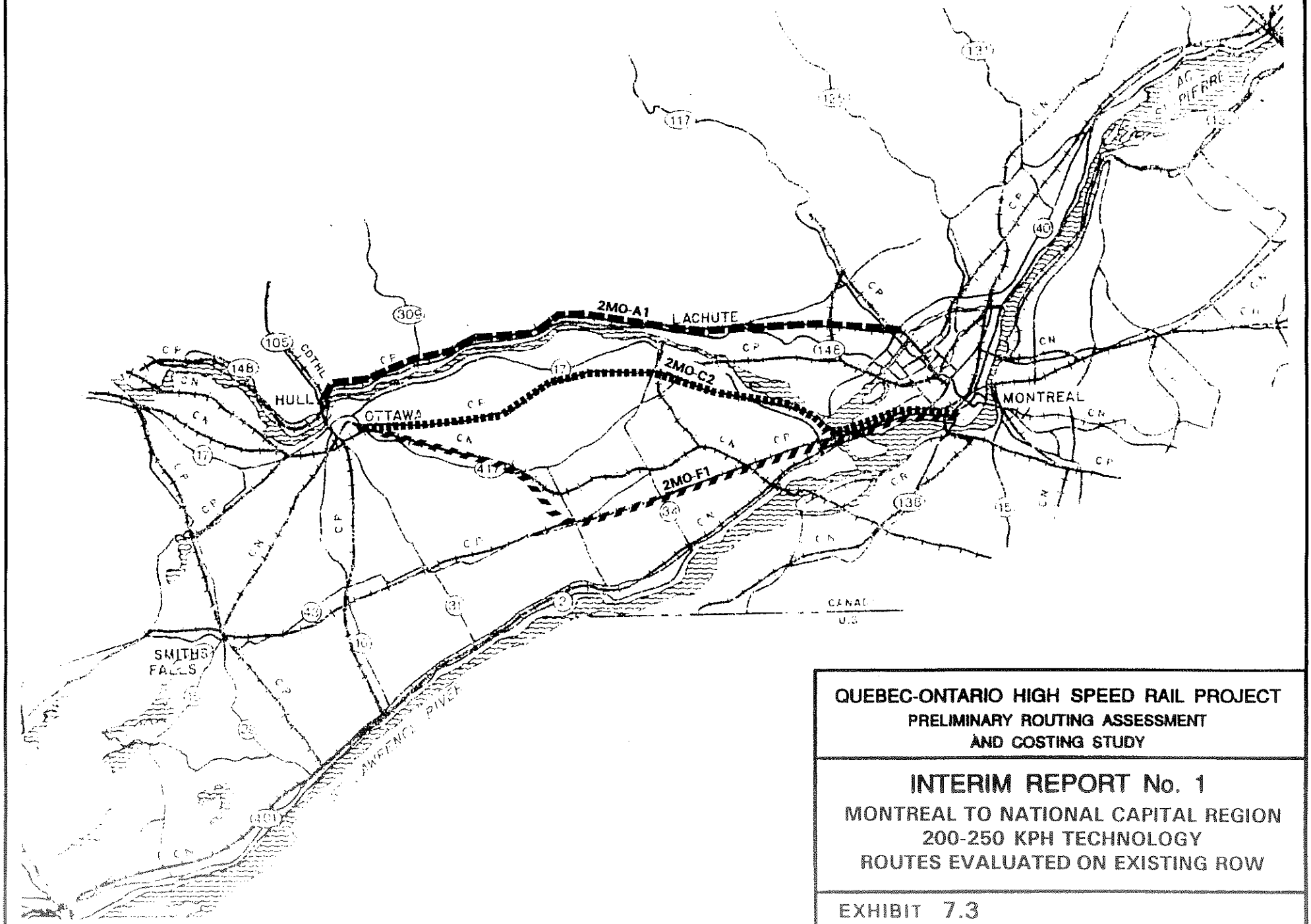
QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT

PRELIMINARY ROUTING ASSESSMENT AND COSTING STUDY

INTERIM REPORT No. 1

MONTREAL TO NATIONAL CAPITAL REGION OVER 300 KPH TECHNOLOGY ROUTES EVALUATED ON EXISTING ROW

EXHIBIT 7.2



QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT

PRELIMINARY ROUTING ASSESSMENT AND COSTING STUDY

INTERIM REPORT No. 1

MONTREAL TO NATIONAL CAPITAL REGION
200-250 KPH TECHNOLOGY
ROUTES EVALUATED ON EXISTING ROW

EXHIBIT 7.3

- over 300 kph technology on existing ROW

In the comparative evaluation (Table 7.5.2) the abandoned M&O ROW is again compared with other north and south shore options. Although travel times are similar, the south shore CM0B2 option serves stations with better intermodal access in the National Capital Region.

- 200-250 kph technology on existing ROW

For this combination Table 7.5.3 the abandoned M&O subdivision with a bypass of Hudson to link to Vaudreuil is compared with the north shore CP Lachute ROW and a combination of the CP Winchester and CN Alexandria ROWs (2M0F1).

From a transportation service perspective, the differences in the options are shorter travel times for the south shore routes and the ability to serve Mirabel with a north shore route. Although not reflected in the evaluation the south shore routes could provide access to Dorval Airport.

7.5.2 Natural Environment

Along the existing CP ROW from Carleton Place to the west end of Ottawa, the route crosses the southern tip of a Class 1 wetland east of Carleton Place. The wetland, which extends from the Manion Corners Marsh to the north is designated as an ANSI of regional significance and the area's numerous flooded areas provide excellent waterfowl and wetland habitat. Deer also inhabit the area. An abundance of floral species contributes to the biodiversity of the area.

The more southerly new approach to the west end of Ottawa encounters the Marlborough Regional Forest and major wetland/wildlife habitat complex south of the community of Richmond. This feature is outlined in the National Capital to Toronto section. There are also two aggregate sites north of Richmond that straddle the route.

There were two corridor options that were examined south of the Ottawa River connecting Ottawa and Montréal. The northerly route following the abandoned CP M&O ROW out of Ottawa extending to the Vankleek Hill area presents more potential environmental concerns than the southerly CN Winchester/Alexandria option. The route touches on the north end of Mer Bleue, a large wetland and federal recreation area. Located only several kilometres outside of Ottawa, Mer Bleue is a sphagnum peat bog that is designated by MNR as a Class 1 wetland, as well a provincial ANSI. The black spruce and tamarack habitat of Mer Bleue and other flora and fauna of the area are characteristic of Peatland habitats, of which there are only a few in the Ottawa vicinity.

Further along the route there are a couple of local ANSI's immediately adjacent to alignment in the Navan and Sarsfield areas. The route then traverses a major waterfowl habitat in two locations south of the Plantagenet area. The alignment continues adjacent to Alfred Bog, which is a Class 1 wetland designated by MNR. There are also several aggregate deposits south of the route in the Vankleek Hill area. This corridor would be the least desirable of the two southern routes from an environmental perspective given the major constraints of Mer Bleue, the two ANSI's east of Navan, the large waterfowl habitat area south of Plantagenet, and the Alfred Bog wetland adjacent to the route.

The extension from this route that crosses the Ottawa River in the Pointe Fortune area has the same environmental constraints as the above route up to the area just east of Vankleek Hill. In addition, major crossings of the Ottawa River and Rivière du Nord would be encountered with this option, along with several minor watercourses on the Québec side draining into the Ottawa River. The route also traverses a designated fish spawning habitat in the Pointe Fortune area. Considering the additional constraints along this route, and those that it shares in common with the route up to Vankleek Hill, this alternative would not be particularly attractive compared to the other major southerly route.

The Winchester/Alexandria route to the south appears to present a better option from a natural environmental perspective. Coming out of Ottawa, the route abuts the southern end of the Mer Bleue wetland/recreation complex, but involves less distance than the route to the north of the

wetland, and is along a ROW that is presently in use. The only other natural environmental features of any potential concern are two significant woodlots that are adjacent to the corridor in the Vars area. They comprise two separate parcels east and west of Vars, that are part of the Cumberland Forest, which is characterized by young maple and aspen communities. These forests provide habitat for a variety of plants and wildlife. Mitigation of potential effects on the forests can be achieved through the alignment of the route.

Along the north shore of the Ottawa River, two corridor options were examined. The existing CP corridor (used for the over 300 kph and 200-250 kph technologies) follows closely the edge of the Ottawa River flood plain and involves a number of environmental constraints, but may be more desirable because it is an existing ROW. South of the corridor in the Masson area there are two designated wildlife protection areas adjacent to the river. A couple of areas presenting some geotechnical hazards (ie. unstable slopes) occur north of the route in the Thurso/Plaisance areas. It is likely that mitigation measures could be developed in these areas.

Other major constraints adjacent to the route are the Plaisance Wildlife Reserve and floodplain and the Granville Bay wetland. A conservation area to north of the route, also occurs east of Montebello. There are also at least nine crossings of large rivers draining from the escarpment to the Ottawa River that would be involved, although this route is not likely to involve any new crossing locations.

The other route alternative north of the Ottawa River (over 300 kph) involves considerable new ROW and traverses three areas presenting geotechnical hazards in the Thurso/Plaisance areas, with a greater total length through these areas than those of the existing ROW option. As with the route along the existing ROW, there would be a number of river crossings involved, some of which would likely be in new locations, which may make this option less preferable than the one along the existing ROW.

7.5.3 Socio-Economic Environment

There are generally fewer constraints related to the social environment than for the natural environment for the corridor options examined for the Ottawa to Montréal section. Rural communities, recreation, conservation and historic sites, and agricultural land zone designations in Québec were identified as the major constraints.

The route along the existing CP ROW from Carleton Place to Ottawa west bisects the community of Stittsville. South of the Ottawa River, Mer Bleue also presents a major constraint to both route options in terms of the social environment, in that the area is managed by the National Capital Commission for multiple use including conservation, outdoor education and natural history, and recreation.

The northerly option along the CP M&O ROW traverses Rigaud at the eastern end of route, and is adjacent to the community of Hudson. The extension from this route that crosses the Ottawa River touches on the southeast corner of Carillon Provincial Park, an impact which the alignment of the route should be able to mitigate. Given that there were no major socio-economic environmental constraints for the southerly route along the Winchester/Alexandria alignment, it would, as for the natural environment, likely be the favoured option.

Socio-economic constraints appear to be more numerous for the route options north of the Ottawa River. Along the existing CP ROW option, the Montebello historic area is adjacent to the route, and the alignment also abuts the northern end of the community of Lachute. There should be no significant conflicts for this option with agricultural zone designations, since most of route is within an existing corridor. However, farm crossing impacts will require more detailed investigation.

The new over 300 kph alignment north of the Ottawa River crosses through an historic site north of Calumet, but it should be possible to mitigate any effects with this site through a minor shift in alignment. Parc Omega, a private wildlife park, lies to the south of this route along

Highway 323. Although this route may be preferable over the existing ROW option in avoiding the rural communities of Angers, Masson, Thurso and Lachute, there is some potential for conflict with Québec agricultural zone designations along the route where new rights-of-way would be involved.

7.5.4 Costs

The comparison of Cost and confidence level considerations indicates the following for each technology/ROW combination:

- over 300 kph on new ROW

The cost of a new ROW through the difficult north shore terrain could be up to 20% higher than south shore routes using abandoned ROW. This difference combined with lower implementation confidence levels is indicated in the comparative ratings.

- over 300 kph on existing ROW

The route using the M&O subdivision and crossing the Ottawa river to Mirabel (3MOB2) emerges with the highest rating as the capital cost is expected to be lowest, the route is shorter and ROW sharing is confined to urban areas.

- 200-250 kph on existing ROW

Again, the advantages of the ROW provided by the abandoned M&O subdivision are apparent and consequently for the reasons noted above, this route option (2MOC2), accessing Montréal through Vaudreuil and Dorion, is rated highest.

The north shore option using the CP Lachute subdivision carries a cost premium and greater uncertainty in implementation issues.

7.6 SELECTION OF REPRESENTATIVE CORRIDOR FOR COSTING

Although not necessarily the preferred corridor for any particular technology the following corridors have been selected as representative for costing:

7.6.1 Over 300 kph Technology on New Corridor

The new alignment following the CP Lachute Subdivision and Autoroute 50 was chosen to represent this technology.

This alignment includes the greatest length of new ROW and traverses some of the more difficult terrain thereby allowing a determination of the sensitivity of the costing to these factors.

7.6.2 Over 300 kph Technology on Existing Corridor

The alignment consisting of a new Ottawa River crossing connecting the CP Lachute and M&O Subdivision was chosen to represent this technology.

Since this alignment would use a vacant ROW (M&O) for much of its length with resulting minimal environmental impact this would represent the lower end of the scale for the over 300 kph technology.

7.6.3 200-250 kph Technology on Existing Corridor

The CP M&O Subdivision with the Hudson bypass was chosen to represent this technology.

This alignment includes the greatest proportion of existing unused ROW combined with a moderate relocation to avoid disruption to existing development. It also avoids, to the maximum extent, possible operational conflicts with current rail movements.

8 NATIONAL CAPITAL REGION

8.1 CONTACT WITH AREA MUNICIPALITIES

Meetings were held with representatives of the Outaouis Urban Community, the City of Hull and the Regional Municipality of Ottawa-Carleton to both explain the scope and process of the study and obtain their comments on potential high speed rail lines in the National Capital Region.

These representatives were advised that the choice of representative routes and station locations is but one part of a pre-feasibility study investigating total costs and benefits of a high speed rail facility in the Québec City - Windsor corridor to determine if further investigation of this technology is warranted.

The Outaouis and Hull representatives requested that:

- Consideration be given to the divisive effect a fourth corridor paralleling the Ottawa River would have on the existing development squeezed between the adjacent mountains and the Ottawa River. Highway 148, the existing CP Lachute Subdivision and Autoroute 50 already exist or are under development in this corridor.

- The effect that possible relocation of existing freight services would have on existing manufacturing industries in Gatineau and Masson-Buckingham be included in the cost analyses.

- If a north shore route is chosen a new station in Hull will be an essential component. The high speed rail corridor must also respect the extension of Boulevard de la Carrière in Hull and the intended intensive redevelopment of the existing Hull Station area.

The Ottawa-Carleton representatives indicated that:

- They had acquired the CN Renfrew Subdivision ROW and are in the process of acquiring the CP Carleton Place Subdivision ROW.

- The CP Ellwood Subdivision ROW north of Prince of Wales is included in their Official Plan as a transitway and arterial corridor.

- The negotiated realignment of the CN Beachburg Subdivision to accommodate the Southeast Transitway retains space for a single railway track.

- RMOC is attempting to protect a 100m wide corridor adjacent to the CP M&O Subdivision and the CN Smiths Falls Subdivision in the Barrhaven area.

- Four potential high speed rail station locations within the Regional Municipality are believed to be:

  - the existing Ottawa Station
  - Lebreton flats
  - adjacent to the Walkley railway yard
  - adjacent to the CN Smiths Falls Subdivision and Woodroffe Avenue

- They wish to be more visibly involved in the study and subsequent processes to facilitate penetration of the urban area.

8.2 STATION OPTIONS

Of the potential station sites in the National Capital Region all except one can be classed as urban. These potential station sites are described in the following sections and are shown on Exhibit 8.1.

8.2.1 Urban

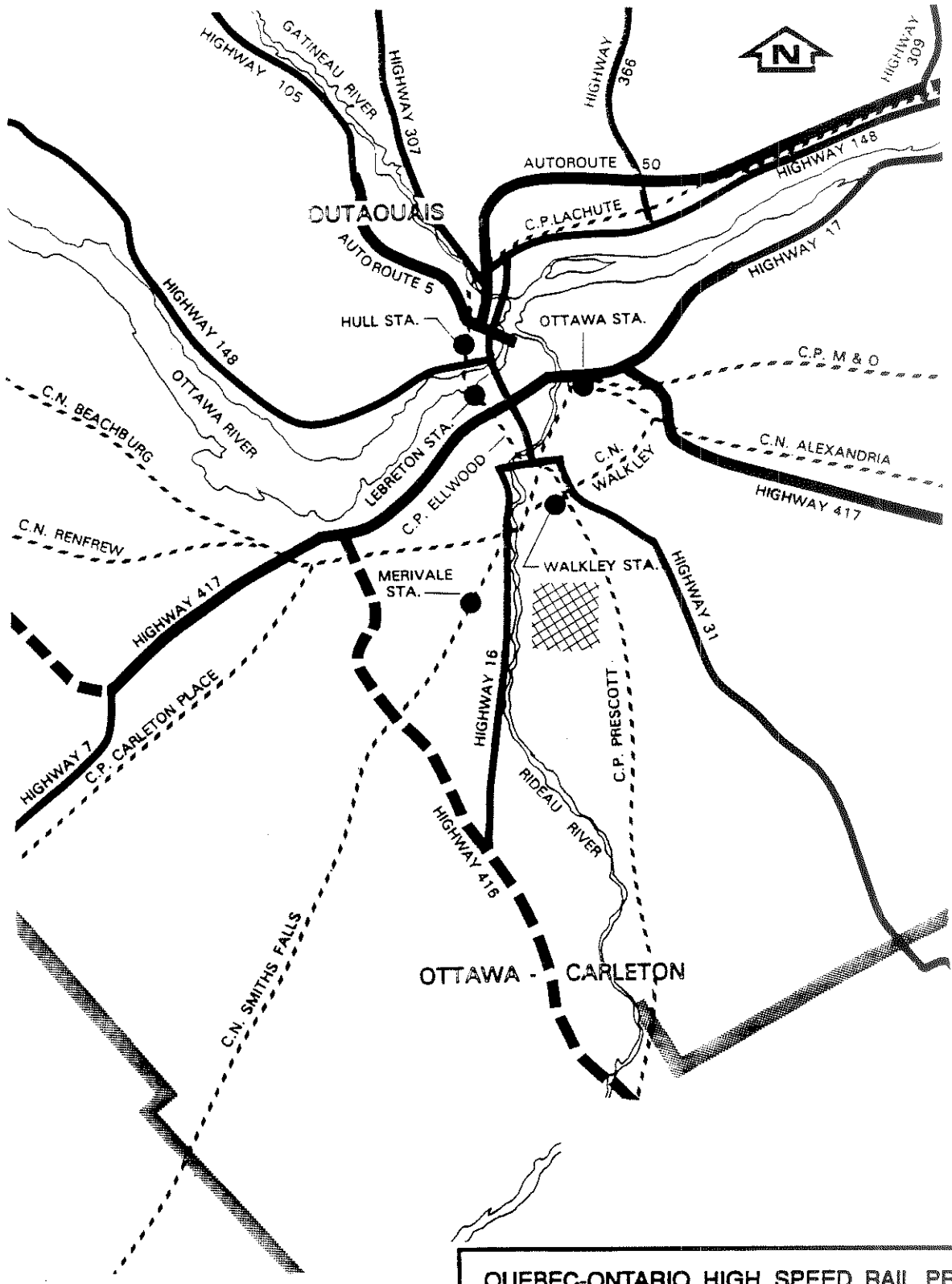
The most obvious station location is that which currently serves the National Capital. The Ottawa Station can be accessed by either of the high speed rail alignments approaching from the east. It can also be accessed by any of the routes approaching from the west via the CN Beachburg Subdivision.

The Ottawa Station is currently served by the adjacent Highway 417 through an existing interchange, by local bus service and by the rapid transit system which has a station at this location.

The Walkley Station would be located immediately adjacent to the South East Transitway, Highway 31, the Airport Parkway, and a proposed Inner Provincial Bypass route.

The Hull Station would be located at the site of the currently closed VIA Station on the CP Lachute Subdivision. It would be immediately adjacent to an Autoroute 50 interchange, two major arterial roadways and a potential transitway. Major intensive redevelopment of the station area is planned.

The Lebreton Station would be located on the periphery of a major downtown redevelopment, adjacent to the West Transitway (and a potential station), and adjacent to two existing and a potential third traffic arterial.



LEGEND:

- MAJOR HIGHWAYS
- PROPOSED MAJOR HIGHWAYS
- RAILWAYS
- MUNICIPAL BOUNDARIES
- EXISTING/POSSIBLE INTERNATIONAL AIRPORTS
- POSSIBLE STATION SITES

QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT
PRELIMINARY ROUTING ASSESSMENT
AND COSTING STUDY

INTERIM REPORT No. 1

NATIONAL CAPITAL REGION
EXISTING CORRIDORS

EXHIBIT 8.1

8.2.2 Suburban

The Merivale Station would be located on the CN Smiths Falls subdivision, adjacent to two major arterials and on the route of a planned South-West Transitway extension.

8.3 ROUTING OPTIONS

Routes on the north shore of the Ottawa River would enter the National Capital Area on the CP Lachute Subdivision. They would exit via the CP Ellwood Subdivision and either the CN Smiths Falls Subdivision or the CP Carleton Place Subdivision. Such routes could thus access the Hull, Lebreton, or Merivale stations except for the CP Carleton Place option which would not access the Merivale Station.

Routes on the south shore of the Ottawa River would enter the National Capital Area on either the CP M&O Subdivision or the CN Alexandria Subdivision. They would exit the area on either the CN Smiths Falls Subdivision or the CP Carleton Place Subdivision via the CN Beachburg Subdivision. All the above routes can be lined by routes along the CN Beachburg Subdivision or the CN Walkley Yard.

This routing would mean that all routes except those exiting on the CP Carleton Place Subdivision could access the Ottawa, Walkley and Merivale stations. The CP Carleton Place Subdivision routes could access only the Ottawa and Walkley stations.

8.4 ISSUES

Routes on the north shore of the Ottawa River would face the following issues:

- a very congested corridor through the Regional Municipality of Ottawa-Carleton (RMOC).

- restricted operating speeds well beyond the station

- competition with proposed roadways for ROW

- significant potential penalties to existing industries due to loss of rail service if the HSR options jeopardized any of the industrial services.

- practicality of twinning tunnel under Rideau Canal

Routes on the south shore of the Ottawa River would face the following issues:

- potential conflict with conventional passenger rail services if in fact any conventional passenger service remains, which is considered unlikely.

- speed restrictions imposed for crossing of existing services

- restricted operating speeds on the CP Carleton Place subdivision at Bells Corners

- difficulty of widening ROW for sharing with existing services

8.5 REPRESENTATIVE STRATEGY

Routes north of the Ottawa River can all access the Hull, LeBreton, and Merivale stations. Routes passing through the urban area and leaving on the CP Carlton Place Subdivision do not access the Merivale station.

For route comparison the assumption of the Hull station is therefore recommended since it is common to all routes north of the Ottawa River.

Likewise all routes from Montréal south of the Ottawa River can access the Ottawa, Walkley and Merivale stations. The route leaving Ottawa along the CP Carleton Place Subdivision does not access the Merivale station. The issue of whether the high speed rail corridor should lead

to the Ottawa or Walkley station can thus be addressed at a later date. Consequently routes leading to the Ottawa station are recommended for comparison

9 CORRIDOR SECTION III - NATIONAL CAPITAL REGION TO TORONTO

9.1 EXISTING RAIL CORRIDORS

This chapter discusses the routing analysis for the approximately 300 km section between the eastern fringe of the Greater Toronto Area (Oshawa East boundary) and the south-western limits of the National Capital Region described in Chapter 8.

In this section, existing rail corridors follow three primary routes from Toronto eastward, i.e.:

- the CN Kingston subdivision along the shore of Lake Ontario between Oshawa and Cornwall.

- the CP Belleville subdivision, also following the lakeshore from Oshawa to Belleville and then heading north-easterly to Perth and Smiths Falls.

- the CP Havelock subdivision, which extends from the north-east corner of Metro Toronto in a north-easterly direction through Peterborough to Havelock with an abandoned ROW continuing to Tweed.

Existing rail access to the National Capital Region from the south and west consists of the CP Carleton Place subdivision through Stittsville, the CN Smiths Falls subdivision from Smiths Falls through Richmond and the CP Prescott subdivision from Kemptville and Prescott on the CN Kingston subdivision. The latter is also linked to Smiths Falls by the CP Brockville subdivision providing a route from Brockville to Ottawa (presently used for VIA service)

9.2 ROUTES IDENTIFIED IN PREVIOUS STUDIES

Studies of potential high speed rail routes in this section commenced in the late seventies and continued in the eighties through initiatives by Bombardier in 1990 and most recently the overview by the Ontario-Québec Rapid Train Task Force in 1991, Carman-Bujold Report.

The various segments considered by these prior studies are identified in Table 9.1. Recommended routes for over 300 kph high speed service between Toronto and Ottawa were the following:

i) VIA Rail Studies and Carman-Bujold Report.

- a lakeshore route between Oshawa and Kingston (using either existing CN or CP ROW's or a new ROW north of Hwy 401) combined with a new ROW heading north-easterly from Kingston to Smiths Falls and on to Ottawa up the existing CN Smiths Falls ROW.

ii) Bombardier Study

- a route along the Lakeshore from Oshawa to Belleville and then continuing in a north-easterly direction along an upgraded CP Belleville subdivision through Smiths Falls to Ottawa.

iii) CIGGT "Alternatives to Air" Study

- a route north of Highway 401 through Frankford from Oshawa to north-east of Kingston and then joining the same new ROW through Smiths Falls as adopted by the VIA studies.

9.3 ROUTES IDENTIFIED IN THIS STUDY

Table 9.1 also lists the two additional routes (or portions of routes) investigated during the comparative route analysis in this study. The first is a variation of the new ROW between Oshawa and Kingston, following closely the Highway 401 corridor instead of the cross-country route further north through Frankford. North-east of Kingston, this variation would join the new ROW through Smiths Falls proposed in the previous studies.

The second additional route analyzed, aimed at minimizing the Toronto - Ottawa distance by following the most direct route between the two major centres. This approach rules out the opportunity to serve Kingston since the route heads north-easterly from Oshawa paralleling the Ontario Hydro ROW to Norwood and then continues to Carleton Place along the Highway 7 Corridor. Peterborough becomes the nearest urban area and a potential intermediate stop as the route passes approximately 6 km south of the City.

9.3.1 Route Options Evaluated in this Study

From the range of routes (or segments) discussed and tabulated the following options were selected for comparative evaluation under the three technology/ROW combinations required by the Terms of Reference:

i) over 300 kph technology on new ROW:

- option OTD, the Highway 401 corridor to Kingston linking to a new ROW through Smiths Falls to Ottawa;

- option OTE, the new southern alignment through Frankford to Kingston linking to the same new ROW through Smiths Falls as in option OTD;

CORRIDOR SECTION III: NATIONAL CAPITAL REGION TO TORONTO

Table 9.1

Routes Identified and Investigated		Routes Eliminated in Initial Screening	Routes selected for Comparative Evaluation of following Technology/Row Combinations		
Route Description	Source		+ 300 kph on New ROW	+ 300 kph on Existing ROW	200-250 kph on Existing ROW
1. CN Kingston/CP Belleville Sub-divisions between Toronto and Kingston.	VIA High Speed Rail Study - 1984			*	*
2. CP/ Belleville Sub-division between Belleville and Smiths Falls	Bombardier High Speed Rail Study - 1990				*
3. ROW through Frankford north of Hwy 401 between Toronto and Kingston	"Alternatives to Air" by CIGGT - 1979		*		
4. ROW through Portland between Kingston and Smiths Falls.	VIA High Speed Rail Study - 1984		*	*	
5. ROW through Peterborough, Madoc, Carleton Place between Toronto and Ottawa.	New Route identified in this study.		*		
6. ROW along Hwy 404 Corridor (North Side) between Oshawa and Kingston	New Route identified in this study.		*		
7. CP Brockville Subdivision between Brockville and Smiths Falls	Use of existing subdivision proposed in this study.			*	*

- option OTF, the new northern alignment through the Peterborough area and Highway 7 corridor to Carleton Place (or a variation joining the CP Belleville ROW at Perth to reach Ottawa through Smiths Falls as in options OTD and OTE.

ii) over 300 kph technology on existing ROW:

- option OTA, optimum use of the existing CN and CP ROWs between Oshawa and Kingston followed by a section of new ROW between Kingston and Smiths Falls (option OTD.OTE above) leading to the existing CN ROW between Smiths Falls and Ottawa.

- Option OTB, again using CN and CP ROWs between Oshawa and Kingston but continuing eastward from Kingston along the CN ROW to Brockville where a new bypass of the town would take the route onto the CP Brockville subdivision to Smiths Falls. From Smiths Falls the route would again follow the CN ROW into Ottawa.

iii) 200 - 250 kph technology on existing ROW:

- option OTA, generally following the same routing as option OTA (for over 300 kph technology) but with less upgrading of existing ROW to maximize their use between Oshawa and Kingston. Also incorporates the segment of new ROW between Kingston and Smiths Falls.

- option OTB which makes maximum use of existing ROWs by adopting the OTA routing between Oshawa and Kingston and then following a Kingston, Brockville, Smiths Falls, Ottawa routing utilizing existing CN or CP ROW except for local bypasses around Brockville and Smiths Falls.

9.4 CONTACTS WITH MUNICIPALITIES

The only municipal areas where station stops are contemplated in this corridor section are Kingston and Peterborough. For the former, previous studies have provided information on the implications of potential sites in the urban area and surroundings. At this stage of the study, where the focus is on a comparative evaluation of inter-urban routes, potential station sites in or near Kingston are dictated by broader route planning considerations. Once approval of the selected representative corridors is received, a meeting with Kingston municipal officials will be convened to discuss planning and access issues which may influence the cost of representative station facilities in the area.

Municipal planning issues are not seen as influencing routing of the northern alignment near Peterborough. Hence, as the Hydro ROW corridor routing passes close enough to the urban area, contact with this municipality has been made conditional on the results of the basic evaluation of the northern route vs the alternative inter-urban route options.

9.5 EVALUATION

The evaluation results for this corridor section are presented in the following tables:

Tables 9.5.1	-	over 300 kph technology on new ROW
Tables 9.5.2	-	over 300 kph technology on existing ROW
Tables 9.5.3	-	200 - 250 kph technology on existing ROW

The route options evaluated are shown on Exhibits 9.1, 9.2 and 9.3.

9.5.1 Transportation Service

- over 300 kph technology on new ROW:

In terms of ridership potential from an intermediate station stop in this section, the two options serving the Greater Kingston region provide access to a larger population base

QUEBEC – ONTARIO H.S.R. STUDY: PRELIMINARY ROUTING ASSESSMENT AND COSTING

EVALUATION OF ROUTING OPTIONS

TABLE 9.5.1

TECHNOLOGY: 300 km/h plus ON NEW R.O.W.	ROUTE OPTIONS											
	OTD – Lakeshore/Highway 401				OTE – Southern Alignment				OTF – Northern alignment			
FACTORS & SUB-FACTORS BY SECTION	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Ratimg	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating
SECTION: NATIONAL CAPITAL REGION – TORONTO												
1. Transportation Service												
1.1 Population centres served by route	110–120,000	5	40	2.00	110–120,000	5	40	2.00	100–110,000	4	40	1.60
1.2 Flexibility of route to access potential station sites	all	5	10	0.50	all	5	10	0.50	no Kingston station	2	10	0.20
1.3 Accessibility of station site by intermodal means	8km/ctr, 4km/401	5	5	0.25	10km/ctr, 6km/401	4	5	0.20	6km/ctr	3	5	0.15
1.4 Ability of route to access Toronto/Montreal airports	Pickering (TOR N route)	1	15	0.15	Pickering	3	15	0.45	Pickering	3	15	0.45
1.5 Anticipated travel time based on max. operating speed	1 hr 34 min	4.5	30	1.35	1 hr 34 min	4.5	30	1.35	1 hr 27 min	5	30	1.50
				4.25				4.50				3.90
2. Natural Environment												
2.1 ESA's, ANSI's, Prov. significant wetlands	35.9km	1	25	0.25	35.7km	1	25	0.25	10.8km	4	25	1.00
2.2 Ecological reserves	2.0km	1	25	0.25	2.0km	1	25	0.25	0	5	25	1.25
2.3 Significant fisheries / aquatic habitat	30	1	20	0.20	15	1	20	0.20	0	5	20	1.00
2.4 Significant forests / woodlots	0.6km	3	10	0.30	0.6km	3	10	0.30	0	5	10	0.50
2.5 Major watercourse crossings	2	5	10	0.50	2	5	10	0.50	0	5	10	0.50
2.6 Floodplain / geotechnical hazards	0	5	10	0.50	0	5	10	0.50	0	5	10	0.50
				2.00				2.00				4.75
3. Socio–Economic Environment												
3.1 Provincial/National Parks and historic sites	0	5	20	1.00	0	5	20	1.00	0	5	20	1.00
3.2 Major tourism / recreation / conservation areas	0.3km	2	15	0.30	1.4km	1	15	0.15	0	5	15	0.75
3.3 Urban perimeters	10.6km	2	15	0.30	1.5km	4	15	0.60	2.3km	3	15	0.45
3.4 Federal reserves	0	5	20	1.00	0	5	20	1.00	0	5	20	1.00
3.5 Rural communities	2.0km	4	10	0.40	2.0km	4	10	0.40	2.0km	4	10	0.40
3.6 Major productive Natural Resource Areas	0	5	15	0.75	0	5	15	0.75	9.0km	1	15	0.15
3.7 Major Waste Management Sites	1.0km	1	5	0.05	0	5	5	0.25	0	5	5	0.25
				3.80				4.15				4.00
4. Cost												
4.1 Order of magnitude cost of capital works	$1.855 billion	2.5	35	0.88	$1.670 billion	3.5	35	1.23	$1.425 billion	5	35	1.75
4.2 Influence on operating cost	305.0km	4	20	0.80	309.5km	4	20	0.80	271.0km	5	20	1.00
4.3 % of route with high level of uncertainty in cost estimate	25–30%	2.5	25	0.63	30%	2.5	25	0.63	60%	1	25	0.25
4.4 % of route involving difficult ROW acquisition	45%	1	10	0.10	35–40%	1.5	10	0.15	30%	2.5	10	0.25
4.5 % of route involving difficult ROW sharing	0%	5	10	0.50	0%	5	10	0.50	0%	5	10	0.50
				2.90				3.30				3.75

EVALUATION OF ROUTING OPTIONS

TABLE 9.5.2

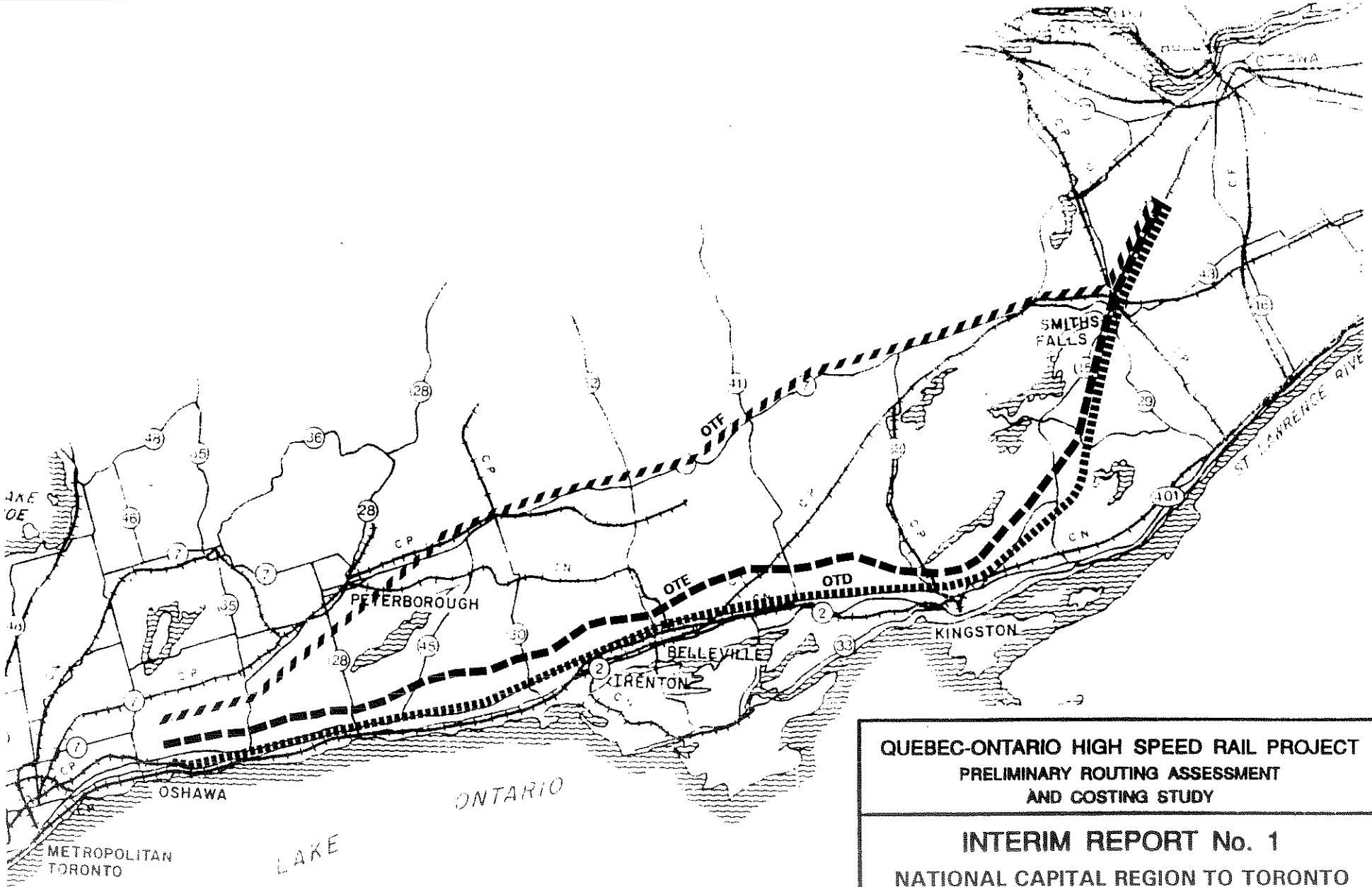
TECHNOLOGY: 300 km/h plus ON EXISTING R.O.W.	ROUTE OPTIONS											
	OTA – Lakeshore/New ROW				OTB – Lakeshore/Brockville				OPTION C			
FACTORS & SUB-FACTORS BY SECTION	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating
SECTION: NATIONAL CAPITAL REGION – TORONTO												
1. Transportation Service												
1.1 Population centres served by route	110–120,000	5	40	2.00	110–120,000	5	40	2.00				
1.2 Flexibility of route to access potential station sites	all	5	10	0.50	all	5	10	0.50				
1.3 Accessibility of station site by intermodal means	8km/ctr, 4km/401	4	5	0.20	2km/ctr, 1km/401	5	5	0.25				
1.4 Ability of route to access Toronto/Montreal airports	Pickering (TOR N route)	1	15	0.15	Pickering (TOR N route)	1	15	0.15				
1.5 Anticipated travel time based on max. operating speed	1 hr 35 min	5	30	1.50	1 hr 40 min	4.5	30	1.35				
				4.35				4.25				
2. Natural Environment												
2.1 ESA's, ANSI's, Prov. significant wetlands	42.7km	1	25	0.25	25.9km	2	25	0.50				
2.2 Ecological reserves	2.0km	1	25	0.25	0	5	25	1.25				
2.3 Significant fisheries / aquatic habitat	30	1	20	0.20	30	1	20	0.20				
2.4 Significant forests / woodlots	0.6km	3	10	0.30	1.3km	1	10	0.10				
2.5 Major watercourse crossings	2	5	10	0.50	2	5	10	0.50				
2.6 Floodplain / geotechnical hazards	0	5	10	0.50	0	5	10	0.50				
				2.00				3.05				
3. Socio-Economic Environment												
3.1 Provincial/National Parks and historic sites	2.8km	1	20	0.20	2.8km	1	20	0.20				
3.2 Major tourism / recreation / conservation areas	1.2km	2	15	0.30	0.8km	1	15	0.15				
3.3 Urban perimeters	23.0km	3	15	0.45	39.4km	1	15	0.15				
3.4 Federal reserves	0	5	20	1.00	0	5	20	1.00				
3.5 Rural communities	2.0km	4	10	0.40	2.0km	4	10	0.40				
3.6 Major productive Natural Resource Areas	0	5	15	0.75	0	5	15	0.75				
3.7 Major Waste Management Sites	1.0km	1	5	0.05	0	5	5	0.25				
				3.15				2.90				
4. Cost												
4.1 Order of magnitude cost of capital works	$1.690 billion	5	35	1.75	$1.780 billion	4.5	35	1.58				
4.2 Influence on operating cost	306.5km	5	20	1.00	338.5km	4	20	0.80				
4.3 % of route with high level of uncertainty in cost estimate	25–30%	2.5	25	0.63	10–15%	4	25	1.00				
4.4 % of route involving difficult ROW acquisition	35%	2	10	0.20	15–20%	3.5	10	0.35				
4.5 % of route involving difficult ROW sharing	25%	3	10	0.30	45%	1	10	0.10				
				3.88				3.83				

QUEBEC - ONTARIO H.S.R. STUDY: PRELIMINARY ROUTING ASSESSMENT AND COSTING

EVALUATION OF ROUTING OPTIONS

TABLE 9.5.3

TECHNOLOGY: 200 km/h plus ON EXISTING R.O.W.	ROUTE OPTIONS											
	OTa – Lakeshore/New ROW				OTb – Lakeshore/Brockville				OTc – Lakeshore/Belleville			
FACTORS & SUB-FACTORS BY SECTION	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating
SECTION: NATIONAL CAPITAL REGION – TORONTO												
1. Transportation Service												
1.1 Population centres served by route	110–120,000	5	40	2.00	110–120,000	5	40	2.00	60–70,000	3	40	1.20
1.2 Flexibility of route to access potential station sites	all	5	10	0.50	all	5	10	0.50	no Kingston station	2	10	0.20
1.3 Accessibility of station site by intermodal means	2km/ctr, 1km/401	5	5	0.25	2km/ctr, 1km/401	5	5	0.25	0km/ctr, 2km/401	5	5	0.25
1.4 Ability of route to access Toronto/Montreal airports	Pickering (TOR N route)	1	15	0.15	Pickering (TOR N route)	1	15	0.15	Pickering (TOR N route)	1	15	0.15
1.5 Anticipated travel time based on max. operating speed	1 hr 55 min	5	30	1.50	2 hr 2 min	4.5	30	1.35	1 hr 51 min	5	30	1.50
				4.40				4.25				3.30
2. Natural Environment												
2.1 ESA's, ANSI's, Prov. significant wetlands	5.3km	3	25	0.75	15.2km	2	25	0.50	22.3km	1	25	0.25
2.2 Ecological reserves	0	5	25	1.25	0	5	25	1.25	0	5	25	1.25
2.3 Significant fisheries / aquatic habitat	31	2	20	0.40	31	2	20	0.40	31	2	20	0.40
2.4 Significant forests / woodlots	0.6km	3	10	0.30	0.6km	3	10	0.30	0.6km	3	10	0.30
2.5 Major watercourse crossings	2	5	10	0.50	2	5	10	0.50	1	5	10	0.50
2.6 Floodplain / geotechnical hazards	0	5	10	0.50	0	5	10	0.50	0	5	10	0.50
				3.70				3.45				3.20
3. Socio-Economic Environment												
3.1 Provincial/National Parks and historic sites	2.8km	1	20	0.20	2.8km	1	20	0.20	0	5	20	1.00
3.2 Major tourism / recreation / conservation areas	1.2km	3	15	0.45	1.2km	3	15	0.45	2.8km	1	15	0.15
3.3 Urban perimeters	37.2km	2	15	0.30	38.6km	1	15	0.15	25.1km	3	15	0.45
3.4 Federal reserves	0.4km	1	20	0.20	0.4km	1	20	0.20	0	5	20	1.00
3.5 Rural communities	2.0km	4	10	0.40	2.0km	4	10	0.40	2.0km	4	10	0.40
3.6 Major productive Natural Resource Areas	0	5	15	0.75	0	5	15	0.75	0	5	15	0.75
3.7 Major Waste Management Sites	0	5	5	0.25	0	5	5	0.25	0	5	5	0.25
				2.55				2.40				4.00
4. Cost												
4.1 Order of magnitude cost of capital works	$1.650 billion	3	35	1.05	$1.630 billion	3	35	1.05	$1.355 billion	5	35	1.75
4.2 Influence on operating cost	311.5km	4.5	20	0.90	339.0km	3.5	20	0.70	291.5km	5	20	1.00
4.3 % of route with high level of uncertainty in cost estimate	25%	3	25	0.75	5–10%	4.5	25	1.13	15–20%	3.5	25	0.88
4.4 % of route involving difficult ROW acquisition	15%	4	10	0.40	5–10%	4.5	10	0.45	5–10%	4.5	10	0.45
4.5 % of route involving difficult ROW sharing	30%	2.5	10	0.25	45%	1	10	0.10	40%	1.5	10	0.15
				3.35				3.43				4.23



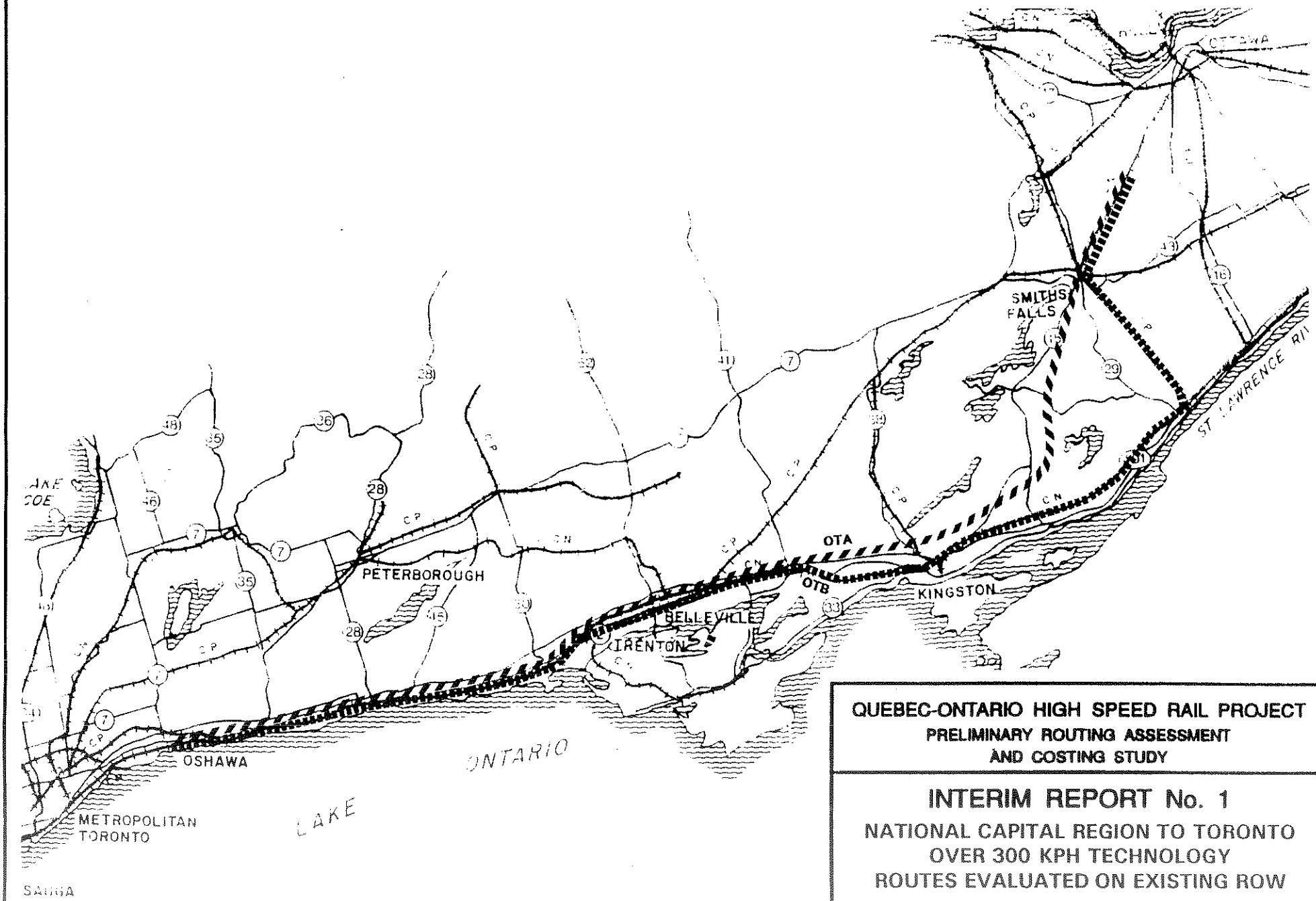
QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT

PRELIMINARY ROUTING ASSESSMENT AND COSTING STUDY

INTERIM REPORT No. 1

NATIONAL CAPITAL REGION TO TORONTO OVER 300 KPH TECHNOLOGY ROUTES EVALUATED ON NEW ROW

EXHIBIT 9.1



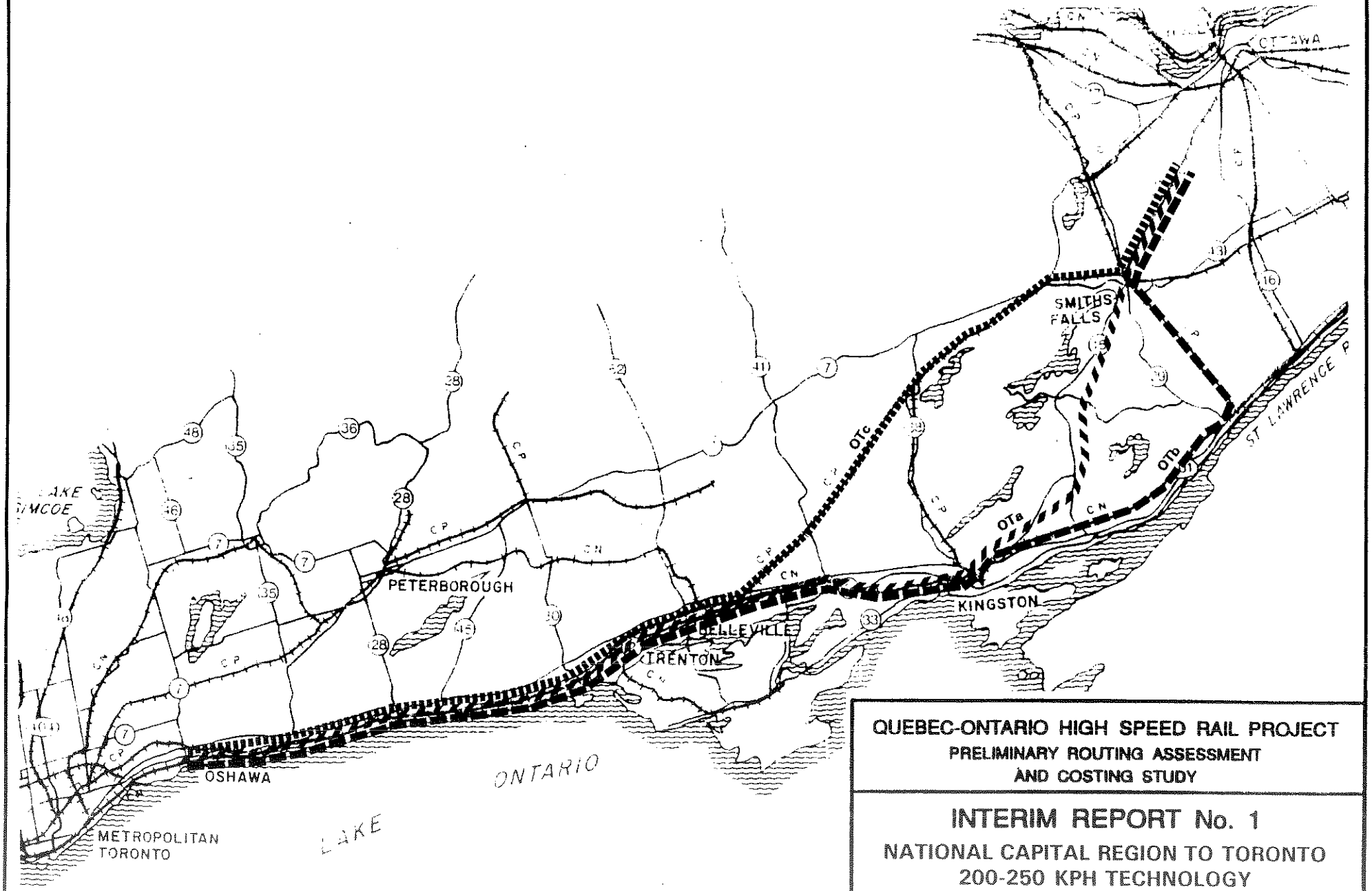
QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT

PRELIMINARY ROUTING ASSESSMENT AND COSTING STUDY

INTERIM REPORT No. 1

NATIONAL CAPITAL REGION TO TORONTO OVER 300 KPH TECHNOLOGY ROUTES EVALUATED ON EXISTING ROW

EXHIBIT 9.2



QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT

PRELIMINARY ROUTING ASSESSMENT AND COSTING STUDY

INTERIM REPORT No. 1

NATIONAL CAPITAL REGION TO TORONTO
200-250 KPH TECHNOLOGY
ROUTES EVALUATED ON EXISTING ROW

EXHIBIT 9.3

with higher travel propensity than can be expected from the Peterborough urban area. All options have similar intermodal accessibility from station sites in either Kingston or Peterborough and do not limit flexibility to reach the available station sites in Ottawa and Toronto. While all options can pass close to the required Pickering Airport site, a northern bypass of Oshawa is required to reach the site from option OTD (the Lakeshore/Highway 401 route). Although use of the shorter northern alignment results in a travel time saving of 6-7 minutes, not serving the Kingston/Lakeshore urban areas is considered a major shortcoming.

- over 300 kph technology on existing ROW:

The main difference in Transportation Service between the two options evaluated is the approximately 5 minutes increase in travel time for the Lakeshore/Brockville route. Although this route offers a station site nearer downtown Kingston, the faster route is rated marginally higher for overall transportation service.

- 200 - 250 kph technology an existing ROW:

Assessment of the three options from a transportation service perspective reveals a small travel time advantage for the Lakeshore/Belleville option, however, this option bypasses all major urban areas, providing only remote access from Highway 401 near Belleville. Combination route OTA offers the shortest travel time.

9.5.2 Natural Environment

In the corridor between Oshawa and Napanee, the Lakeshore and Highway 401 alignments for the 200-250 kph and over 300 kph technologies exhibit similar impacts on the natural environment. This is due to the fact that all of the rivers and streams flow from north to south, into Lake Ontario. Many of the wetlands, sensitive area features, natural corridors and fisheries concerns are also oriented in this north-south direction, often associated with the stream valleys. This means that the proposed routes impact a large number of sensitive features due

to their east-west orientation, necessitating the crossing of 30 streams which have migratory salmonoid or cold water fishery importance.

Distance through Areas of Natural and Scientific Interest (ANSI), Environmentally Sensitive Areas (ESA), and Provincially Significant Wetlands ranges from 5.3 to 42.7 km for the entire length of the Lakeshore Alignments. As these routes either turn north at Gananoque toward Smiths Falls, or continue east to Brockville before turning north to Smiths Falls, they encounter a number of large wetlands associated with the Rideau Lake system or the Saint-Laurent lowlands.

From Smiths Falls to Richmond, where virtually all new routes are combined, two very large natural features are encountered. Northern Shrike habitat is affected along its southwest edge and the Marlborough Regional Forest/Wetland Complex is crossed inside its western perimeter. A number of other, smaller wetland ares in this section also constitute routing concerns.

The Southern Alignment parallels the Lakeshore Alignments at a distance of two-to-five concessions further north of Highway 401. This means that it often impacts a different assemblage of natural features. Total distance of natural features affected is 35.7 km, represented in large part by the common features of the Marlborough Regional Forest/Wetland Complex and Shrike habitat. Important deer wintering areas in the Regional Forest, waterfowl habitat and rare plants are some of the sensitive features of this recognized, major wildlife refuge.

The Shrike habitat is important as nesting area for some of the Province's Loggerhead Shrike. This species was never numerous in Ontario and has suffered noticeable decline in recent years due to habitat destruction. This species is designated as "threatened" in Canada by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

Between Oakville and Trenton, the Southern Alignment affects at least 15 recognized cold water or salmonoid migration streams. Of considerable added significance, is that many of the

crossings occur at or near the headwaters of these important salmonoid producing streams. Detailed inspection will be required throughout this area in future.

The Northern Alignment is new for all of its length and encroaches on numerous large wetlands, extensive tracts of woodland, and is adjacent to numerous recorded areas of natural and scientific interest and deer wintering areas. Many of these areas are in Tweed District (MNR) which has less detailed mapping. These sensitive areas occur primarily along the Highway 7 alignment from Marmora to Kaladar. This alignment enters Perth and then joins the other common alignments north of Smiths Falls.

9.5.3 Socio-Economic Environment

The Lakeshore Alignments cross extensive areas of urban communities ranging from 10.6 to 37.2 km. Key urban centres crossed include Oshawa, Bowmanville, Port Hope, Cobourg, Colborne, Brighton, Trenton, Belleville, Napanee and Kingston. A number of smaller towns and villages are affected as well.

The distance of urban perimeter affected by the 200-250 kph alignments along the Lakeshore ranges from 38.6 to 39.4 km, which represents the greatest impact of any set of alignments.

The Lakeshore Alignments also cross 2.8 km of the Darlington Provincial Park, just east of Oshawa, and 0.4 km of the Tyendinaga Indian Reserve No. 38, just east of Belleville. These sites will require detailed inspection in future. The Lakeshore-Belleville-Perth Alignment involves 25.1 km of urban perimeter.

The Lakeshore/Highway 401 and Lakeshore New ROW cross a 1.0 km area being considered for a candidate landfill site north of Kingston, at the crossing of Colonel By Lake (Rideau Canal) east of Fairmount. This location may be controversial due to the focus of local attention.

The Southern Alignment crosses the lowest amount of urban perimeter at 1.5 km, including the common crossing of Oshawa.

The Northern Alignment also affects less urban area (2.3 km) but traverses more natural area, including the crossing of 9.0 km of managed forest land. This area is densely wooded or has extensive surface exposed bedrock.

9.5.4 Costs

Cost and confidence level assessments of the three "over 300 kph, new ROW" options reflect potentially lower capital and operating costs for the shorter Northern Alignment (option OTF), however, this option carries a higher level of uncertainty. This makes the overall advantage less significant.

The cost and implementation considerations for over 300 kph technology on existing ROWs indicate that option OTB through Brockville has a higher rating overall although this advantage could become insignificant if construction and operating difficulties in shared ROW are greater than assessed.

For the 200 - 250 kph technology on existing ROW, the analysis of cost and confidence level sub-factors shows the benefits of the significantly shorter route on the existing CP Belleville sub-division. However, this option also carries high levels of uncertainty in the cost of alignment upgrading in difficult terrain and the operational implications of ROW sharing.

9.6 SELECTION OF REPRESENTATIVE CORRIDOR FOR COSTING

The comparative evaluation of options in the National Capital Region - Toronto section led to the selection of the following representative routings for more detailed costing:

9.6.1 Over 300 kph Technology on New Corridor

Option OTE between Ottawa and Kingston linked to the optimum combination of options OTD and OTE between Kingston and Oshawa. Local alignment modifications to minimize environmental impact between Kingston and Smiths Falls are to be investigated in the more detailed analysis.

9.6.2 Over 300 kph Technology on Existing Corridor

Option OTA, the Lakeshore rail corridor to Kingston, linked to the existing CN ROW from Smiths Falls to Ottawa, by a segment of new ROW between Kingston and Smiths Falls.

9.6.3 200-250 kph Technology on Existing Corridor

Option OTB, maximizing the use of existing ROWs through Kingston, Brockville and Smiths Falls to again enter the National Capital Region at Richmond.

10 METROPOLITAN TORONTO

10.1 CONTACT WITH MUNICIPALITIES

A meeting was convened with John Gartner, Commissioner of Planning, Doug Floyd, Commissioner of Transportation and Richard Gordon, Director, Transportation Division for Metropolitan Toronto on September 9, 1992. The purpose of the meeting was to provide background to the high speed rail project and receive feedback on routing and station preferences. Two station locations were noted as preferable; downtown and Pearson International Airport. A preference between these two sites was not cited since the meeting participants felt the demand forecast information (i.e. type of user) is key in this decision. It was noted that an effort to utilize the CP North Toronto Subdivision would likely be met with strong opposition from local residents.

10.2 STATION OPTIONS

To ensure a high level of ridership it is imperative that station sites offer rapid access and egress. A station which is readily accessible to other modes of transportation is highly desirable. Location options are shown on Exhibits 10.1.

10.2.1 Urban Options

There are two possible station sites which would directly serve downtown Metropolitan Toronto.

Union Station, which station presently serves VIA Rail passengers in Metro. The station is readily accessible to the following transportation modes:

EXHIBIT 10.1

- Subway (Yonge and Spadina lines)
- Regional commuter rail (GO Transit gateway)
- Freeway (Gardiner Expressway)

North Toronto Station, a new station which would be located on the CP line (running just north of the downtown area) in the vicinity of Yonge Street. The station is readily accessible to the following transportation modes:

- Subway (Yonge line)
- Possible future GO Transit service

10.2.2 Suburban Options

Possible station sites for routes bypassing the downtown are listed below. In brackets are the modes of transportation which would have good access to these sites.

- Highway 48 (Hwy 407, possible extension of SRT)
- Yonge Street (possible extension of Yonge Subway line, also freeway and GO Transit if Hwy 407 corridor utilized for high speed rail)
- Dufferin/Keele Street (Hwy 407, possible extension of Spadina subway line)

10.2.3 Airport Access

Pearson International Airport is Canada's busiest airport. Airport access would be desirable to connect southern Ontario with International and long distance flights. Existing corridors with potential to accommodate high speed rail are more than 2.5 kilometres from the airport terminals. This leaves two options for directly serving the airport:

- Shuttle service between the HSR station and the airport terminals.
- Create a HSR corridor through the use of elevated or tunnel sections.

The Federal Government has land holdings in the Town of Pickering immediately northeast of Metro Toronto. These lands were assembled for a possible international airport site. If the high speed rail corridor is close to the Hwy 407 technically preferred route in Pickering a station could be located to serve a future airport on this site.

10.3 ROUTING OPTIONS

Creating a new east-west corridor in the vicinity of Metropolitan Toronto would not be practical due to the large negative impact it would have on the built environment in the area. Therefore this review is limited to existing corridors in the region. The following east-west corridors exist in the Metro Toronto Region:

i) Railways

- CN Lakeshore route (Kingston, Oakville, Subdivisions)
- CP Midtown route (Belleville, North Toronto, Galt Subdivisions)
- CN Weston Subdivision
- CN York Subdivision

ii) Highways

- Highway 401
- Highway 403
- Highway 407

iii) Hydro Corridors

From the above the following have been initially screened out:

- CP Galt Subdivision. This corridor has poor geometrics and does not offer a good connection to corridors leading to Hamilton.

- Highway 401. Development immediately abuts the corridor leaving no ROW available for high speed rail.

- Highway 403 through Mississauga. With a planned transitway in the corridor, development immediately abuts the corridor leaving no ROW available for high speed rail.

- Hydro Corridors. The required clear width for the high speed corridor would seriously impact existing hydro operations. Also land use adjacent to the hydro corridors would not be compatible with high speed rail operations. In many cases the hydro corridors are utilized as parks.

10.4 ISSUES

The following issues require resolution in Phase 2:

- Railway ROW available for high speed rail and access requirements by freight. All the railway corridors are fully developed with several industrial accesses.

- Rouge Valley Park with respect to corridors crossing the park.

- Potential for subway and/or GO Transit service to serve alternative station sites in the future.

- Need for direct connection to Pearson International Airport and development of an elevated/tunnelled route to accomplish this.

10.5 REPRESENTATIVE STRATEGY

There are two entrance nodes to the Metro Toronto area from the east, namely; the lakeshore corridor and the northeast corner, and two exit nodes from the Metro Toronto area, namely the lakeshore corridor and the northwest corner. To connect each entrance and exit node there are two primary alternatives; one for a downtown station and one for a suburban station.

For the routes selected to be carried forward to Phase 2 of this study, a cost will be calculated for a downtown station and a suburban station route;

- The route selected for the over 300 kph technology on a new ROW would bring the route into Metro Toronto from the northeast node and it would exit via the northwest node. The route for Phase 2 of the study for a suburban station would utilize the CN York Subdivision and/or Highway 407 corridor. The route for a downtown station would utilize the CP Havelock and CP Belleville Subdivisions to Union Station and the CN Weston Subdivision to exit Metro Toronto. As an alternative the possibility of utilizing the CP North Toronto Subdivision with a North Toronto station will be reviewed.

- The route selected for both the over 300 kph and 200-250 kph technologies on existing ROW would enter and exit the Metro Toronto area via the Lakeshore corridor. The route for a suburban station would utilize the CN York Subdivision to Highway 48 and the CN York Subdivision and/or Highway 407 corridor to north of Pearson International Airport and the Highway 407 corridor to Highway 403. The Highway 403 corridor would be utilized to a point in Burlington where a connection would be made back to the Lakeshore corridor. For an urban station the Lakeshore corridor would be utilized.

11 CORRIDOR SECTION IV - METRO TORONTO TO LONDON

11.1 EXISTING RAIL CORRIDORS

There are three existing rail corridors connecting Toronto and London:

- CN Weston and Guelph Subdivisions which direct the railway through Guelph, Kitchener, and Stratford.
- CP Galt Subdivision which directs the railway through Milton, Cambridge and Woodstock.
- CN Oakville and Dundas Subdivisions which direct the railway through Burlington, Brantford and Woodstock.

11.2 ROUTES IDENTIFIED IN PREVIOUS STUDIES

- CN Weston and Guelph Subdivisions which direct the railway through Guelph, Kitchener, and Stratford.
- CP Galt Subdivision which directs the railway through Milton, Cambridge and Woodstock.
- CN Oakville and Dundas Subdivisions which direct the railway through Burlington, Brantford and Woodstock.

11.3 ROUTES IDENTIFIED IN THIS STUDY

Previous studies almost exclusively looked at routes through the Hamilton area. This study identified some alternative routes which would have a station in the Kitchener Area. These routes have been included in Table 11.1.

Outlined below are the routes carried forward from the initial screening. These routes were assessed and evaluated at the October 6, 1992 evaluation session.

For the over 300 kph technology on a new ROW one basic new route was carried forward. This route directed the high speed rail from the northwest part of Metro eastward through the Highway 401 corridor between Kitchener and Cambridge and onto the northeast corner of London. Two sub-alternatives were evaluated to determine the corridor location to climb the escarpment:

- Pearson/South Guelph/Cambridge - This route would cross the escarpment at a new location half way between the Hwy 401 corridor and the CN Halton Subdivision.

- Pearson/Hwy 401/Cambridge - This route would cross the escarpment in the Hwy 401 corridor.

For the over 300 kph technology sharing existing ROW three routes were evaluated:

- CN Halton/South Guelph/North London - This route would share the Halton Subdivision ROW through Brampton to Acton where it would leave the existing ROW and be directed on a new ROW south of Guelph through the Highway 401 corridor between Kitchener and Cambridge and onto the northeast corner of London.

- CN/South Guelph/South London - As a variation on the above alternative, the ROW west of Kitchener would turn southward and connect with the existing CP ROW west of Woodstock and share it into London.

CORRIDOR SECTION IV: METRO TORONTO TO LONDON

Table 11.1
Page 1

Routes Identified and Investigated		Routes Eliminated in Initial Screening	Routes selected for Comparative Evaluation of following Technology/Row Combinations		
Route Description	Source		+ 300 kph on New ROW	+ 300 kph on Existing ROW	200-250 kph on Existing ROW
TH&B through Hamilton, CN Hagersville Sub, CN Caso west to St. Thomas	High performance passenger rail (VIA St.Thomas) June 1983 - VIA Rail	No station in London, more expensive than other alternatives.			
CN Oakville and Dundas Sub Toronto and London, bypassing Brantford and Paris	High performance passenger rail (VIA London) June 1983 - VIA Rail	CN Woodstock to London has more built up areas and is longer than CP route.		*	*
CN Oakville and Dundas Sub. Toronto to Woodstock and CP line Woodstock to London	High performance passenger rail (VIA London) June 1983 - VIA Rail and High Speed passenger rail April 1984 - VIA Rail	Route modified to bypass Woodstock			
CN Oakville, CP and TH&B through Hamilton, CN Dundas Sub to Woodstock and CP into London	High performance passenger rail (VIA London) June 1983 - VIA Rail and 1989 rail passenger review - VIA Rail			*	

CORRIDOR SECTION IV: METRO TORONTO TO LONDON

Routes Identified and Investigated		Routes Eliminated in Initial Screening	Routes selected for Comparative Evaluation of following Technology/Row Combinations		
Route Description	Source		+ 300 kph on New ROW	+ 300 kph on Existing ROW	200-250 kph on Existing ROW
CN Halton, Guelph and Thorndale Subdivision	Review of env. impact of High Speed Rail, August 1990 Ont/Que Task Force			*	
Hwy 407 and Hwy 401 corridors to Kitchener, west to northeast corner of London	New route identified in this study		*		
Same as above route except crosses escarpment 5 km north of hwy 401 corridor.	New route identified in this study		*		
CN Halton Sub to Acton, New route south of Guelph to Hwy 401 corridor at Kitchener and new route to northeast corner of London	New route identified in this study			*	
Same as above to Kitchener, connect to existing CP ROW west of Woodstock and follow CP line to London	New route identified in this study			*	

- CN Oakville/CN Dundas - This route would share the CN Oakville and Dundas Subdivisions ROW. This alternative would have local bypasses of Brantford and Paris, and Woodstock.

- For the 200-250 kph technology sharing existing ROW three routes were evaluated:

- CN Halton/Guelph/Kitchener/Stratford - This route would share the CN Halton and Guelph Subdivisions ROW through Brampton, Guelph and Kitchener with local bypasses of Stratford and St. Marys.

- CN Oakville/CN Dundas (Hamilton North) - This route would share the CN Oakville and Dundas Subdivisions ROW. This alternative would have local bypasses of Brantford and Paris, and Woodstock.

- CN Oakville/CN Dundas (Hamilton South) - As a minor alternative to the above, the route would enter Hamilton via the TH&B and continue through Aberdeen Yard and climb the escarpment on a new alignment to connect with the CN Dundas Subdivision ROW at Capetown.

11.4 CONTACTS WITH MUNICIPALITIES

A meeting was held with the Commissioners of Transportation and Planning for the Region of Hamilton-Wentworth on September 29, 1992. The purpose of the meeting was to introduce the high speed rail project and receive feedback on routing and station preferences. The meeting participants were made aware of the fact that an alternative station site was also being looked at in the Kitchener area.

The preferred station locations were noted as the TH&B Station (downtown) and the airport south of the city. The Hamilton technical representatives recognized the difficulties of routing the high speed rail through Hamilton to continue on to London. It was suggested that there would likely be trains between Montréal and Toronto that would not continue onto London. These trains could terminate at the Hamilton-Wentworth airport and reinforce the airport as a relief airport for Pearson.

An attempt to meet with the Region of Waterloo remained unsuccessful at the time of writing this report.

11.5 EVALUATION

The results of the evaluation of route options shown on Exhibits 11.1, 11.2 and 11.3, are presented in Table 11.5.1 to 11.5.3.

11.5.1 Transportation Service

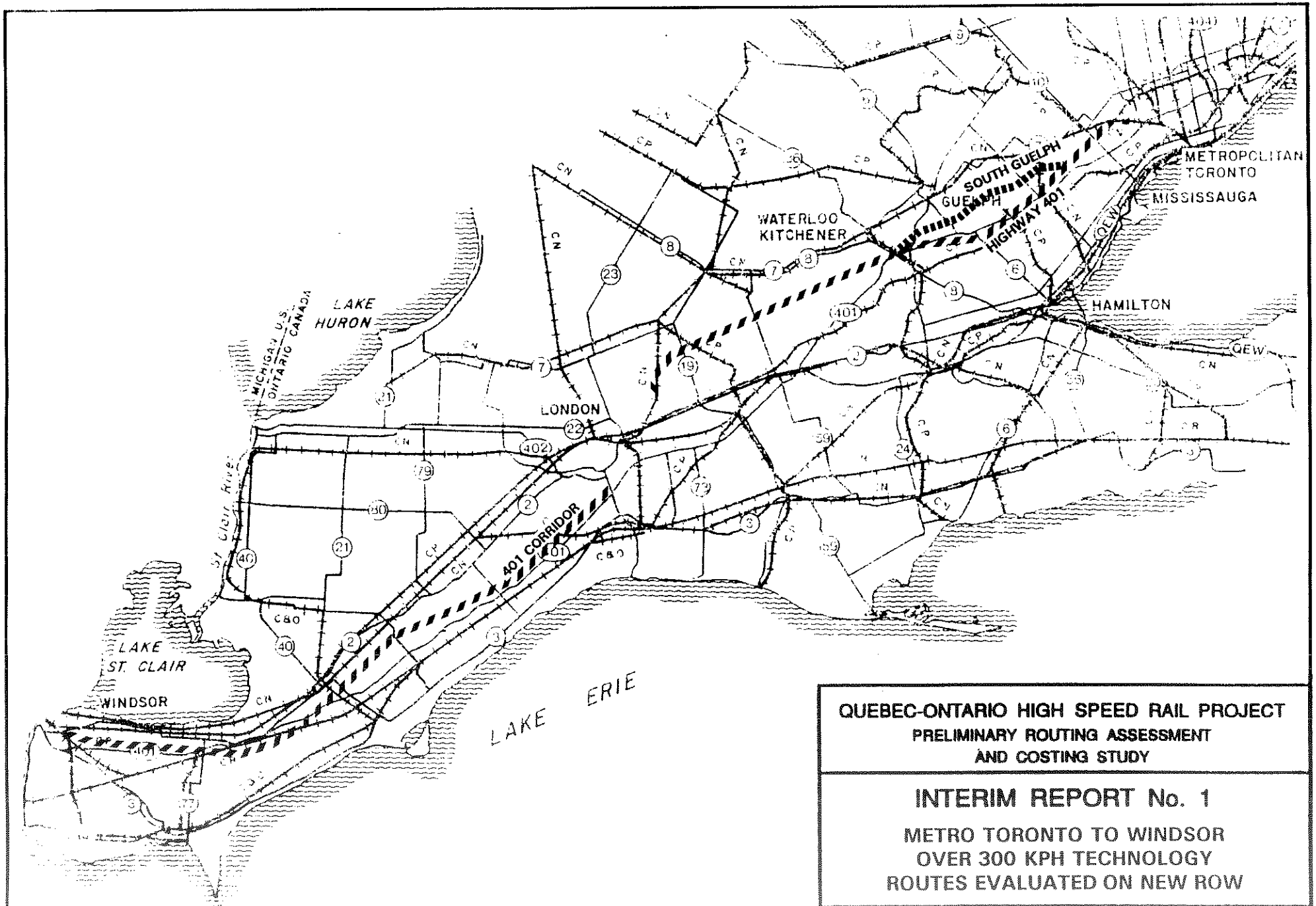
For the over 300 kph technology the two alternatives only involve a different location for crossing the escarpment. Since the route length for two escarpment crossing options are the same, the transportation service provided by each is identical.

For the over 300 kph technology sharing existing ROW, the CN Oakville/Dundas alternative offered significantly better transportation service than the other two alternatives. This was due to the higher population served by a Hamilton station as opposed to a Kitchener station and the better intermodal connections in Hamilton which would allow direct access to GO Transit.

As with the above, the two Hamilton alternatives for the 200-250 kph technology sharing existing ROW offered better transportation service than the CN Halton/Guelph alternative with a Kitchener station. The Hamilton north alternative offered a slightly better travel time between Toronto and London.

11.5.2 Natural Environment

All of the routing options cross the Niagara Escarpment, a major landform of provincial interest. Of the new over 300 kph routes, the Pearson/Highway 401/Cambridge option is preferable since it crosses the Escarpment in an area previously disturbed by the Highway 401 corridor, while the South Guelph option crosses a sensitive area west of Georgetown and also affects extensive wetland areas west of the Escarpment. The Highway 401 option also exhibits fewer potential impacts to the Bronte Creek and Speed River systems near Guelph and Cambridge,

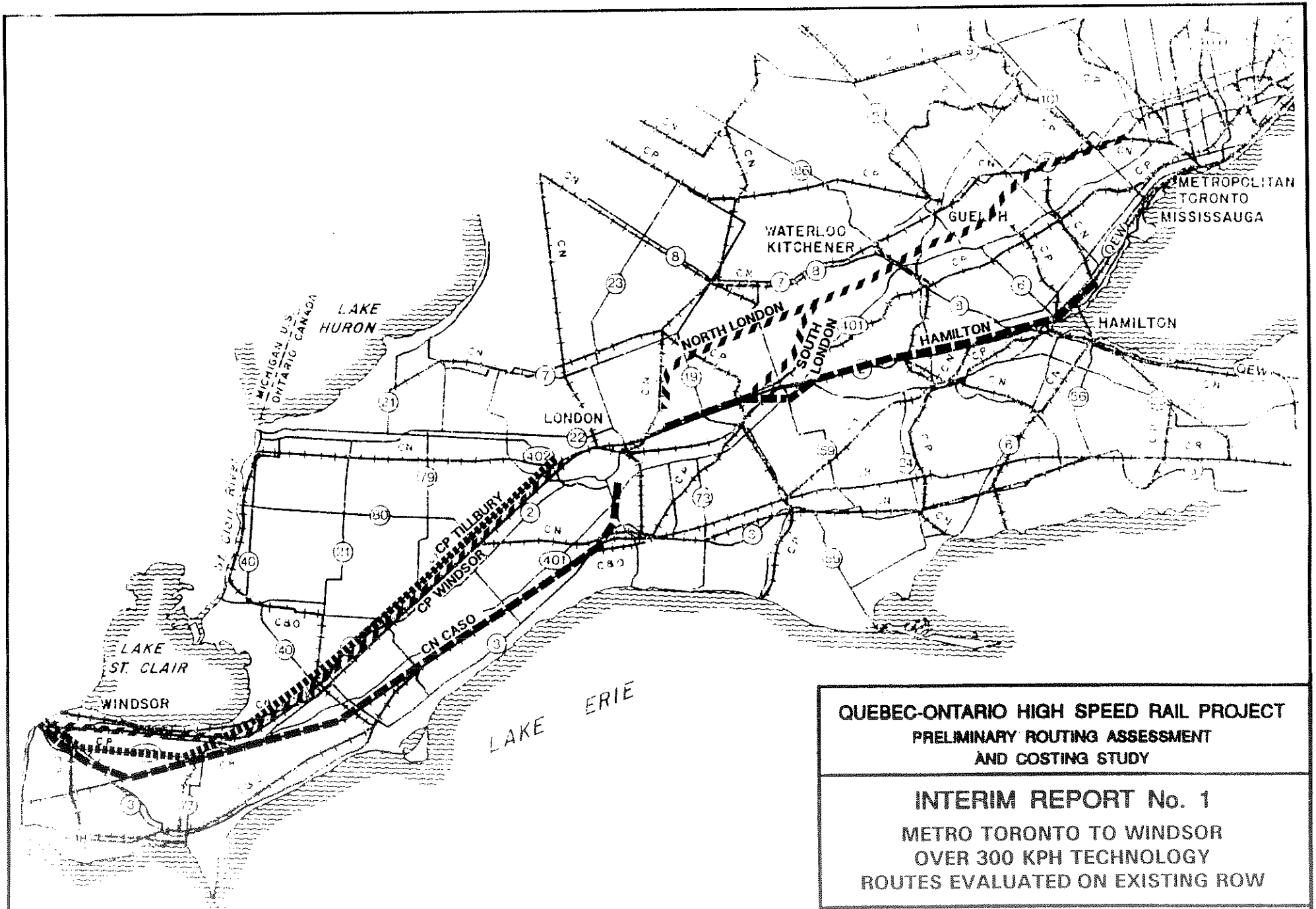


QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT
PRELIMINARY ROUTING ASSESSMENT AND COSTING STUDY

INTERIM REPORT No. 1

METRO TORONTO TO WINDSOR
OVER 300 KPH TECHNOLOGY
ROUTES EVALUATED ON NEW ROW

EXHIBIT 11.1



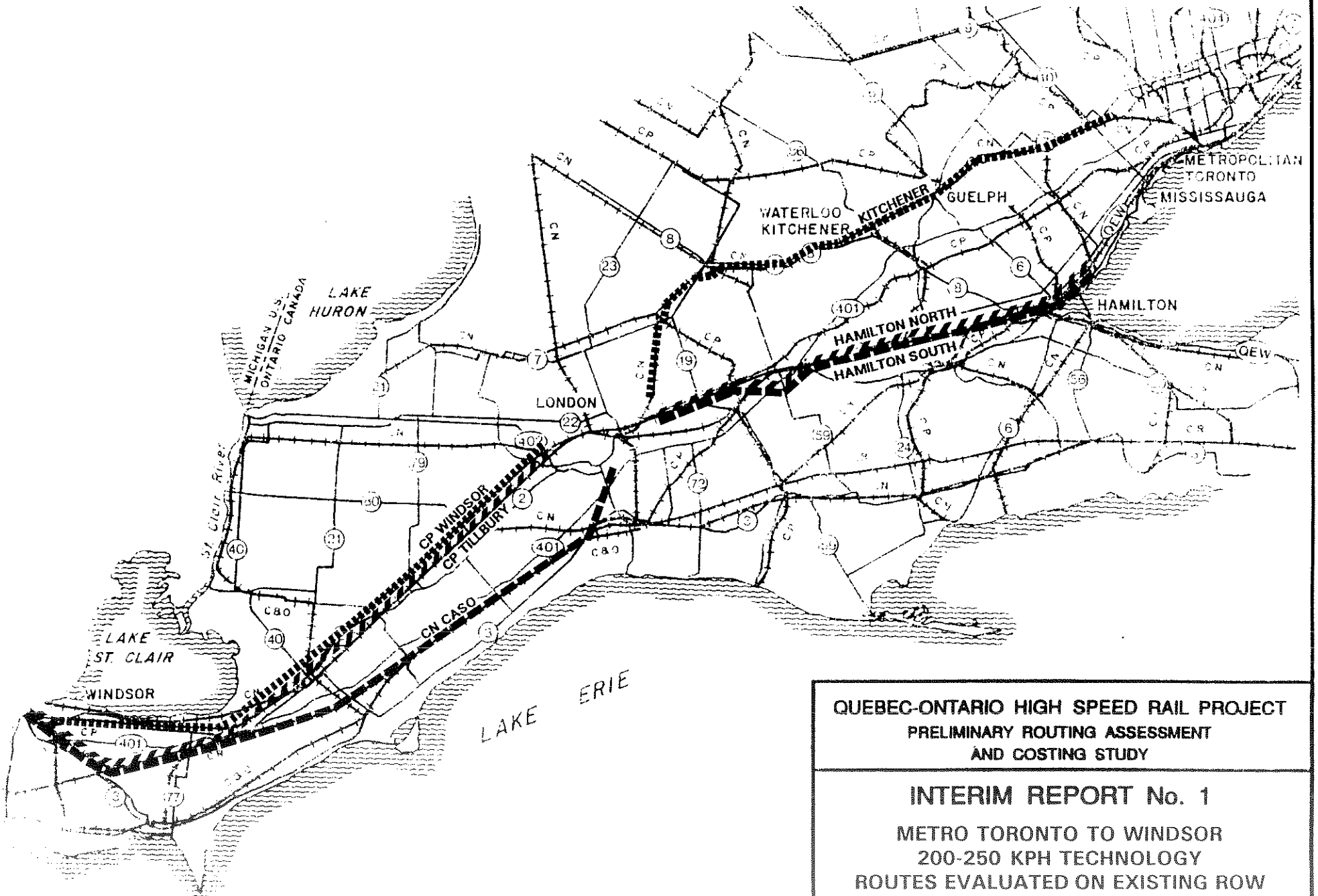
QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT

PRELIMINARY ROUTING ASSESSMENT AND COSTING STUDY

INTERIM REPORT No. 1

METRO TORONTO TO WINDSOR
OVER 300 KPH TECHNOLOGY
ROUTES EVALUATED ON EXISTING ROW

EXHIBIT 11.2



QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT
PRELIMINARY ROUTING ASSESSMENT AND COSTING STUDY

INTERIM REPORT No. 1

METRO TORONTO TO WINDSOR
200-250 KPH TECHNOLOGY
ROUTES EVALUATED ON EXISTING ROW

EXHIBIT 11.3

TABLE 11.5.1

TECHNOLOGY: 300 km/h plus ON NEW R.O.W.	ROUTE OPTIONS											
	Pearson/South Guelph/Cambridge				Pearson/Highway 401/Cambridge				OPTION C			
FACTORS & SUB-FACTORS BY SECTION	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating
SECTION: METRO TORONTO – LONDON												
1. Transportation Service												
1.1 Population centres served by route	476,000	5	40	2.00	476,000	5	40	2.00				
1.2 Flexibility of route to access potential station sites	LON – poor site	4	10	0.40	LON – poor site	4	10	0.40				
1.3 Accessibility of station site by intermodal means	freeway	3	5	0.15	freeway	3	5	0.15				
1.4 Ability of route to access Toronto/Montreal airports	LON/TOR – good	5	15	0.75	LON/TOR – good	5	15	0.75				
1.5 Anticipated travel time based on max. operating speed	1 hr 0 min	5	30	1.50	1 hr 0 min	5	30	1.50				
				4.80				4.80				
2. Natural Environment												
2.1 ESA's, ANSI's, Prov. significant wetlands	5.5km	2	25	0.50	2.8km	3	25	0.75				
2.2 Ecological reserves	0.8km	4	25	1.00	0.8km	4	25	1.00				
2.3 Significant fisheries / aquatic habitat	7	2	20	0.40	9	2	20	0.40				
2.4 Significant forests / woodlots	0	5	10	0.50	0	5	10	0.50				
2.5 Major watercourse crossings	5	4	10	0.40	5	4	10	0.40				
2.6 Floodplain / geotechnical hazards	5	3	10	0.30	1	4	10	0.40				
				3.10				3.45				
3. Socio-Economic Environment												
3.1 Provincial / National Parks and historic sites	0	5	20	1.00	0	5	20	1.00				
3.2 Major tourism / recreation / conservation areas	0.9km	4	15	0.60	4.9km	2	15	0.30				
3.3 Urban perimeters	12.9km	3	15	0.45	12.9km	3	15	0.45				
3.4 Federal reserves	0	5	20	1.00	0	5	20	1.00				
3.5 Rural communities	109.0km	2	10	0.20	91.0km	3	10	0.30				
3.6 Major productive Natural Resource Areas	0.4km	4	15	0.60	0.5km	4	15	0.60				
3.7 Major Waste Management Sites	0	5	5	0.25	0	5	5	0.25				
				4.10				3.90				
4. Cost												
4.1 Order of magnitude cost of capital works	$0.615 billion	5	35	1.75	$0.630 billion	5	35	1.75				
4.2 Influence on operating cost	133.9km	3	20	0.60	134.0km	3	20	0.60				
4.3 % of route with high level of uncertainty in cost estimate	9%	4.5	25	1.13	13%	4	25	1.00				
4.4 % of route involving difficult ROW acquisition			10	0.00			10	0.00				
4.5 % of route involving difficult ROW sharing	9%	4.5	10	0.45	10%	4.5	10	0.45				
				3.93				3.80				

QUEBEC - ONTARIO H.S.R. STUDY: PRELIMINARY ROUTING ASSESSMENT AND COSTING

EVALUATION OF ROUTING OPTIONS

TABLE 11.5.2

TECHNOLOGY: 300 km/h plus ON EXISTING R.O.W.					ROUTE OPTIONS							
	CN Halton/South Guelph/North London				CN Halton/South Guelph/South London				CN Oakville/CN Dundas (Hamilton)			
FACTORS & SUB-FACTORS BY SECTION	Unit of Performance Degree of Impact	Rating (1-5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1-5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1-5)	Weight %	Weighted Rating
SECTION: METRO TORONTO - LONDON												
1. Transportation Service												
1.1 Population centres served by route	476,000	3	40	1.20	476,000	3	40	1.20	679,000	5	40	2.00
1.2 Flexibility of route to access potential station sites	LON - poor site	4	10	0.40	LON - poor site	5	10	0.50	LON - poor site	5	10	0.50
1.3 Accessibility of station site by intermodal means	freeway	3	5	0.15	freeway	3	5	0.15	freeway/GO	4	5	0.20
1.4 Ability of route to access Toronto/Montreal airports	LON/TOR - good	5	15	0.75	LON/TOR - good	5	15	0.75	LON/TOR - good	5	15	0.75
1.5 Anticipated travel time based on max. operating speed	1 hr 0 min	5	30	1.50	59 min	5	30	1.50	1 hr 2 min	5	30	1.50
				4.00				4.10				4.95
2. Natural Environment												
2.1 ESA's, ANSI's, Prov. significant wetlands	5.7km	3	25	0.75	5.7km	3	25	0.75	7.2km	2	25	0.50
2.2 Ecological reserves	0.8km	4	25	1.00	0.8km	4	25	1.00	0	5	25	1.25
2.3 Significant fisheries / aquatic habitat	8	2	20	0.40	9	2	20	0.40	5	3	20	0.60
2.4 Significant forests / woodlots	0	5	10	0.50	0	5	10	0.50	0	5	10	0.50
2.5 Major watercourse crossings	4	4	10	0.40	5	4	10	0.40	4	4	10	0.40
2.6 Floodplain / geotechnical hazards	2	4	10	0.40	4	3	10	0.30	5	3	10	0.30
				3.45				3.35				3.55
3. Socio-Economic Environment												
3.1 Provincial / National Parks and historic sites	0	5	20	1.00	0	5	20	1.00	0	5	20	1.00
3.2 Major tourism / recreation / conservation areas	0.9km	4	15	0.60	0.9km	4	15	0.60	2.7km	3	15	0.45
3.3 Urban perimeters	15.5km	3	15	0.45	16.7km	3	15	0.45	3.4km	4	15	0.60
3.4 Federal reserves	0	5	20	1.00	0	5	20	1.00	0	5	20	1.00
3.5 Rural communities	0.1km	5	10	0.50	1.4km	4	10	0.40	0.5km	4	10	0.40
3.6 Major productive Natural Resource Areas	0.9km	4	15	0.60	2.4km	3	15	0.45	2.7km	3	15	0.45
3.7 Major Waste Management Sites	2.6km	4	5	0.20	2.6km	4	5	0.20	0	5	5	0.25
				4.35				4.10				4.15
4. Cost												
4.1 Order of magnitude cost of capital works	$0.585 billion	2	35	0.70	$0.670 billion	1	35	0.35	$0.440 billion	5	35	1.75
4.2 Influence on operating cost	133.0km	3	20	0.60	145.0km	2	20	0.40	109.0km	5	20	1.00
4.3 % of route with high level of uncertainty in cost estimate	17%	3.5	25	0.88	16%	3.5	25	0.88	18%	3.5	25	0.88
4.4 % of route involving difficult ROW acquisition			10	0.00			10	0.00			10	0.00
4.5 % of route involving difficult ROW sharing	9%	4.5	10	0.45	8%	4.5	10	0.45	18%	3.5	10	0.35
				2.63				2.08				3.98

QUEBEC – ONTARIO H.S.R. STUDY: PRELIMINARY ROUTING ASSESSMENT AND COSTING

EVALUATION OF ROUTING OPTIONS

TABLE 11.5.3

TECHNOLOGY: 200 km/h plus ON EXISTING R.O.W.	ROUTE OPTIONS											
	CN Halton/Guelph/Kitchener/Stratford				CN Oakville/CN Dundas (Hamilton North)				CN Oakville/CN Dundas (Hamilton South)			
FACTORS & SUB-FACTORS BY SECTION	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating
SECTION: METRO TORONTO – LONDON												
1. Transportation Service												
1.1 Population centres served by route	476,000	3	40	1.20	679,000	5	40	2.00	679,000	5	40	2.00
1.2 Flexibility of route to access potential station sites	LON – poor site	4	10	0.40		5	10	0.50		5	10	0.50
1.3 Accessibility of station site by intermodal means	transit	3	5	0.15	freeway/GO	4	5	0.20	freeway/GO/transit	5	5	0.25
1.4 Ability of route to access Toronto/Montreal airports	LON/TOR – good	5	15	0.75	LON/TOR – good	5	15	0.75	LON/TOR – good	5	15	0.75
1.5 Anticipated travel time based on max. operating speed	1 hr 21 min	4	30	1.20	1 hr 13 min	5	30	1.50	1 hr 15 min	5	30	1.50
				3.70				4.95				5.00
2. Natural Environment												
2.1 ESA's, ANSI's, Prov. significant wetlands	4.5km	3	25	0.75	7.2km	2	25	0.50	3.9km	3	25	0.75
2.2 Ecological reserves	0	5	25	1.25	0	5	25	1.25	0	5	25	1.25
2.3 Significant fisheries / aquatic habitat	4	3	20	0.60	5	3	20	0.60	5	3	20	0.60
2.4 Significant forests / woodlots	0	5	10	0.50	0	5	10	0.50	0	5	10	0.50
2.5 Major watercourse crossings	5	4	10	0.40	4	4	10	0.40	4	4	10	0.40
2.6 Floodplain / geotechnical hazards	5	3	10	0.30	5	3	10	0.30	5	3	10	0.30
				3.80				3.55				3.80
3. Socio-Economic Environment												
3.1 Provincial / National Parks and historic sites	0	5	20	1.00	0	5	20	1.00	0	5	20	1.00
3.2 Major tourism / recreation / conservation areas	0	5	15	0.75	2.7km	3	15	0.45	3.1km	3	15	0.45
3.3 Urban perimeters	41.1km	1	15	0.15	3.4km	4	15	0.60	9.5km	3	15	0.45
3.4 Federal reserves	0	5	20	1.00	0	5	20	1.00	0	5	20	1.00
3.5 Rural communities	0	5	10	0.50	0.5km	4	10	0.40	0.5km	4	10	0.40
3.6 Major productive Natural Resource Areas	0.8km	4	15	0.60	2.7km	3	15	0.45	2.7km	3	15	0.45
3.7 Major Waste Management Sites	2.6km	4	5	0.20	0	5	5	0.25	0	5	5	0.25
				4.20				4.15				4.00
4. Cost												
4.1 Order of magnitude cost of capital works	$0.680 billion	1	35	0.35	$0.440 billion	5	35	1.75	$0.465 billion	4.5	35	1.58
4.2 Influence on operating cost	144.0km	2	20	0.40	109.0km	5	20	1.00	112.0km	5	20	1.00
4.3 % of route with high level of uncertainty in cost estimate	27%	2.5	25	0.63	18%	3.5	25	0.88	19%	3.5	25	0.88
4.4 % of route involving difficult ROW acquisition			10	0.00			10	0.00			10	0.00
4.5 % of route involving difficult ROW sharing	24%	3	10	0.30	18%	3.5	10	0.35	19%	3.5	10	0.35
				1.68				3.98				3.80

since crossings are downstream of tributary and headwater areas. Potential impacts to the Credit, Nith and Thames River systems are relatively common to both options.

The potential impacts associated with the over 300 kph route on the existing CN Halton ROW routes to north and south London are similar to those of the over 300 kph new option through South Guelph/Cambridge, since much of the new route has been adopted for this scenario. The CN Oakville/CN Dundas route does not affect any major ESA's, wetlands or ANSI's in crossing the Escarpment at Hamilton but does affect such features in crossing 16 Mile Creek and Bronte Creek east of Hamilton and a number of cold water tributaries and headwater areas of the Grand and Thames River systems between Paris and Woodstock. However, the northern routes cross an ecological reserve (Washington Creek fish spawning area) which was accorded significant weighting in the evaluation process.

The two CN Oakville/CN Dundas options adopted for the 200-250 kph scenarios through Hamilton exhibit potential impacts similar to those for the over 300 kph technology. The existing CN Halton/Guelph Subdivisions route to Stratford is preferable from a natural environment perspective because it avoids the aforementioned headwater and cold water tributary (fisheries) sensitivities.

11.5.3 Socio-Economic Environment

The candidate over 300 kph new routing in the Highway 401 corridor would encroach on both the Hilton Falls and Kelso Conservation Areas (which flank the freeway) and other recreation/open space facilities. This must be weighed against its natural environment advantages.

This routing option passes through approximately 20% less identifiable rural (farming) area than the South Guelph route. In the order of 80% (192 km) of the Highway 401 corridor route passes through soils classified as exhibiting class 1 and class 2 agricultural capability.

Any use of the CN Dundas Subdivision across the Escarpment and Dundas Valley area may have intrusive effects on readily accessible major recreational and natural amenities in close proximity to the large Hamilton market. However, this may be outweighed by the significant

length of the northern (CN Halton) over 300 kph route through outlying GTA urban perimeters (Brampton, Georgetown, Cambridge). The CN Halton route may also conflict with three Region of Peel candidate waste management sites between Brampton and Georgetown.

With respect to the 200-250 kph technology on existing ROW, the primary impact of the CN Halton/Guelph Subdivisions through Stratford pertains to its passage through over 40 km of urban area. This must be weighed against its minimal effects on other socio-economic attributes. The northern CN Oakville/CN Dundas route through Hamilton is marginally preferable to the southern Hamilton option due to fewer potential impacts to the aforementioned Dundas Valley area conservation/recreation areas and the shorter length through the Hamilton urban area.

The representative corridors for the over 300 kph and 200-250 kph technologies on existng ROW exhibit similar characteristics with respect to length of route through class 1 and class 2 agricultural lands (132 km and 127 km respectively).

With respect to potential impacts to specialty agricultural crops, effects would be limited to relatively small and isolated orchard operations, primarily on and flanking the Niagara Escarpment, and none of the routes would affect the tender fruit lands normally associated with Niagara Region.

11.5.4 Costs

For the over 300 kph technology the estimated cost and the uncertainty of the cost for the two alternatives was so close this was not a determinant factor.

To account for the different starting and ending nodes in Toronto and London the capital costs for the over 300 kph technology sharing existing ROW were divided by the length to come up with a unit cost per kilometre. The CN Oakville/Dundas was found to be 11 % less costly than the other two alternatives with approximately the same level of uncertainty. This alternative was noted as having a significantly higher percentage of route with difficult ROW sharing (18% vs 9%)

As above, the capital costs were calculated as a cost per kilometre for the 200-250 kph technology sharing existing ROW. The cost differences were not significant with the CN Halton/Guelph/Kitchener/Stratford line showing a 12% higher cost than the other two alternatives. Both the percentage of route with a high level of uncertainty in cost and involving difficult ROW sharing were noticeably higher for the CN Halton/Guelph/Kitchener/Stratford route (27% vs 19% and 24% vs 19% respectively).

11.6 SELECTION OF REPRESENTATIVE CORRIDOR FOR COSTING

11.6.1 Over 300 kph Technology on New ROW

The selected route was the Pearson/South Guelph/Cambridge alternative. The major tradeoff between the two over 300 kph routes from an environmental perspective involved the crossing of the Niagara Escarpment. The natural environmental advantages of the Pearson/401/Cambridge option in crossing the Escarpment in a previously disturbed corridor (Highway 401) outweighed the disadvantages associated with encroaching on the Hilton Falls and Kelso Conservation Areas. From a transportation service and cost perspective the two alternatives were identical.

11.6.2 Over 300 kph Technology on Existing ROW

The CN Oakville/CN Dundas (Hamilton) route was selected to be carried forward to Phase 2 of the study for the reasons outlined below;

- The CN Oakville/Dundas alternative offered significantly better transportation service due to the higher population served by a Hamilton station and better intermodal connections in Hamilton

- The CN Oakville/CN Dundas (Hamilton) route was considered preferable from a natural environmental perspective because it exhibits fewer potential impacts to significant fisheries resources, including avoidance of cold water tributaries and headwater areas

(particularly the Washington Creek fish spawning area). This outweighed its greater impacts to ESA's, ANSI's and provincially significant wetlands.

- With respect to socio-economic factors, the Hamilton route's potential impacts to major natural and recreational amenities on the Niagara Escarpment were not considered as significant as the impacts that the CN Halton route would have on GTA urban perimeter areas (Brampton, Georgetown, Cambridge).

- The CN Oakville/Dundas route was found to be slightly less costly than the other two alternatives with approximately the same percentage of uncertainty.

11.6.3 200-250 kph Technology on Existing ROW

The CN Oakville/CN Dundas (Hamilton North) route was selected to be carried forward to Phase 2 of the study for the reasons outlined below;

- The CN Oakville/Dundas (Hamilton North) alternative was only slightly less favourable with respect to transportation service than its Hamilton south counterpart. The Hamilton southern alternative was more favourable due to the better intermodal connections and better station site (closer to downtown).

- The northern route through Hamilton was considered superior for the socio-economic environmental factor due to fewer impacts to urban areas (i.e. 3.4 km through urban perimeters versus 41 km traversed by the CN route through Guelph, Kitchener and Stratford), even though the Stratford route was rated higher for most other socio-economic sub-factors.

- The Hamilton north route was marginally less desirable than the Hamilton south and Stratford options for the natural environment component primarily because of greater impacts to ESA's, ANSI's and provincially significant wetlands. This disadvantage was outweighed by its socio-economic advantages.

- The cost for the northern Hamilton route was essentially the same as for the southern route and slightly less than for the route through Kitchener.

12 LONDON URBAN AREA

12.1 CONTACT WITH MUNICIPALITIES

A meeting was held on September 3, 1992 with the Director of Planning and Development, Deputy City Engineer, and Planning Administrator for the City of London and the Manager, London Transit Commission. The purpose of the meeting was to introduce the high speed rail project and receive feedback on routing and station preferences. Four possible station sites were discussed:

- Centre of London (on either the CN or CP lines)
- East London (Hwy 100 and the airport)
- South London (Hwy 401 and Wellington Road)
- North London (vicinity of the community of Arva)

Two station locations were noted as preferable; London south and London east. The meeting participants felt the CN and CP corridors in London do not lend themselves to high speed rail and the impact would be prohibitive to have a high speed rail station in the centre of London. It was also noted that a station at the north end of London would not be desirable.

In a subsequent telephone conversation September 30, it was stated the city's preference was the London east location.

12.2 ROUTING OPTIONS

Four entrance/exit nodes exist at London. Routes enter London from the northeast and east and exit to the south or northwest. The four basic routes through the London area are:

- Through the city via the CN corridor

- Through the city via the CP corridor

- Northern Bypass

- Southern Bypass

- Routes which would exit the London area via the south could only utilize the southern bypass which precludes a station being located in the centre of London. Routes which would enter the city from the northeast and exit to the northwest would either utilize the northern bypass (requiring a northern station) or would have significant circuitous routing.

12.3 REPRESENTATIVE ROUTES

The selected route for the over 300 kph technology on a new ROW enters the city from the northeast and exits at the south so only the southern bypass route could be utilized with an east or south station possible.

The selected routes for the over 300 kph and 200-250 kph technologies enter the city from the east and exit at the northwest which allows the flexibility to use any route through the London area. With additional information in the first part of Phase 2 a representative through route and bypass route will be selected and costed.

13 CORRIDOR SECTION V - LONDON TO WINDSOR

13.1 EXISTING RAIL CORRIDORS

There are three existing rail corridors connecting London and Windsor:

- CP Windsor Subdivision which directs the railway through Chatham and along the south part of Windsor.

- CN Chatham Subdivision which directs the railway through Chatham and along the north part of Windsor to the existing VIA station.

- CN Caso line which joins St. Thomas (20 km south of London) to Windsor and directly connects to the rail tunnel to Detroit.

13.2 ROUTES IDENTIFIED IN PREVIOUS STUDY

Table 13.1 outlines the routes identified in previous studies. For any routes not carried forward into this study a reason has been noted in the table.

13.3 ROUTES IDENTIFIED IN THIS STUDY

Previous studies did not identify any new routes. A new route has been identified and is included in Table 13.1

Outlined below are the routes carried forward from the initial screening.

For the over 300 kph technology on a new ROW only one alternative was created:

- Hwy 401 Corridor - This route would begin immediately south of London and approximately follow the Hwy 401 corridor to Windsor where it would join the CN Caso line to the rail tunnel.

For the over 300 kph technology sharing existing ROW three routes were evaluated:

- CP Windsor - This route would follow the existing CP line from the northwest corner of London to Chatham where a new ROW would direct the route to the north around Chatham. West of Chatham the high speed rail would rejoin the existing CP ROW and follow it into Windsor with a minor realignment at Tilbury.

CN Caso - This route would begin at the south end of London and head south to the St. Thomas area where it would join the CN Caso ROW and follow it to Windsor.

- CP Tilbury/Hwy 401 Corridor - This route would be the same as the CP Windsor route up to Tilbury. West of Tilbury the route would cross over to the Hwy 401 Corridor route.

For the 200-250 kph technology sharing existing ROW three routes were evaluated:

- CP Windsor - As noted above.

- CN Caso - As noted above.

- CP Tilbury/CN Caso - This route would be the same as the CP Windsor route up to Tilbury. West of Tilbury the route would cross over to the CN Caso route.

13.4 CONTACTS WITH MUNICIPALITIES

No municipalities were contacted between London and Windsor since there is no station proposed in this section.

13.5 EVALUATION

The results of the evaluation of route options shown on Exhibits 11.1, 11.2 and 11.3. are presented in Tables 13.5.1 to 13.5.3.

TECHNOLOGY: 300 km/h plus ON NEW R.O.W.					ROUTE OPTIONS							
	401 Corridor				OPTION B				OPTION C			
FACTORS & SUB–FACTORS BY SECTION	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating
SECTION: LONDON – WINDSOR												
1. Transportation Service												
1.1 Population centres served by route	329,000	5	40	2.00								
1.2 Flexibility of route to access potential station sites	no LON downtown stn	4	10	0.40								
1.3 Accessibility of station site by intermodal means	freeway/airport	4	5	0.20								
1.4 Ability of route to access Toronto/Montreal airports	not applicable	0	15	0.00								
1.5 Anticipated travel time based on max. operating speed	50 min	5	30	1.50								
				4.10								
2. Natural Environment												
2.1 ESA's, ANSI's, Prov. significant wetlands	0	5	25	1.25								
2.2 Ecological reserves	0	5	25	1.25								
2.3 Significant fisheries / aquatic habitat	0	5	20	1.00								
2.4 Significant forests / woodlots	0	5	10	0.50								
2.5 Major watercourse crossings	2	4	10	0.40								
2.6 Floodplain / geotechnical hazards	0	5	10	0.50								
				4.90								
3. Socio–Economic Environment												
3.1 Provincial / National Parks and historic sites	0	5	20	1.00								
3.2 Major tourism / recreation / conservation areas	0	5	15	0.75								
3.3 Urban perimeters	0	5	15	0.75								
3.4 Federal reserves	0	5	20	1.00								
3.5 Rural communities	180.0km	1	10	0.10								
3.6 Major productive Natural Resource Areas	10.6km	1	15	0.15								
3.7 Major Waste Management Sites	0	5	5	0.25								
				4.00								
4. Cost												
4.1 Order of magnitude cost of capital works	$0.620 billion	5	35	1.75								
4.2 Influence on operating cost	164.8km	4.5	20	0.90								
4.3 % of route with high level of uncertainty in cost estimate	5%	5	25	1.25								
4.4 % of route involving difficult ROW acquisition			10	0.00								
4.5 % of route involving difficult ROW sharing	4%	5	10	0.50								
				4.40								

QUEBEC - ONTARIO H.S.R. STUDY: PRELIMINARY ROUTING ASSESSMENT AND COSTING

EVALUATION OF ROUTING OPTIONS

TABLE 13.5.2

TECHNOLOGY: 300 km/h plus ON EXISTING R.O.W.	ROUTE OPTIONS											
	CP Windsor				CN Caso				CP Tillbury/401 Corridor			
FACTORS & SUB-FACTORS BY SECTION	Unit of Performance Degree of Impact	Rating (1-5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1-5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1-5)	Weight %	Weighted Rating
SECTION: LONDON - WINDSOR												
1. Transportation Service												
1.1 Population centres served by route	329,000	5	40	2.00	329,000	5	40	2.00	329,000	5	40	2.00
1.2 Flexibility of route to access potential station sites	all	5	10	0.50	no LON downtown stn	4	10	0.40	all	5	10	0.50
1.3 Accessibility of station site by intermodal means	freeway	3	5	0.15	freeway/airport	4	5	0.20	freeway/airport	4	5	0.20
1.4 Ability of route to access Toronto/Montreal airports	not applicable	0	15	0.00	not applicable	0	15	0.00	not applicable	0	15	0.00
1.5 Anticipated travel time based on max. operating speed	51 min	5	30	1.50	53 min	5	30	1.50	54 min	4.5	30	1.35
				4.15				4.10				4.05
2. Natural Environment												
2.1 ESA's, ANSI's, Prov. significant wetlands	2.5km	3	25	0.75	1.3km	4	25	1.00	2.5km	3	25	0.75
2.2 Ecological reserves	0	5	25	1.25	0	5	25	1.25	0	5	25	1.25
2.3 Significant fisheries / aquatic habitat	1	4	20	0.80	0	5	20	1.00	1	4	20	0.80
2.4 Significant forests / woodlots	0	5	10	0.50	0	5	10	0.50	0	5	10	0.50
2.5 Major watercourse crossings	8	3	10	0.30	3	4	10	0.40	7	3	10	0.30
2.6 Floodplain / geotechnical hazards	0	5	10	0.50	2	4	10	0.40	0	5	10	0.50
				4.10				4.55				4.10
3. Socio-Economic Environment												
3.1 Provincial / National Parks and historic sites	0	5	20	1.00	0	5	20	1.00	0	5	20	1.00
3.2 Major tourism / recreation / conservation areas	0	5	15	0.75	0	5	15	0.75	0	5	15	0.75
3.3 Urban perimeters	16.1km	3	15	0.45	11.8km	3	15	0.45	9.1km	4	15	0.60
3.4 Federal reserves	0	5	20	1.00	0	5	20	1.00	0	5	20	1.00
3.5 Rural communities	0	5	10	0.50	0	5	10	0.50	0	5	10	0.50
3.6 Major productive Natural Resource Areas	6.3km	3	15	0.45	3.8km	4	15	0.60	4.8km	3	15	0.45
3.7 Major Waste Management Sites	0	5	5	0.25	0	5	5	0.25	0	5	5	0.25
				4.40				4.55				4.55
4. Cost												
4.1 Order of magnitude cost of capital works	$0.695 billion	5	35	1.75	$0.665 billion	5	35	1.75	$0.705 billion	4.5	35	1.58
4.2 Influence on operating cost	159.7km	5	20	1.00	179.1km	4	20	0.80	162.9km	5	20	1.00
4.3 % of route with high level of uncertainty in cost estimate	9%	4.5	25	1.13	8%	4.5	25	1.13	7%	4.5	25	1.13
4.4 % of route involving difficult ROW acquisition			10	0.00			10	0.00			10	0.00
4.5 % of route involving difficult ROW sharing	9%	4.5	10	0.45	8%	4.5	10	0.45	7%	4.5	10	0.45
				4.33				4.13				4.15

TABLE 13.5.3

TECHNOLOGY: 200 km/h plus ON EXISTING R.O.W.	ROUTE OPTIONS											
	CP Windsor				CN Caso				CP Tillbury/CN Caso			
FACTORS & SUB-FACTORS BY SECTION	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating	Unit of Performance Degree of Impact	Rating (1–5)	Weight %	Weighted Rating
SECTION: LONDON – WINDSOR												
1. Transportation Service												
1.1 Population centres served by route	329,000	5	40	2.00	329,000	5	40	2.00	329,000	5	40	2.00
1.2 Flexibility of route to access potential station sites	all	5	10	0.50	no LON downtown stn	4	10	0.40	all	5	10	0.50
1.3 Accessibility of station site by intermodal means	freeway	3	5	0.15	freeway/airport	4	5	0.20	freeway/airport	4	5	0.20
1.4 Ability of route to access Toronto/Montreal airports	not applicable	0	15	0.00	not applicable	0	15	0.00	not applicable	0	15	0.00
1.5 Anticipated travel time based on max. operating speed	1 hr 13 min	5	30	1.50	1 hr 16 min	5	30	1.50	1 hr 17 min	4.5	30	1.35
				4.15				4.10				4.05
2. Natural Environment												
2.1 ESA's, ANSI's, Prov. significant wetlands	2.5km	3	25	0.75	1.3km	4	25	1.00	3.6km	3	25	0.75
2.2 Ecological reserves	0	5	25	1.25	0	5	25	1.25	0	5	25	1.25
2.3 Significant fisheries / aquatic habitat	1	4	20	0.80	0	5	20	1.00	1	4	20	0.80
2.4 Significant forests / woodlots	0	5	10	0.50	0	5	10	0.50	0	5	10	0.50
2.5 Major watercourse crossings	8	3	10	0.30	3	4	10	0.40	7	3	10	0.30
2.6 Floodplain / geotechnical hazards	0	5	10	0.50	2	4	10	0.40	0	5	10	0.50
				4.10				4.55				4.10
3. Socio-Economic Environment												
3.1 Provincial / National Parks and historic sites	0	5	20	1.00	0	5	20	1.00	0	5	20	1.00
3.2 Major tourism / recreation / conservation areas	0	5	15	0.75	0	5	15	0.75	0	5	15	0.75
3.3 Urban perimeters	16.1km	3	15	0.45	11.8km	3	15	0.45	12.6km	3	15	0.45
3.4 Federal reserves	0	5	20	1.00	0	5	20	1.00	0	5	20	1.00
3.5 Rural communities	0	5	10	0.50	0	5	10	0.50	0	5	10	0.50
3.6 Major productive Natural Resource Areas	6.3km	3	15	0.45	3.8km	4	15	0.60	4.8km	3	15	0.45
3.7 Major Waste Management Sites	0	5	5	0.25	0	5	5	0.25	0	5	5	0.25
				4.40				4.55				4.40
4. Cost												
4.1 Order of magnitude cost of capital works	$0.695 billion	5	35	1.75	$0.665 billion	5	35	1.75	$0.675 billion	5	35	1.75
4.2 Influence on operating cost	156.7km	5	20	1.00	179.1km	4	20	0.80	162.9km	5	20	1.00
4.3 % of route with high level of uncertainty in cost estimate	9%	4.5	25	1.13	8%	4.5	25	1.13	9%	4.5	25	1.13
4.4 % of route involving difficult ROW acquisition			10	0.00			10	0.00			10	0.00
4.5 % of route involving difficult ROW sharing	9%	4.5	10	0.45	8%	4.5	10	0.45	9%	4.5	10	0.45
				4.33				4.13				4.33

13.5.1 Transportation Service

For the over 300 kph technology only one alternative was developed. When compared with the alternative routes in other categories this route exhibits no disadvantages except it precludes the opportunity for a downtown station in London.

For the over 300 kph and 200-250 kph technologies sharing existing ROW, there was no significant difference between the CP Windsor, CP Tilbury/Hwy 401 Corridor and CP Tilbury/CN Caso alternatives. However the CN Caso route would take between 4 to 7 minutes longer to travel due to the additional length. The CN Caso route would also preclude a station in downtown London whereas the other routes would provide for such an opportunity.

13.5.2 Natural Environment

The single proposed routing option for the over 300 kph technology on a new ROW is relatively free of major natural environmental concerns in that it avoids any crossing of the Thames River, Jeannettes and Baptsite Creeks and the associated candidate wetland area on the Lake St. Clair shoreline. It will, however, require a new crossing of the Belle River valley lands and other less significant watercourses with no identified fisheries concerns. The candidate routings for the over 300 kph and 200-250 kph technologies on existing rights-of-way are coincident in the vicinity of major river crossings. Use of the Caso line is marginally preferable due to the fact that it avoids a crossing of the Thames River at Chatham and would require a narrower crossing of other major creeks flowing to Lake St. Clair since the crossings are located further upstream. In addition, the Caso line avoids the candidate Lake St. Clair wetland at the terminus of the Thames River north of Tilbury.

13.5.3 Socio-Economic Environment

The route for the over 300 kph technology avoids most of the identified socio-economic constraint areas with the exception of two major producing gas/oil pools (southeast of Tilbury and northwest of Rodney).

In addition, the route may constitute a concern for agricultural operations due to the introduction of property severances and the need for new farm crossings in an area already influenced by a number of linear transportation and utility corridors. However, the route has been developed to minimize such impacts by running along or parallel to major property boundaries over approximately 68% of its length. Major areas where the awkward configuration of residual agricultural parcels may result are east of Chatham where the route moves away from the Highway 401 corridor and west of Chatham where the route swings west, south of Lake St. Clair. This routing option traverses approximately 150 km of Class 1 and Class 2 agricultural lands which represents 75% of its length, and would not directly affect any major specialty crop operations.

The major concern with respect to the use of the CP and Caso lines for over 300 kph and 200-250 kph technologies is related to effects on existing settlements. When the impacts to the Windsor urban perimeter are discounted, the CP line appears to be preferable since it would result in few significant impacts compared to the Caso line which passes through approximately a dozen existing communities between London and Windsor.

The representative over 300 kph and 200-250 kph routes on existing rights-of-way traverse 170 km and 158 km of Class 1 and Class 2 agricultural lands, respectively, with no major impacts on speciality crop operations.

Judgments on the degree to which agricultural communities may be affected should be reserved pending additional deliberations on possible rail operations rationalization (i.e. availability of rail corridors for exclusive use by high speed rail service) and criteria related to lateral separation of high speed rail and conventional commuter/freight operation, including the need to introduce local bypasses of small rural communities situated on existing rail lines.

A potentially significant concern for all routing options (and any new route in particular) will be the effects on artificial drainage systems, which constitute a significant capital investment relative to the improvement of agricultural lands. These drainage systems, comprising primarily systematic tile drains and numerous major municipal drains, are most extensive between Chatham and Windsor.

13.5.4 Costs

The costs of all the route alternatives were found to be within 8% of each other. Also for the over 300 kph and 200-250 kph technologies sharing existing ROW, the range in the percentage of route with a high level of uncertainty in cost and involving difficult ROW sharing is very narrow (ie 7% to 9%). Since there were no significant differences between the alternatives, cost was not a factor in deciding which alternative to carry forward.

13.6 SELECTION OF REPRESENTATIVE CORRIDOR FOR COSTING

13.6.1 Over 300 kph Technology in New ROW

The over 300 kph option in the Highway 401 corridor has been developed to avoid identified major environmental constraints. Future costing investigations will focus on farm crossing/severance impacts, effects on oil/gas pools and watercourse crossing implications. The route length will also be optimized.

13.6.2 Over 300 kph Technology in Existing ROW

The CP Windsor corridor was selected to be carried forward into Phase 2. A route in the CP corridor would offer better transportation service than a route in the CN Caso corridor. The travel time would be 4 to 5 minutes shorter and there would be the opportunity for a station in the centre of London.

Use of the existing Caso line is preferable from a natural environmental perspective due to the lower number of major watercourse crossings and impacts to the candidate wetland area on the St. Clair shoreline north of Tilbury. However, in retaining the CP Windsor line, the degree to which the Caso line affected urban settlement areas (i.e. traverses a dozen communities) outweighed its natural environmental advantages.

The CP Tilbury/401 Corridor was discarded because it was considered less representative of an existing ROW than the other two options.

13.6.3 200-250 kph Technology in Existing ROW

The CP Windsor line was retained for reasons similar to those outlined in Section 13.6.2.

14 WINDSOR URBAN AREA

14.1 CONTACT WITH MUNICIPALITIES

A meeting was held on September 2, 1992 with the Commissioner of Planning and Director of Long Range Planning for the City of Windsor. The purpose of the meeting was to introduce the high speed rail project and receive feedback on routing and station preferences. The meeting participants were made aware of the objective to have the high speed rail corridor connect with the Windsor-Detroit rail tunnel. Two possible station locations were discussed:

- Urban area of Windsor as close to downtown as possible (a station in downtown Windsor is not possible with a connection to the rail tunnel)

- In the vicinity of the airport

The airport location was noted as preferred since it would be better for intermodal connections (freeway and air).

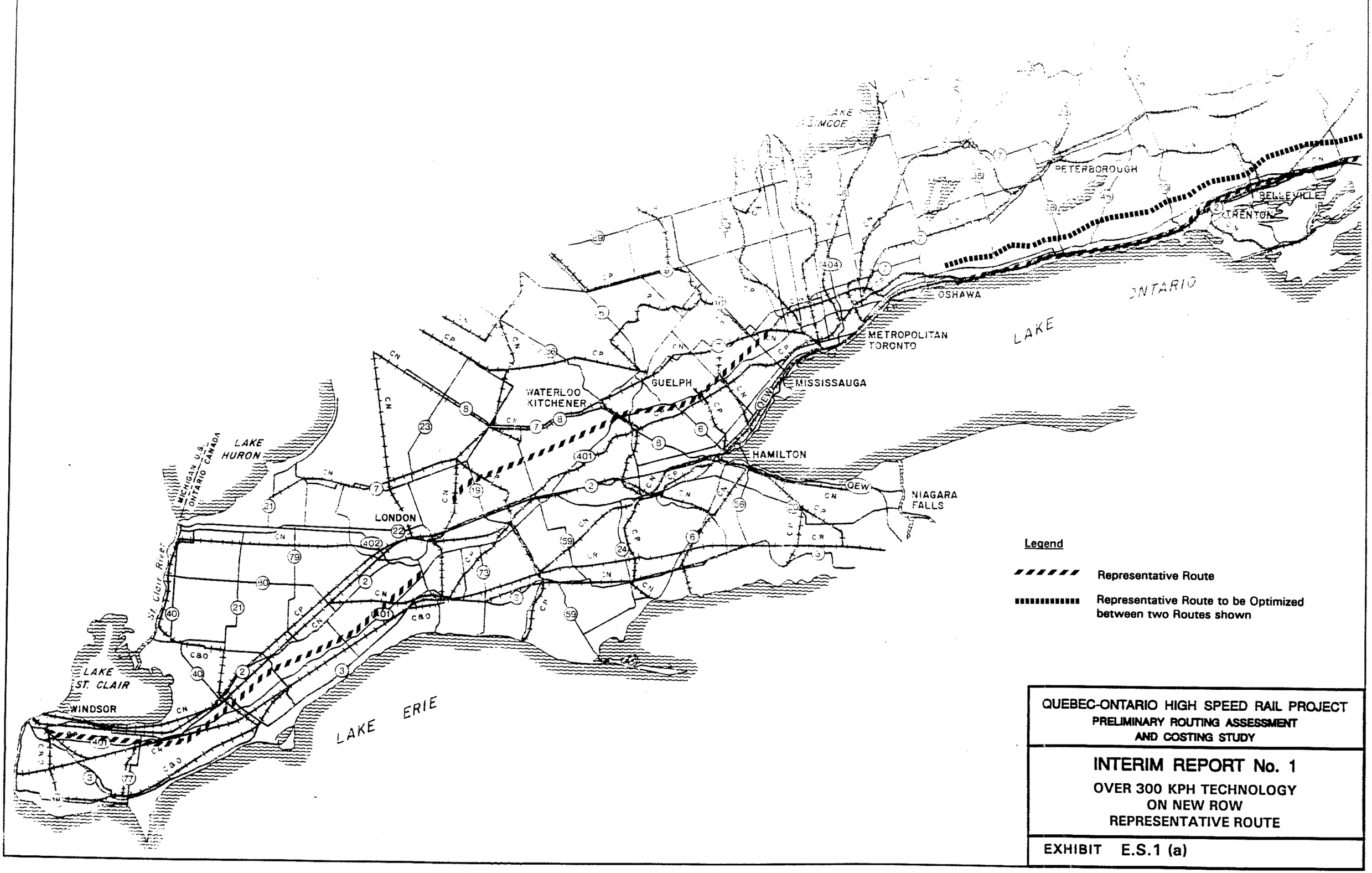
14.2 STATION OPTIONS

Windsor has few routing options since all routes must connect with the rail tunnel leading to Detroit. Two rail corridors go through Windsor and connect to the rail tunnel, namely the CP line and the CN Caso line. One alternative for routes entering the city in the vicinity of the CN Caso line would be to utilize the Chesapeake and Ohio corridor along the west perimeter of the airport to connect to the CP corridor. This would allow a station to be located near the airport terminal.

14.3 ROUTING OPTIONS

The selected route for the over 300 kph technology on a new ROW enters the city utilizing the CN Caso line. The Chesapeake and Ohio corridor alternative will be reviewed as an alternative to the CN Caso line through Windsor. With additional information in the first part of Phase 2 a representative route will be selected for the purpose of costing.

The selected routes for the over 300 kph and 200 kph technologies enter the city utilizing the CP corridor. This corridor will be costed in Phase 2.



Legend

Representative Route

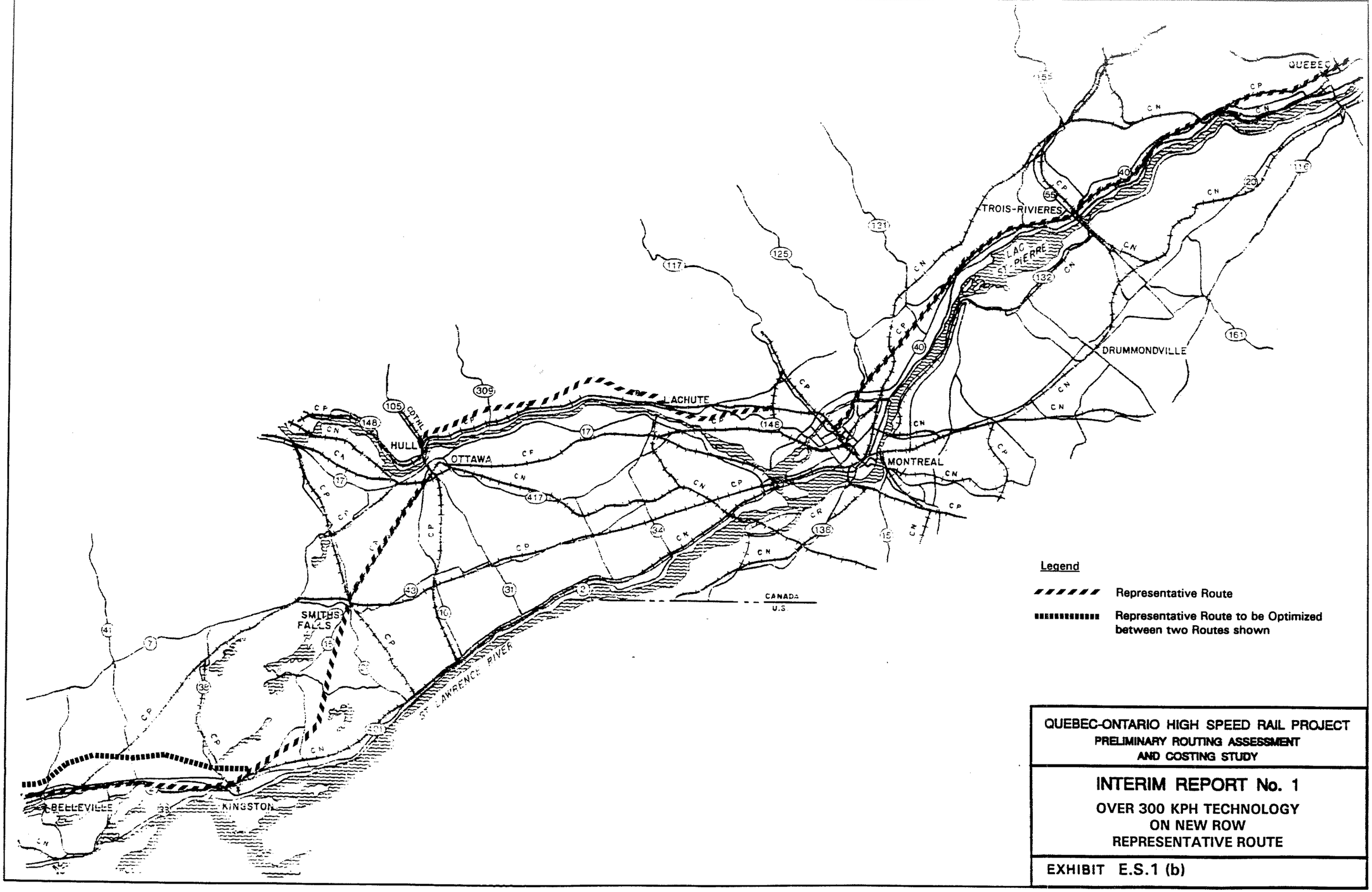
Representative Route to be Optimized between two Routes shown

QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT
PRELIMINARY ROUTING ASSESSMENT AND COSTING STUDY

INTERIM REPORT No. 1

OVER 300 KPH TECHNOLOGY
ON NEW ROW
REPRESENTATIVE ROUTE

EXHIBIT E.S.1 (a)

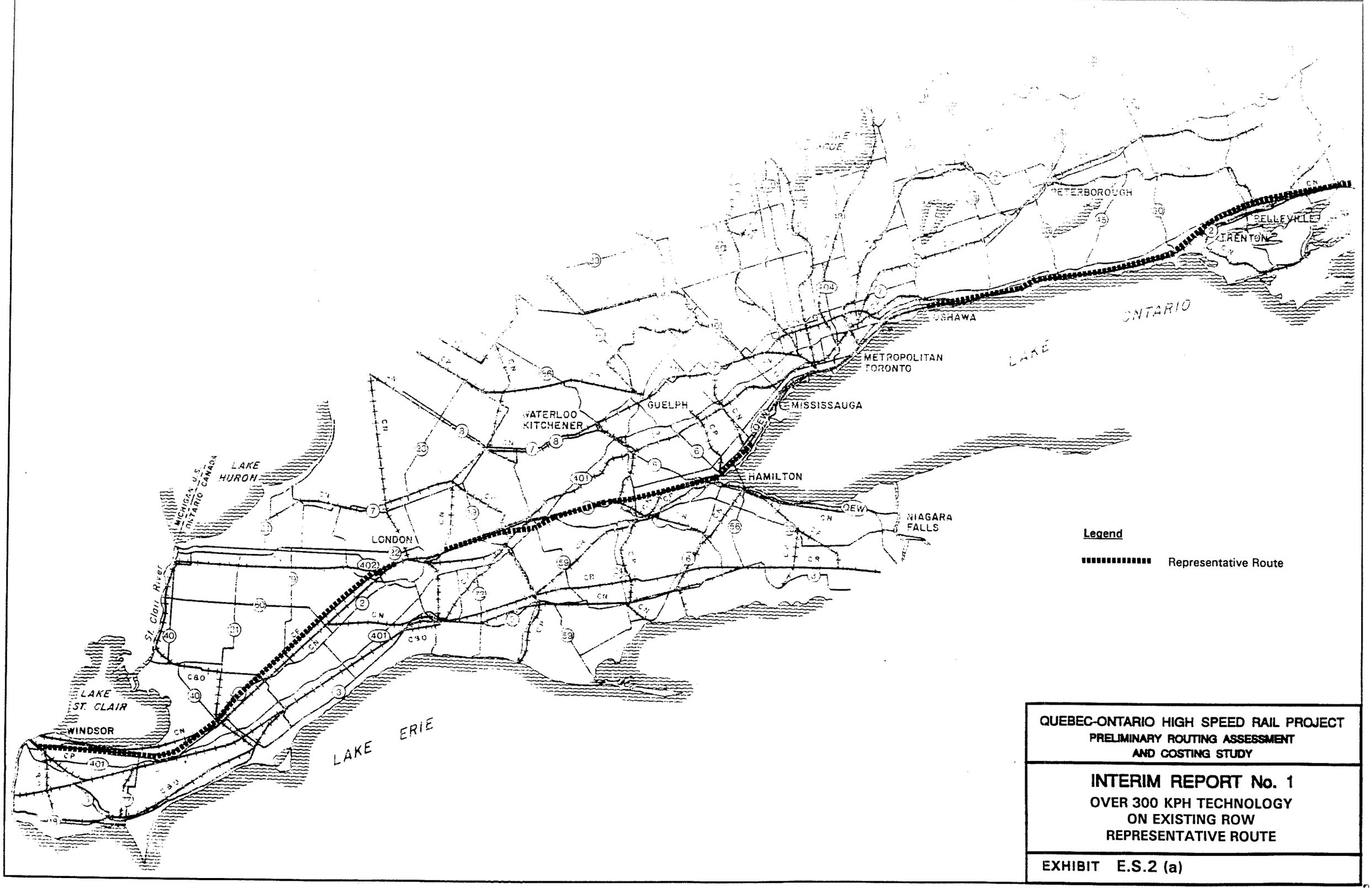


QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT
PRELIMINARY ROUTING ASSESSMENT AND COSTING STUDY

INTERIM REPORT No. 1

OVER 300 KPH TECHNOLOGY ON NEW ROW REPRESENTATIVE ROUTE

EXHIBIT E.S.1 (b)

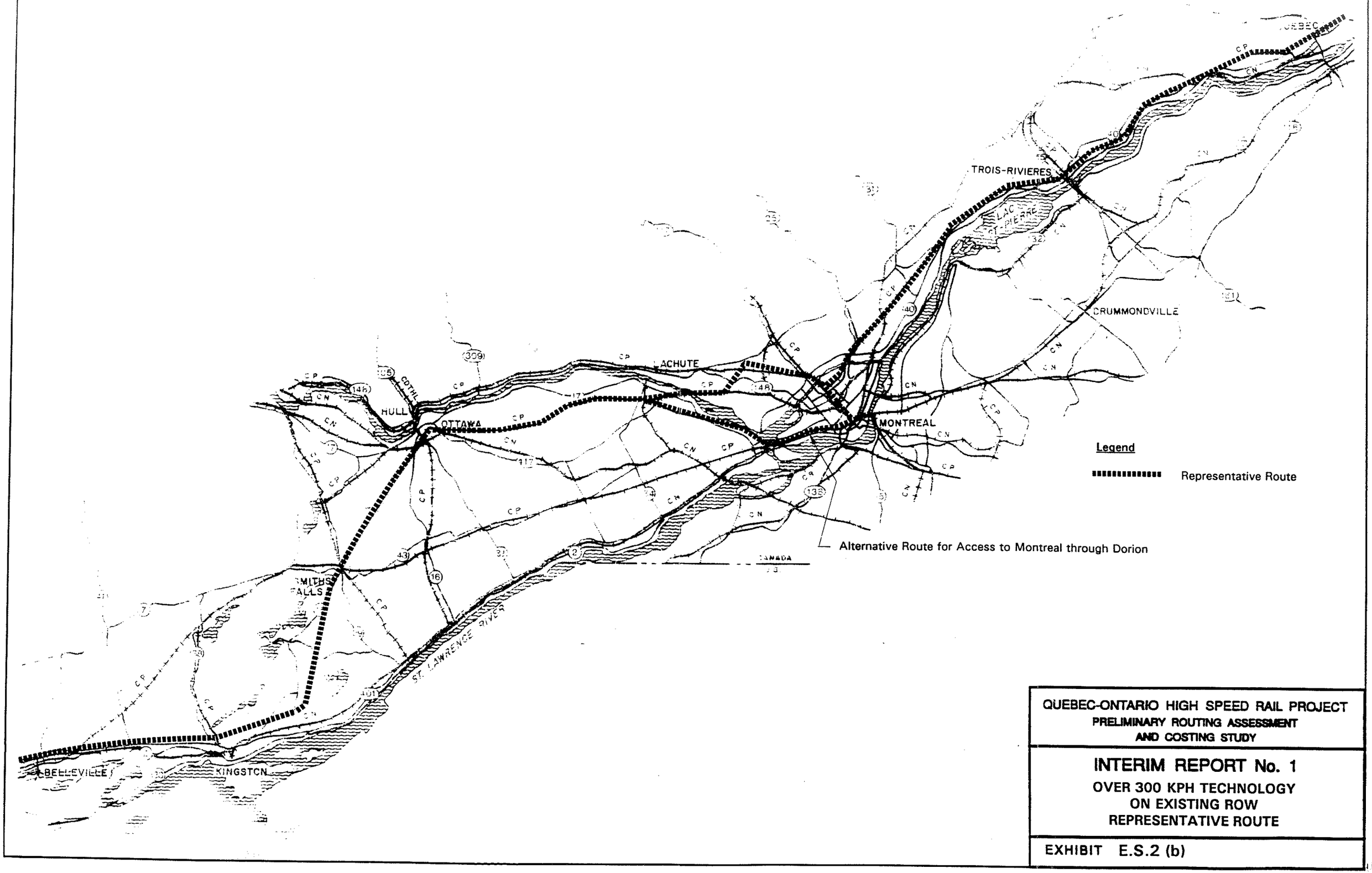


QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT
PRELIMINARY ROUTING ASSESSMENT
AND COSTING STUDY

INTERIM REPORT No. 1

OVER 300 KPH TECHNOLOGY
ON EXISTING ROW
REPRESENTATIVE ROUTE

EXHIBIT E.S.2 (a)

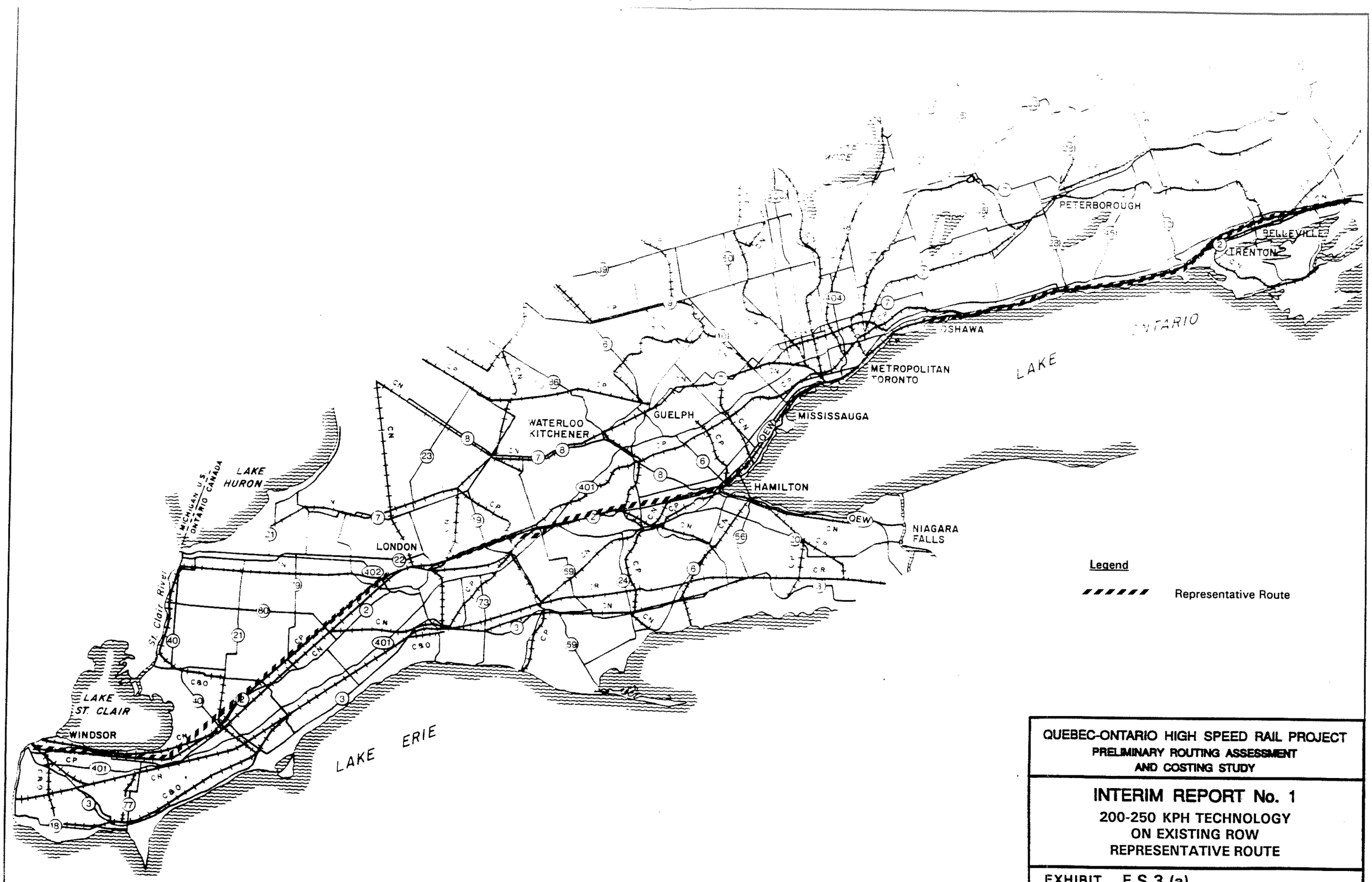


QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT
PRELIMINARY ROUTING ASSESSMENT AND COSTING STUDY

INTERIM REPORT No. 1

OVER 300 KPH TECHNOLOGY
ON EXISTING ROW
REPRESENTATIVE ROUTE

EXHIBIT E.S.2 (b)

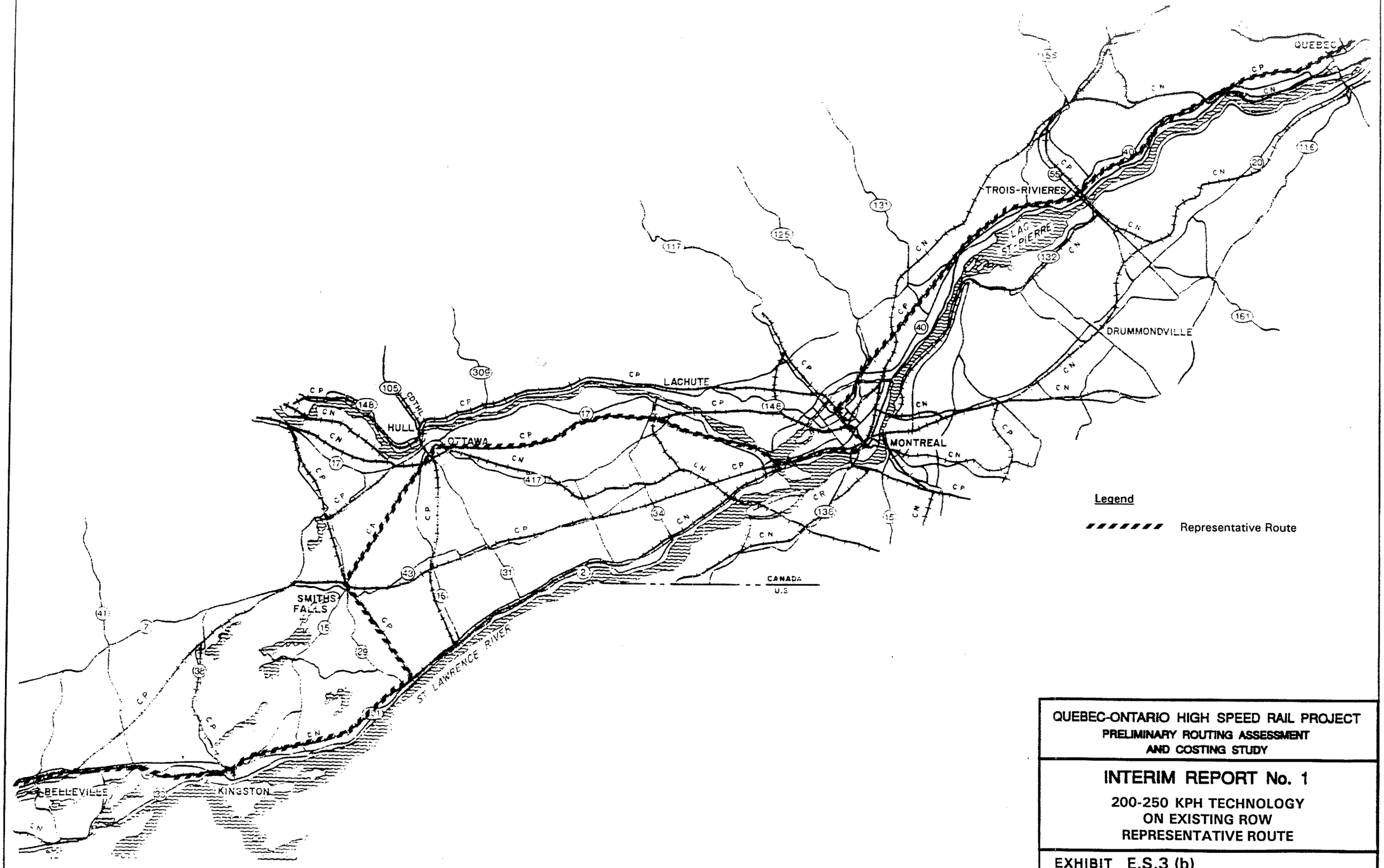


QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT
PRELIMINARY ROUTING ASSESSMENT AND COSTING STUDY

INTERIM REPORT No. 1

200-250 KPH TECHNOLOGY
ON EXISTING ROW
REPRESENTATIVE ROUTE

EXHIBIT E.S.3 (a)

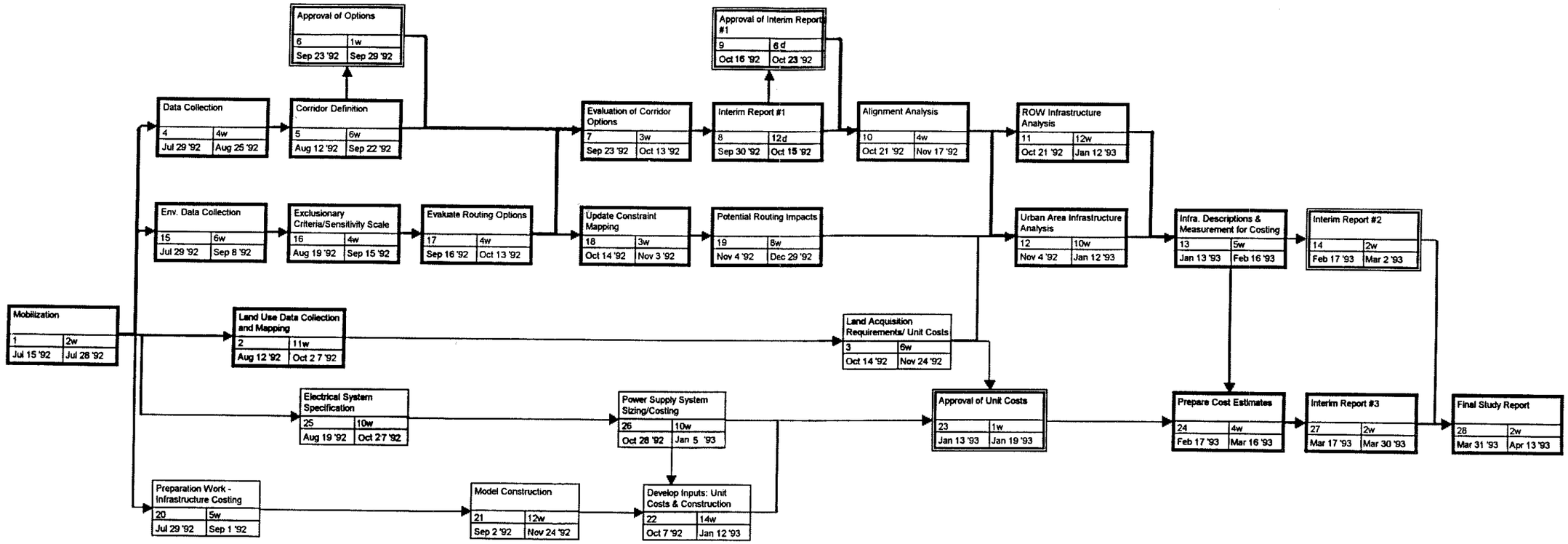


QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT
PRELIMINARY ROUTING ASSESSMENT
AND COSTING STUDY

INTERIM REPORT No. 1

200-250 KPH TECHNOLOGY
ON EXISTING ROW
REPRESENTATIVE ROUTE

EXHIBIT E.S.3 (b)



QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT
PRELIMINARY ROUTING ASSESSMENT
AND COSTING STUDY

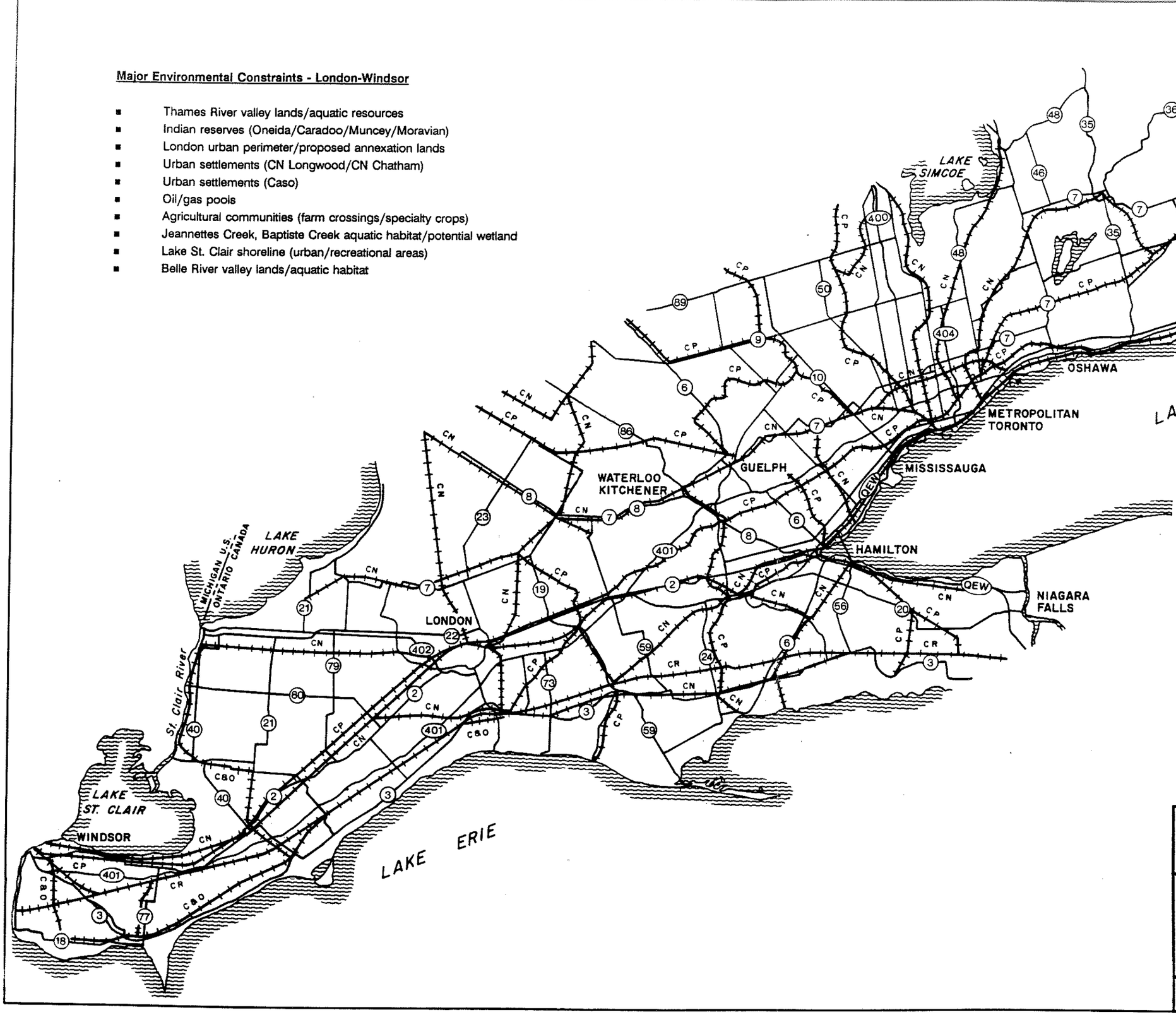
INTERIM REPORT No. 1

STUDY WORK PROGRAM

EXHIBIT 2.1

Major Environmental Constraints - London-Windsor

- Thames River valley lands/aquatic resources
- Indian reserves (Oneida/Caradoo/Muncey/Moravian)
- London urban perimeter/proposed annexation lands
- Urban settlements (CN Longwood/CN Chatham)
- Urban settlements (Caso)
- Oil/gas pools
- Agricultural communities (farm crossings/specialty crops)
- Jeannettes Creek, Baptiste Creek aquatic habitat/potential wetland
- Lake St. Clair shoreline (urban/recreational areas)
- Belle River valley lands/aquatic habitat



Major Environmental Constraints - Toronto-London

- Credit River valley lands/aquatic habitat
- Niagara Escarpment and associated ESA's/ Conservation Areas/aggregate resources
- Bronte Creek valley lands/aquatic habitat/headwaters
- Sixteen Mile Creek valley lands/aquatic habitat
- GTA urban areas (Brampton/Georgetown/Burlington)
- Kitchener-Waterloo/Cambridge, Guelph, Hamilton urban perimeters
- Grand River valley lands/aquatic habitat/headwaters
- Urban settlements Kitchener-Stratford (CN Guelph); Hamilton-London (CN Dundas)
- Thames/Middle Thames Rivers valley lands/ aquatic habitat/headwaters

QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT
PRELIMINARY ROUTING ASSESSMENT AND COSTING STUDY

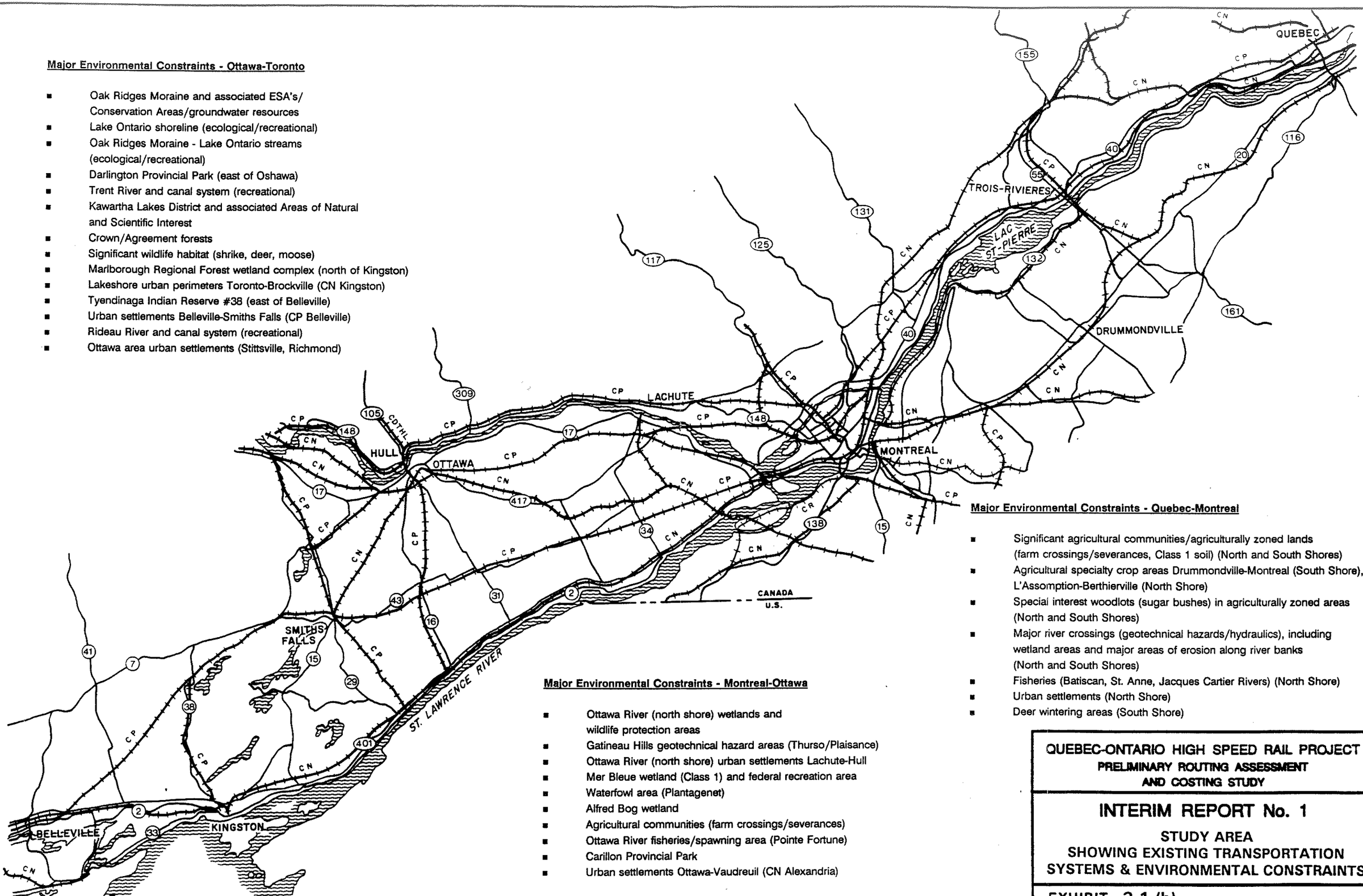
INTERIM REPORT No. 1

STUDY AREA SHOWING EXISTING TRANSPORTATION SYSTEMS & ENVIRONMENTAL CONSTRAINTS

EXHIBIT 3.1 (a)

Major Environmental Constraints - Ottawa-Toronto

- Oak Ridges Moraine and associated ESA's/ Conservation Areas/groundwater resources
- Lake Ontario shoreline (ecological/recreational)
- Oak Ridges Moraine - Lake Ontario streams (ecological/recreational)
- Darlington Provincial Park (east of Oshawa)
- Trent River and canal system (recreational)
- Kawartha Lakes District and associated Areas of Natural and Scientific Interest
- Crown/Agreement forests
- Significant wildlife habitat (shrike, deer, moose)
- Marlborough Regional Forest wetland complex (north of Kingston)
- Lakeshore urban perimeters Toronto-Brockville (CN Kingston)
- Tyendinaga Indian Reserve #38 (east of Belleville)
- Urban settlements Belleville-Smiths Falls (CP Belleville)
- Rideau River and canal system (recreational)
- Ottawa area urban settlements (Stittsville, Richmond)



Major Environmental Constraints - Montreal-Ottawa

- Ottawa River (north shore) wetlands and wildlife protection areas
- Gatineau Hills geotechnical hazard areas (Thurso/Plaisance)
- Ottawa River (north shore) urban settlements Lachute-Hull
- Mer Bleue wetland (Class 1) and federal recreation area
- Waterfowl area (Plantagenet)
- Alfred Bog wetland
- Agricultural communities (farm crossings/severances)
- Ottawa River fisheries/spawning area (Pointe Fortune)
- Carillon Provincial Park
- Urban settlements Ottawa-Vaudreuil (CN Alexandria)

Major Environmental Constraints - Quebec-Montreal

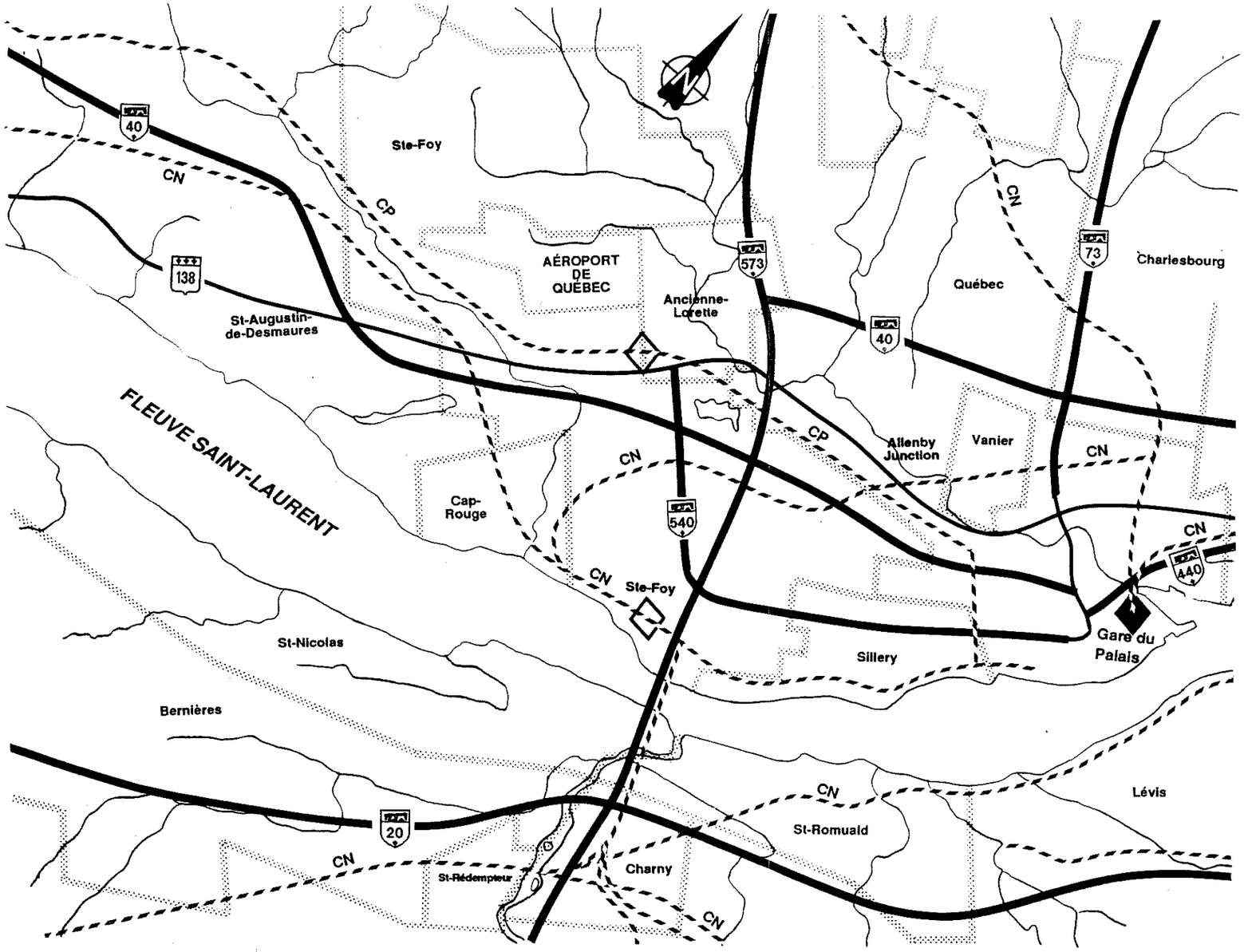
- Significant agricultural communities/agriculturally zoned lands (farm crossings/severances, Class 1 soil) (North and South Shores)
- Agricultural specialty crop areas Drummondville-Montreal (South Shore), L'Assomption-Berthierville (North Shore)
- Special interest woodlots (sugar bushes) in agriculturally zoned areas (North and South Shores)
- Major river crossings (geotechnical hazards/hydraulics), including wetland areas and major areas of erosion along river banks (North and South Shores)
- Fisheries (Batiscan, St. Anne, Jacques Cartier Rivers) (North Shore)
- Urban settlements (North Shore)
- Deer wintering areas (South Shore)

QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT
PRELIMINARY ROUTING ASSESSMENT AND COSTING STUDY

INTERIM REPORT No. 1

STUDY AREA
SHOWING EXISTING TRANSPORTATION SYSTEMS & ENVIRONMENTAL CONSTRAINTS

EXHIBIT 3.1 (b)



LEGEND:

- MAJOR HIGHWAYS
- RAILWAYS
- MUNICIPAL BOUNDARIES
- EXISTING INTERNATIONAL AIRPORTS
- POSSIBLE STATION SITES
- POSSIBLE SUBURBAN STATION SITES

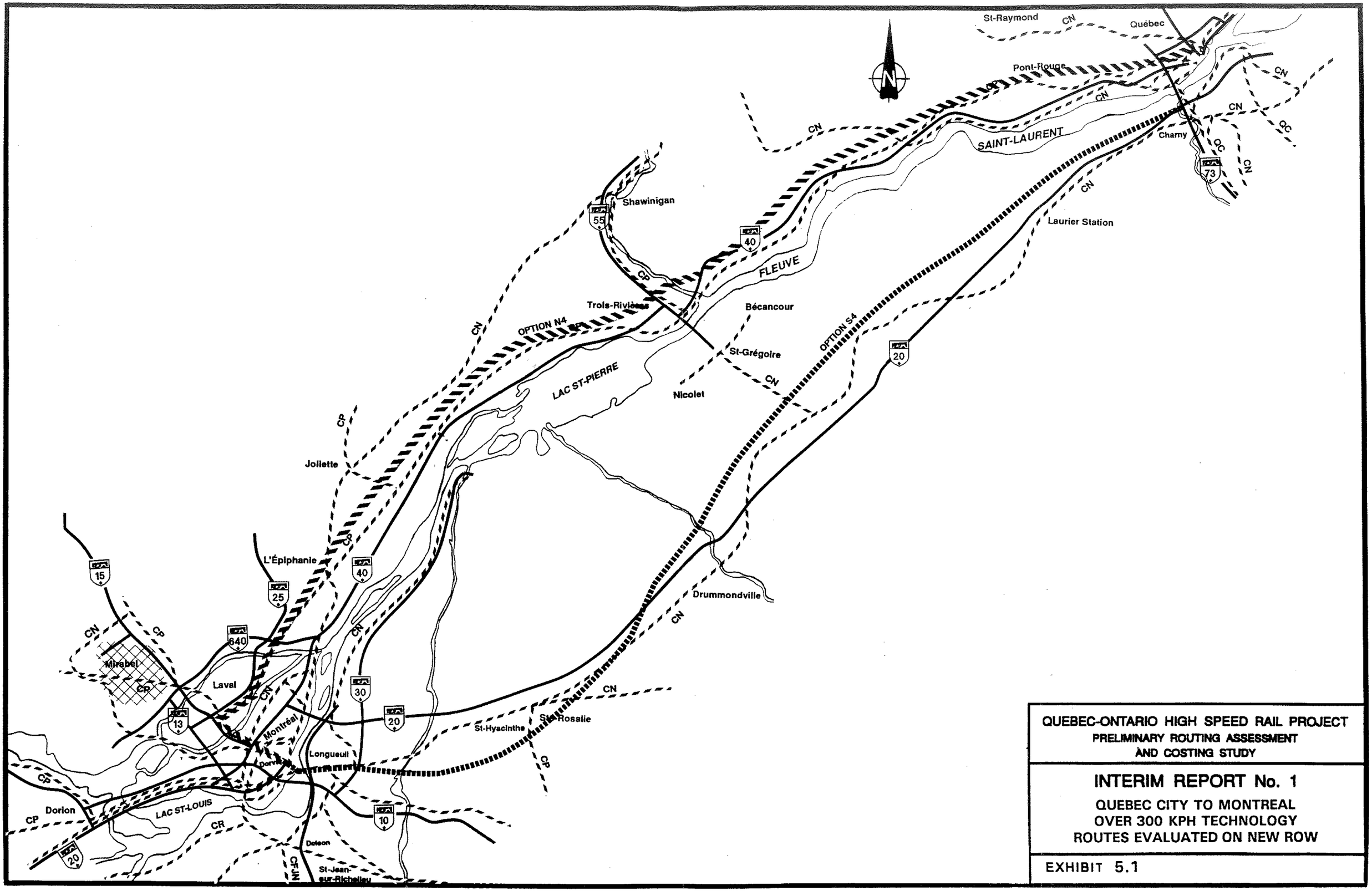
SCALE: 1: 100 000

QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT
PRELIMINARY ROUTING ASSESSMENT
AND COSTING STUDY

INTERIM REPORT No. 1

QUEBEC URBAN AREA
EXISTING CORRIDORS

EXHIBIT 4.1

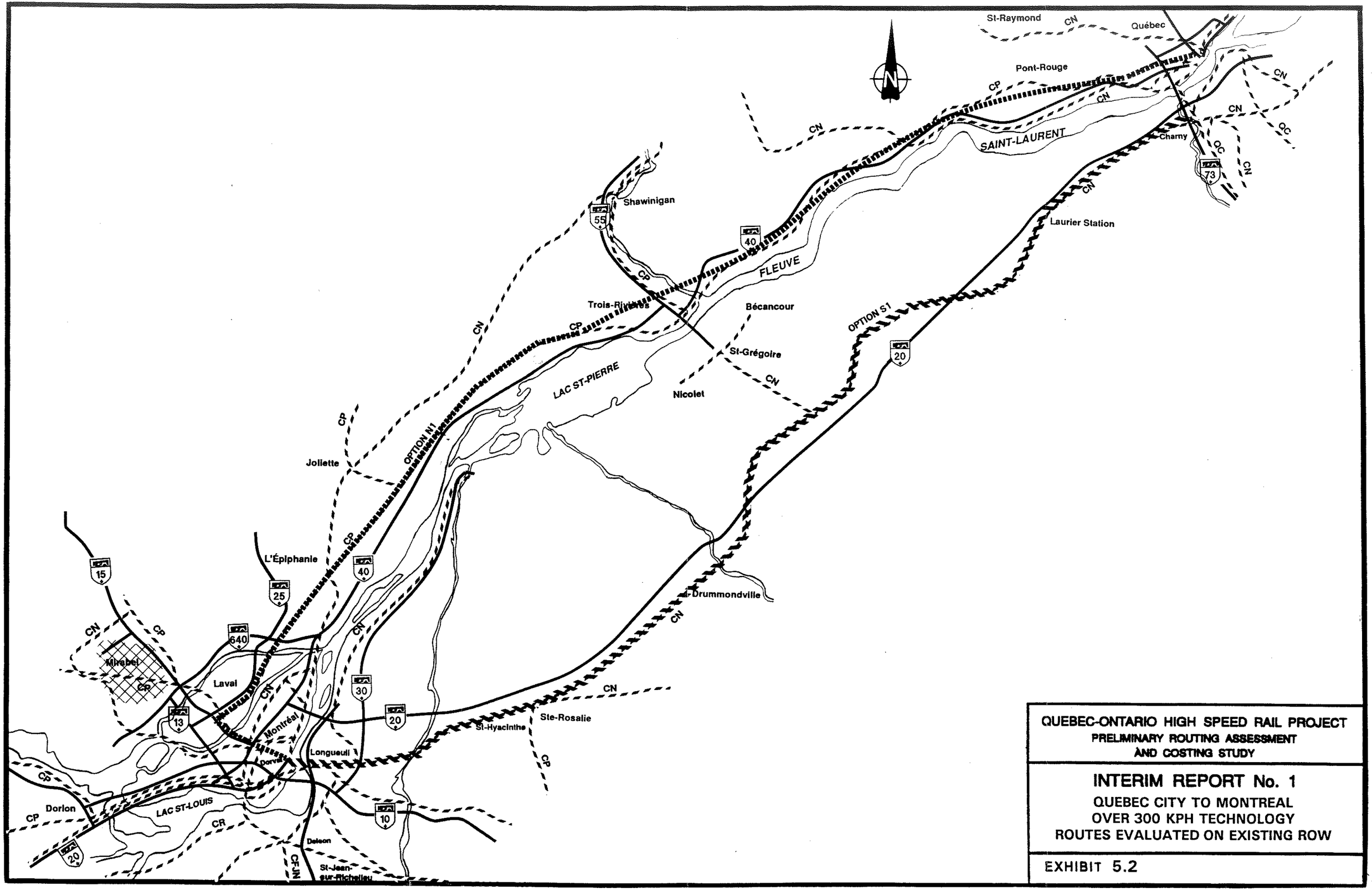


QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT
PRELIMINARY ROUTING ASSESSMENT
AND COSTING STUDY

INTERIM REPORT No. 1

QUEBEC CITY TO MONTREAL
OVER 300 KPH TECHNOLOGY
ROUTES EVALUATED ON NEW ROW

EXHIBIT 5.1

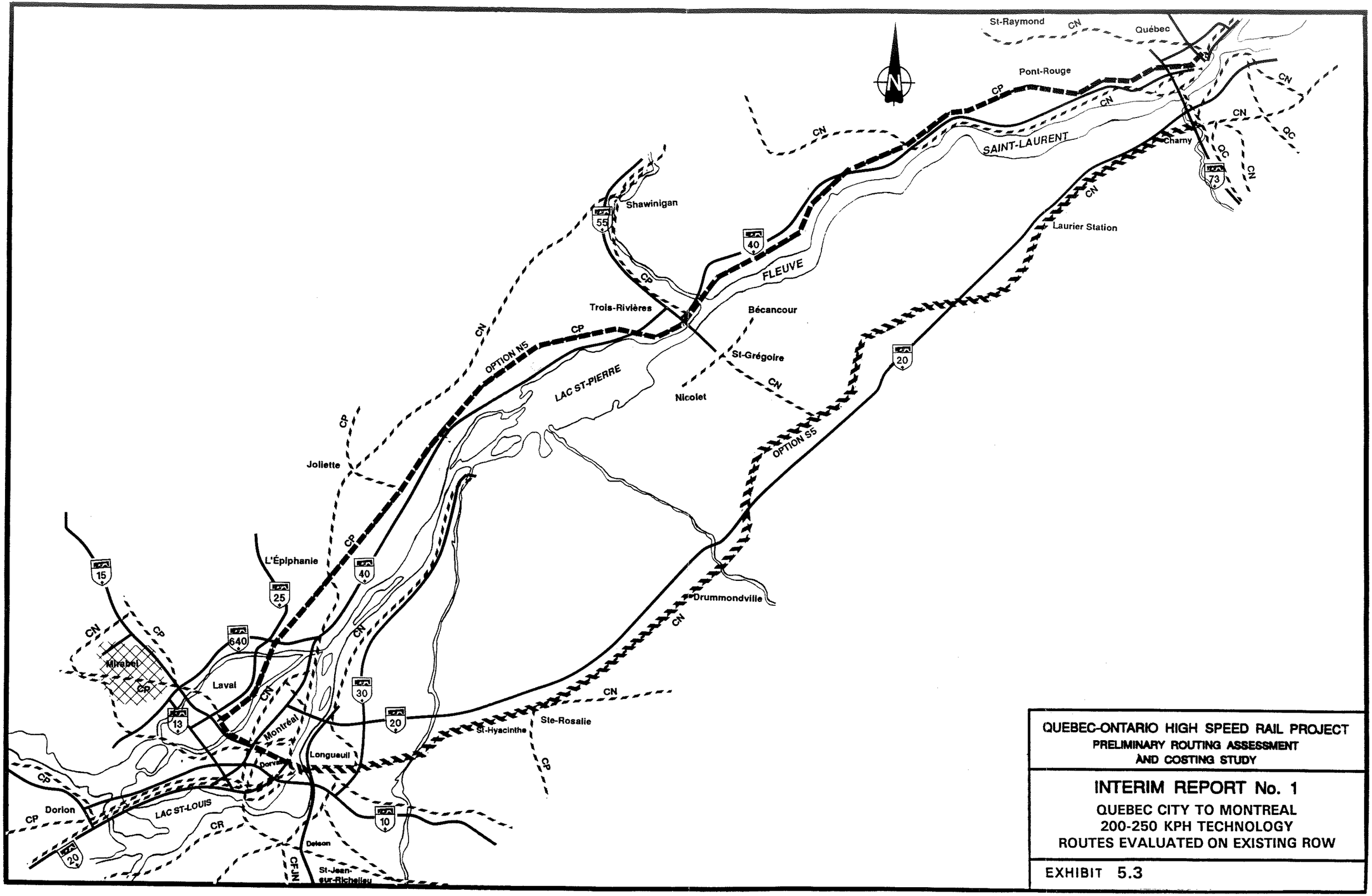


QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT
PRELIMINARY ROUTING ASSESSMENT
AND COSTING STUDY

INTERIM REPORT No. 1

QUEBEC CITY TO MONTREAL
OVER 300 KPH TECHNOLOGY
ROUTES EVALUATED ON EXISTING ROW

EXHIBIT 5.2

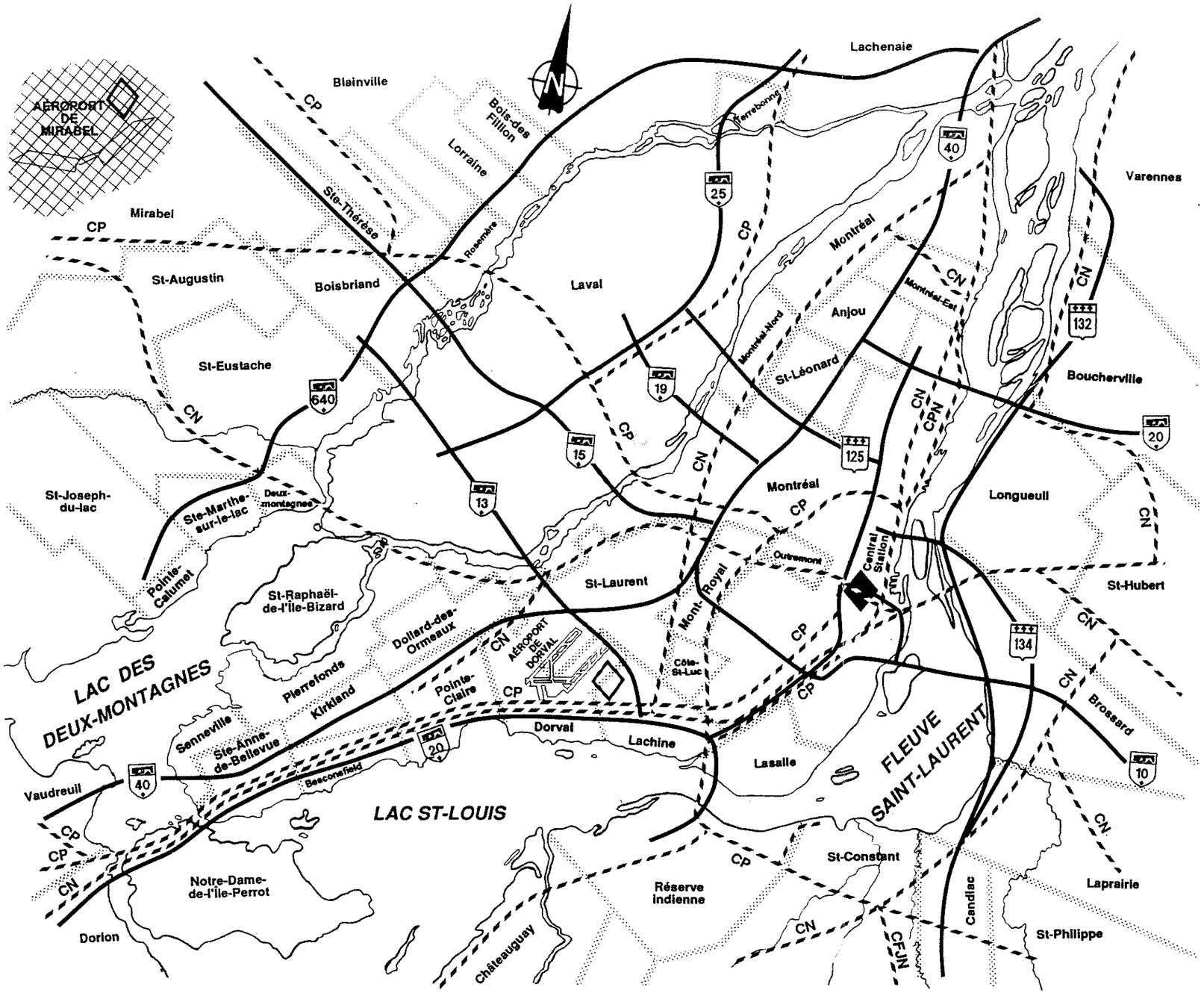


QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT
PRELIMINARY ROUTING ASSESSMENT
AND COSTING STUDY

INTERIM REPORT No. 1

QUEBEC CITY TO MONTREAL
200-250 KPH TECHNOLOGY
ROUTES EVALUATED ON EXISTING ROW

EXHIBIT 5.3



LEGEND:

- MAJOR HIGHWAYS
- RAILWAYS
- MUNICIPAL BOUNDARIES
- EXISTING INTERNATIONAL AIRPORTS
- POSSIBLE STATION SITES
- POSSIBLE SUBURBAN STATION SITES

SCALE: 1 : 200 000

QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT
PRELIMINARY ROUTING ASSESSMENT
AND COSTING STUDY

INTERIM REPORT No. 1

MONTREAL URBAN AREA
EXISTING CORRIDORS

EXHIBIT 6.1

REGION OF PEEL

REGION OF YORK

REGION OF DURHAM

REGION OF HALTON

METROPOLITAN TORONTO

LAKE ONTARIO

HIGHWAY 400

CNR NEW MARKET SUB.

CNR BALA SUB.

HIGHWAY 404

CNR UXBRIDGE SUB.

CPR HAVELOCK SUB.

PICKERING

HIGHWAY 407

CNR YORK SUBDIVISION

CPR BELLEVILLE SUB.

CNR HALTON SUB.

CNR WESTON SUB.

PEARSON

HIGHWAY 401

CNR KINGSTON SUB.

CPR NORTH TORONTO

HIGHWAY 403

CPR GALT SUB.

Q. E. W.

CNR OAKVILLE SUB.

LEGEND:

- MAJOR HIGHWAYS
- PROPOSED MAJOR HIGHWAYS
- RAILWAYS
- MUNICIPAL BOUNDARIES
- EXISTING/POSSIBLE INTERNATIONAL AIRPORTS
- POSSIBLE STATION SITES

QUEBEC-ONTARIO HIGH SPEED RAIL PROJECT
PRELIMINARY ROUTING ASSESSMENT
AND COSTING STUDY

INTERIM REPORT No. 1

GREATER TORONTO URBAN AREA
EXISTING CORRIDORS

EXHIBIT 10.1