

REGION OF OTTAWA-CARLETON
RÉGION D'OTTAWA-CARLETON

REPORT
RAPPORT

Our File/N/Réf. **50 RS 216 -1**
Your File/V/Réf.

DATE 31 July 2000

TO/DEST. Co-ordinator
 Transportation Committee

FROM/EXP. Director, Engineering Division
 Environment and Transportation Department

SUBJECT/OBJET **LAURIER BRIDGE RECONSTRUCTION**
 LAURIER AVENUE - ELGIN STREET TO
 NICHOLAS STREET

DEPARTMENTAL RECOMMENDATIONS

That Transportation Committee recommend Council:

- 1. Approve the replacement of the Laurier Bridge structure as follows;**
 - a. Construction of a five span steel structure (Option D2), as illustrated on Annex A, with a total length of 92.3 metres and width of 25.8 metres to provide for sidewalks on both sides with a clear width of 3.9 metres each, two dedicated bicycle lanes with a width of 2.0 metres each and four traffic lanes with a width of 3.25 metres each as illustrated on Annex B;**
 - b. Existing steel arches (two pairs), vertical end posts and girders over the Rideau Canal, to be retained as heritage features from the original structure built in 1900;**
 - c. Addition of one pair of arches, vertical end posts and girders of the same size and spacing as the existing, on the south side, to facilitate widening of the structure;**

- d. **Stairs on both the north and south side of the west abutment and new pedestrian paths to access the stairs;**
 - e. **Stairs on the south side of the east abutment and a new pedestrian path adjacent to the stairs for access to Colonel By Drive;**
 - f. **Reconstruction of the spiral stairs between the north sidewalk of the bridge and the east side of the Canal;**
2. **Approve the following modifications to Laurier Avenue from Elgin Street to Nicholas Street as shown on Annex C;**
- a. **Modification of the roadway cross section from the Elgin Street intersection to the ramps to and from Queen Elizabeth Drive to provide for two traffic lanes at 3.25 metres each, two shared traffic/bicycle lanes of 4.25 metres each, one westbound right turn lane of 3.25 metres, a 3.0 metre wide north sidewalk and a 2.0 metre wide south sidewalk;**
 - b. **Modification of north and south ramps linking Queen Elizabeth Drive to Laurier Avenue including affected intersections;**
 - c. **Provision of a contra-flow bicycle lane at the south ramp from Queen Elizabeth Drive to Laurier Avenue;**
 - d. **Provision of a 3.25 metre wide eastbound right turning lane from Laurier Bridge to Nicholas Street;**
3. **Approve modifications to the Laurier-Nicholas intersection as shown on Annex D;**
4. **Approve the following modifications under the bridge at Queen Elizabeth Drive as shown on Annex C;**
- a. **Provision of a 5.0 metre wide pathway on the west side to provide linkage between Confederation Park and Festival Plaza;**
 - b. **Reduction in roadway width to 9.0 metres and removal of the existing median;**
 - c. **Modifications to provide for a walkway at road level and a continuous pathway at the lower level along the west bank of the canal;**
5. **Approve the following modifications under the bridge at Colonel By Drive as shown on Annex C;**

- a. **Reduction in roadway width to 9.0 metres and removal of the existing median;**
 - b. **Provision of a new 3.0 metre wide sidewalk on the east side of Colonel By Drive;**
6. **Authorize the completion and filing of the Environmental Study Report for the Laurier Bridge Reconstruction - Laurier Avenue, Elgin Street to Nicholas Street;**
 7. **Authorize staff to proceed with engineering activities related to preliminary and final design of the project;**
 8. **Authorize staff to initiate property acquisition negotiations for property required for the project as will be identified in the detailed design;**
 9. **Authorize staff to initiate necessary utility relocations for this project, including relocation of the existing gas main from the bridge to under the Canal and rehabilitation, and relocation of the water main, as required;**
 10. **Authorize staff to initiate cost sharing negotiations with the National Capital Commission and other affected agencies;**
 11. **Authorize the initiation of the public hearing process as required by Sections 297 and 300 of the *Ontario Municipal Act*.**

EXECUTIVE SUMMARY

The Laurier Bridge carries Laurier Avenue over the Rideau Canal, Queen Elizabeth Drive and Colonel By Drive. The bridge is a key link in the Regional transportation network and carries significant pedestrian and bicycle traffic. The steel arch span over the Rideau Canal is considered to be of heritage significance.

There have been concerns for a number of years relating to the severely deteriorated condition of the concrete structure east of the Canal and its remaining service life. The level of deterioration is such that repair of the structure is not practical and the structure must be replaced.

There are also issues relating to inadequate facilities for pedestrians, cyclists and vehicles on the bridge, the approaches and at the Nicholas-Laurier intersection. In addition, there are inadequate linkages to and from the bridge and concerns relating to safety due to high traffic speeds.

McCormick Rankin Corporation was appointed in December 1999 to carry out an Environmental Study for the Laurier Bridge Reconstruction, including Laurier Avenue from Elgin Street to Nicholas Street. This study included updating and finalizing a Transportation Operational Study (TOS) carried out for the project between 1993 and 1995.

The project has included extensive stakeholder and public consultation through the Technical Advisory Committee (TAC) and Public Advisory Committee (PAC). Focus group meetings were also held with individual stakeholders, as necessary. A Public Information Centre was also held.

The required operational improvements and better facilities for pedestrians, cyclists and other users cannot be achieved without widening the bridge. The Terms of Reference also required that there be no addition to or reduction in the number of through lanes. In order to maintain the visual identity and heritage character of the arch span over the canal, it is proposed that one additional pair of arches be added south of the two existing pairs.

The study identified deficiencies associated with the following main components of the project:

- Laurier Bridge structure
- Laurier Avenue roadway
- Laurier - Nicholas intersection
- Queen Elizabeth Drive and ramps to Laurier Avenue
- Colonel By Drive
- Pedestrian and cyclist connections

Laurier Avenue is a major corridor for underground utilities, including those owned by Ottawa Hydro, Ontario Hydro, Bell, Rogers Cable, a gas main owned by Enbridge, water and sewer lines. It is proposed to rehabilitate and relocate an existing water main crossing under the Rideau Canal, originally built around 1900. Furthermore, the gas main currently on the bridge is proposed to be relocated under the Canal.

Alternative solutions were developed to address the identified deficiencies. These solutions were evaluated and preferred solutions are proposed as described in the report and shown on Annexes.

BACKGROUND

The Laurier Bridge is the most southerly of the three crossings over the Rideau Canal in downtown Ottawa and is a key link in the Regional transportation network. The bridge is part of the Regional truck route system and also carries significant pedestrian and bicycle traffic. It carries four substandard traffic lanes with sidewalks on either side and has a total length of 123 metres. The bridge serves as a main access route to downtown Ottawa from Highway 417. The Department of National Defence Headquarters building abuts the bridge at the north-east corner. The University of Ottawa and the

community of Sandy Hill are located on east side of the project limits and Confederation Park, Festival Plaza, Drill Hall, Regional Headquarters and Provincial Court House are located on the west side.

The bridge is comprised of two main structures. The west structure includes the prominent steel arch span over the Rideau Canal. These arches and one span west of the arches were built in 1900. This structure was extended by the addition of two additional spans over Queen Elizabeth Drive in 1927. The steel arches are considered to be of heritage significance.

East of the arches, there is a seven span concrete structure, built in 1943 to replace an earlier steel trestle structure at the same location. This structure was built to accommodate the railway lines existing at the time. Presently, Colonel By Drive is located under the structure. The Department of National Defence Headquarters building, constructed in the late sixties, blocks four of the seven spans on the north side.

This bridge was transferred to the Region from the National Capital Commission and Public Works and Government Services Canada in 1996 as part of the Bridge Transfer Agreement.

The structural condition of the easterly (concrete) structure has been of particular concern for a number of years. In 1992, the Region undertook interim repairs to the concrete structure on behalf of the National Capital Commission and Public Works Canada, owners of the bridge at that time. These repairs were intended to have a service life of three years with subsequent replacement of the structure.

A Transportation Operational Study (TOS) was initiated in 1993. This study was not finalized due to anticipated impact of significant development proposals (Conference Centre) for lands located east of the bridge. Higher priorities relating to Mackenzie King Bridge and Plaza Bridge resulted in further deferral of replacement of the Laurier Bridge.

Current Activities

On 01 December 1999, Corporate Services and Economic Development Committee approved the appointment of McCormick Rankin Corporation to provide professional engineering services to carry out an environmental study, detailed design and preparation of contract documents for the reconstruction of Laurier Bridge, including Laurier Avenue from Elgin Street to Nicholas Street.

One component of the Environmental Study was to update the previous draft Transportation Operational Study (TOS), based on the same Terms of Reference and directions as approved in 1993 by Transportation Committee and Council, some of which are highlighted below:

- Consider operational improvements for all users of the Laurier Bridge crossing and in the immediate vicinity.

- Reduction in the number of traffic lanes at the crossing or provision of additional through lanes on Laurier Avenue are not to be considered.
- To assess Transportation Operational requirements at the crossing:
 - a) for pedestrians, cyclists, transit and other vehicles (in that order of priority per current Regional Official Plan and Transportation Master Plan)
 - b) for movement of good and services and pedestrian and cyclist needs across Laurier Avenue (north-south direction) and to improve pedestrian and bicycle safety at the intersection at both ends of the Laurier Bridge
- No change in available vehicular capacity at the Nicholas Street corridor.

The background work for the environmental study is now complete and a draft Environmental Study Report has been prepared and is ready for filing subject to approval of the recommendations contained herein.

In addition, engineering activities related to the proposed relocation of the gas main from the bridge to under the Rideau Canal are in progress. Furthermore, engineering activities for the rehabilitation and partial relocation of a watermain crossing of the Canal are also in progress.

STUDY AREA

The study area for the Environmental Study is bounded by McLaren Street on the south side, Bank Street on the west side, Rideau/Wellington Street on the north side and King Edward Avenue on the east side.

EXISTING SITE CONDITIONS

1. Bridge Structure

The structural condition of the bridge has been of concern for a number of years. There are a number of significant structural deficiencies as follows:

- The concrete structure is severely deteriorated and is at the end of its service life. Replacement of the concrete structure is required.
- Significant rehabilitative works and strengthening are required to various components of the steel structure.
- The concrete deck on both structures is severely deteriorated and in need of replacement.

- Handrails and streetlighting are deficient in terms of current standards.

2. Laurier Avenue Roadway - Elgin Street to Nicholas Street

a) Elgin Street to Bridge

West of the bridge, Laurier Avenue has a four lane undivided cross section with lane widths of 3.50 metres. There is also a westbound right turn lane west of the Queen Elizabeth Drive ramp.

There is no provision for cyclists.

A signalized at-grade pedestrian crossing of Laurier Avenue was installed in front of Regional Headquarters in 1996 and has become heavily used since that time.

b) Roadway Cross-Section on Bridge

The existing roadway cross-section on the bridge is shown on Annex B. There are four traffic lanes of 2.9 metres width each with a 2.74 metre wide sidewalk (including railing) on each side of the roadway for a total structure width of 17.07 metres. This cross-section has the following deficiencies:

- Traffic lanes are substandard in width.
- No provision for cyclists.
- Sidewalks are relatively narrow in consideration of the high pedestrian volumes across the bridge.
- The narrow lanes and the proximity of vehicular traffic to the sidewalks create an environment on the bridge that is uncomfortable for all modes, but particularly for pedestrians and cyclists.

Approximately 2,400 vehicles, 440 pedestrians and 160 bicycles cross the bridge during peak hours.

3. Laurier-Nicholas Intersection

This intersection has high volumes of pedestrian, bicycle and vehicular traffic with high numbers of vehicular turning movements (particularly northbound left turns onto the bridge in the morning and eastbound right turns from the bridge in the afternoon). The existing intersection is shown on Annex C and has the following main deficiencies:

- Channelized right turn lanes with islands make it particularly difficult for pedestrians to cross the intersection as each crossing must be done in three stages.

- The south-west quadrant is particularly troublesome given the conflict between the high volume of right turning vehicular traffic, the high volume of pedestrian traffic crossing the channelizing lane and the roadway grades. Signs give priority to pedestrian traffic, however a low vehicular compliance rate has been noted.
- The north approach merges two through lanes from Nicholas Street, two lanes from Waller Street and the single lane DND road into three lanes causing congestion and weaving of traffic.

4. Queen Elizabeth Drive and Ramps to Laurier Avenue

Queen Elizabeth Drive is owned by the National Capital Commission and passes under the bridge on the west side of the Canal. The roadway under the bridge has the following deficiencies:

- The bridge pier in the median obstructs views and requires a wider roadway with median.
- There is no guiderail protection for the bridge pier in the median.
- Vertical clearance is only 3.9 metres which is substandard compared to current codes.
- Sidewalk on west side of roadway only 1.4 metres in width.

Immediately west of the bridge are ramps connecting Laurier Avenue with Queen Elizabeth Drive as shown on Annex D. These ramps are unsignalized, free flow, single lane ramps with yield controlled accesses having the following deficiencies:

- The ramp connections are at relatively flat angles allowing high speed vehicular access with resultant complaints from pedestrians attempting to cross the ramps.
- The throats of the ramps are very wide and therefore difficult for pedestrians to cross.
- The south ramp connection to Queen Elizabeth Drive is at the same point as the Drill Hall parking lot exit resulting in unsafe merging.
- The north ramp connection to Laurier Avenue crosses the pedestrian crosswalk, extending the pedestrian crossing distance

5. Colonel By Drive

Colonel By Drive is also owned by the National Capital Commission and passes under the bridge on the east side of the Canal. The roadway under the bridge has the following deficiencies:

- The bridge pier in the median obstructs views and requires a wider roadway with median
- The guiderail protection for the bridge pier is substandard with respect to current codes
- There is no sidewalk on the east side of the roadway

6. Pedestrian and Cyclist Connections

A number of deficiencies were identified related to the lack of convenient pedestrian and cyclist connections to the bridge from Queen Elizabeth Drive and Colonel By Drive.

- At the west end of the bridge, stairs on the north side of Laurier Avenue are in a dilapidated condition and far removed from the connecting sidewalk under the bridge and therefore rarely used. Most pedestrians choose instead to make an unsafe crossing from the north sidewalk on the bridge to access the stairs on the south side.
- At the east end of the bridge there is no pedestrian or cyclist connection to Colonel By Drive or the Canal from the south sidewalk. There are spiral stairs connecting the north sidewalk to the Canal. Many pedestrians make unsafe crossings between the south sidewalk and these spiral stairs.
- There are no cyclist connections between Queen Elizabeth Drive and the bridge eastbound or from the bridge westbound to Queen Elizabeth Drive.
- There is poor access to the sidewalk under the bridge on the west side of Queen Elizabeth Drive. As a result, this sidewalk receives little usage and makes a poor connection between Confederation Park and Festival Plaza.
- The promenade on the west side of the Canal is not continuous but is interrupted by stairs to the Queen Elizabeth Drive level, making the promenade unusable for disabled.
- There is no sidewalk on the east side of Colonel By Drive.

7. Utilities

Laurier Avenue is currently a major corridor for utilities, a number of which cross the bridge or are in the immediate vicinity as follows:

- A 300 mm gas main owned by Enbridge Consumers Gas is carried across the north side of the bridge providing the main feed to the downtown core.
- Bell Canada, Rogers Cablevision and Ottawa Hydro also have major plant carried in duct structure across the bridge.
- A major 115 kV Ontario Hydro oil-filled underground transmission line is located between Queen Elizabeth Drive and the Canal which runs south of the bridge and along Laurier Avenue to Elgin Street.

- A twin 762 mm diameter water main crossing of the Canal is located south of the bridge providing the main feed to the downtown core. The original main was constructed in approximately 1900. A 900 mm water main running along Laurier Avenue west of the bridge is in good condition with the exception of deteriorated valve chambers. There are also smaller water mains in the project area in need of rehabilitation.
- A major 2130 mm storm sewer running along Laurier Avenue west of the bridge outlets into the Rideau Canal north of the bridge. No modifications to this storm sewer are anticipated.
- A 600 mm combined storm/sanitary sewer running along Laurier Avenue west of the bridge connects to a major collector running along the west side of the Canal. No modifications to this sewer are anticipated.

The relocation of the gas main off the bridge and rehabilitation and partial relocation of the water main must be undertaken prior to start of construction operations associated with replacement of the bridge.

STUDY PROCESS

The Environmental Study was carried out in accordance with the Class Environmental Assessment document for Municipal Road Projects as approved by the Ministry of the Environment. The Planning and Design Process for Schedule C projects was followed as shown on the chart in Annex E extracted from the Class EA document. In addition, the study was harmonized to include the requirements of the Federal Environmental Assessment Review Process.

A significant component of the study process was extensive consultation with affected agencies, stakeholders and the general public. The consultation process is described elsewhere in this report.

IDENTIFICATION OF ALTERNATIVE SOLUTIONS AND PREFERRED SOLUTION

The Do-Nothing alternative is not a practical alternative for the Laurier Bridge due to:

- the severely deteriorated condition of the concrete structure;
- the bridge's importance in the Regional transportation network and its heavy usage by pedestrians and cyclists;
- continued safe operation of this structure must be assured.

The structure has reached the end of its structural service life and cannot be effectively repaired. Replacement is the only practical alternative and provides the opportunity to address the operational deficiencies associated with the crossing.

The required operational improvements cannot be achieved without widening the bridge. The Terms of Reference require that four lanes be maintained. Provision for cyclists, wider sidewalks and standard width lanes therefore require that the bridge be widened.

The heritage significance and visual identity associated with the steel arches over the canal necessitate their preservation and incorporation in the reconstructed crossing. To achieve the required widening, it was deemed desirable to add one additional pair of arches to the two existing pairs, at same width and spacing, to preserve the existing visual identity of the crossing.

1. Bridge Structure

The preferred alternative for the bridge structure proposes that:

- The entire structure be removed and replaced with the exception of the steel arch span over the canal.
- The arch span would be maintained, including the arches, steel girders and vertical end posts which would all be repaired and repainted.
- The new structure would be comprised of a concrete deck on steel girders supported on steel pier columns consistent with original construction.
- Steel girders used for the new structure would be plate girders, similar to original construction, as opposed to the more modern construction technique of box girders.
- This solution recognizes the heritage significance of the steel arch span in accordance with the recommendations of the heritage report that was carried out as part of the environmental study.

The preferred bridge span layout is a five span arrangement as shown on Annex A having the following main features:

- Symmetric about the centre arch span over the canal.
- No piers in the median of Colonel By Drive or Queen Elizabeth Drive.
- Piers located between Queen Elizabeth Drive and the west bank of the canal and between Colonel By Drive and the east bank where they serve to frame the adjacent Canal promenades.
- West abutment replaced at a location approximately 3.5 metres west of the current location in order to provide a 5 metre wide sidewalk adjacent to Queen Elizabeth Drive.

- East abutment replaced at a location approximately 30 metres west of its current location in order to leave a 5 metre wide sidewalk adjacent to Colonel By Drive. The open area currently existing between Colonel By Drive and the east abutment would be filled in as it is no longer required as a bridge structure since removal of the railway lines that were formerly spanned. Access structures and plenums would be added through the abutment wall and fill to connect to electrical and ventilation equipment of the Department of National Defence Headquarters Building.

Other alternatives considered for the bridge structure included:

1. Rehabilitate existing structure;
2. Replace existing structure completely, including removal of steel arch span; and
3. Replace existing structure with new structure, maintaining steel arch span.

It was determined that Alternative 3 was preferable based on structural, architectural and heritage considerations.

The following options were considered for Alternative 3:

- 7 span structure with median piers (Option “A”)
- 5 span structure with median piers (Option “C”)
- 5 span structure without median piers, Concrete end spans (Option “D1”)
- 5 span structure without median piers, Steel plate girder end spans (Option “D2”)
- 5 span structure without median piers, Steel box girder end spans (Option “D3”)

These options were assessed based on criteria outlined in Table 1:

Table 1
Assessment of Bridge Structure Alternatives

Factor	Option "A"	Option "C"	Option "D"		
	7 Span Steel Structure (Median Piers)	5 Span Steel Structure (Median Piers)	"D1" 5 Span - Open End Spans Concrete End Spans	"D2" (Recommended) 5 Span - Open End Spans Steel Plate Girders	"D3" 5 Span - Open End Spans Steel Box Girders
Architectural					
visual primacy of heritage arch maintained	good	good	fair	fair	fair
sight lines for distant views through bridge	fair	fair	fair	good	good
aesthetic composition & proportion of elements	good	good	fair	good	fair
accommodation of utilities (except gas main)	good	good	good	good	good
Heritage					
visibility / clarity of retained heritage elements	good	fair	good	good	good
Integrity of retained heritage elements	good	good	good	good	good
compatibility of new elements / materials	good	good	poor	good	fair
Structural					
simplicity (conventionality) of overall design	good	good	poor	good	fair
future maintenance requirements	fair	fair	fair	fair	fair
Constructability					
time for construction	good	good	poor	good	good
complexity of staging	good	good	poor	good	fair
ease of construction over canal & roadways	fair	fair	poor	good	good
Pedestrian / Cyclists (under bridge)					
pedestrian comfort / safety	fair	fair	good	good	good
cyclists comfort / safety	fair	fair	good	good	good
continuity of linkages	fair	poor	good	good	good
Pedestrian / Cyclists (on bridge)	good	good	good	good	good
Roadways					
minimization of number of roadside hazards	poor	poor	good	good	good
continuity of cross-section	fair	poor	good	good	good
horizontal alignment	fair	poor	good	good	good
Environmental					
opportunities for streetscaping	fair	fair	good	good	good
bird roosting	poor	poor	good	poor	fair
impact on canal	minimal	minimal	minimal	minimal	minimal
Cost (Bridge Only)	1*	1*	2*	3*	4*

* Costs rated lowest to highest (1 to 4 respectively). The range of costs from the lowest to highest cost alternative is of the order of 10% .

Following are the main features of the preferred bridge structure alternative (Option D2):

- extends life of the crossing for an expected 75 year minimum period;
- preserves the heritage elements of the bridge;
- allows improved pedestrian crossing under bridge at Queen Elizabeth Dr. on widened sidewalk;
- improved safety by eliminating piers in the median of Colonel By Drive and Queen Elizabeth Drive;
- improved aesthetics achieved by opening up views by elimination of pier columns and guiderail systems;
- reduced maintenance cost by reducing structure length achieved by eliminating medians in Colonel By Drive and Queen Elizabeth Drive and filling in area east of Colonel By Drive.

2. Roadway Cross-Section - Laurier Avenue

a) Elgin Street to Bridge

The preferred alternative proposes an overall widening of the Laurier Avenue roadway cross-section by 1.0 metre from the Elgin Street intersection to the ramps to and from Queen Elizabeth Drive. The widening is to the south in order to minimize impact on Confederation Park. The widening will allow:

- Two side through lanes in each direction to be increased in width to 4.25 metres in order to make provisions for cyclists on shared traffic/bicycle lanes.
- Two centre through lanes at 3.25 metres each.
- One westbound right turn lane of 3.25 metres.
- The 3.0 metre wide north sidewalk would remain.
- The south sidewalk would be 2.0 metres wide and constructed 1.0 metre south of the current location.

East of the ramps to and from Queen Elizabeth Drive the roadway cross-section transitions to that on the bridge as described in the following section.

b) Roadway Cross-Section on Bridge

The roadway cross-section on the bridge was developed with a goal to provide better facilities for all users and conforming to modern day standards. The widening of the bridge is primarily achieved by addition of a pair of arches at same spacing as existing. This was deemed to be important for architectural, aesthetic and heritage considerations. This widening is carried through to other spans of the bridge.

The preferred roadway cross-section on the bridge is shown on Annex B and provides for the following:

- four traffic lanes of 3.25 metres width each;
- two dedicated bicycle lanes of 2.0 metre width each;
- two sidewalks of clear width 3.9 metres each; and
- an overall clear width of 24.8 metres.

A lane width of 3.25 metres is deemed to be the minimum acceptable width, consistent with the operational use of the bridge and approach roadways and conforming to latest Transportation Association of Canada standards.

Dedicated bicycle lanes of 2.0 metre width are recommended in each direction. Consideration was given to shared use curb lanes of width 4.75 metres or dedicated bicycle lanes of 1.5 metre width but these alternatives are deemed less desirable given the roadway grades and traffic volumes on the bridge.

The clear sidewalk width of 3.9 metres is recommended in order to provide improved security for pedestrians including splash protection. This sidewalk width allows room for streetlighting poles and possible streetscaping features such as planters or benches if desired in future.

The preferred cross-section allows the spacing of the two new arches to be the same as the existing arches (4.4 metres) which is an important aesthetic quality.

Alternative cross-sections were also evaluated as shown in the Table 2. An alternative cross-section in which a median is provided to separate the eastbound and westbound traffic was considered. In addition, an alternative with barrier curbs at the sidewalk was considered. These alternatives were evaluated and considered less desirable than the recommended cross-section.

The benefits of the preferred roadway cross-section on the bridge are:

- improved security for pedestrians with wider sidewalks and increased separation from other users;
- improved safety for bicyclists by providing dedicated cycle lanes;
- improved safety for other vehicles by providing lane widths in accordance with current standards and increased separation from bicycles and pedestrians;
- preserves aesthetics of arch span by maintaining equal spacing of arches.

c) Bridge to Nicholas Street

The cross-section on the bridge extends easterly through to the Nicholas Street intersection, with the addition of a 3.25 metre wide eastbound right turning lane east of the bridge. This turning lane is required in order to accommodate right turning traffic in consideration of other modifications recommended for the intersection as described in the following section.

Table 2
Assessment of Roadway Cross-Section Alternatives on Bridge

Factor	A – Exclusive Cycle Lane	B – Shared Cycle Lane	C – Exclusive Cycle Lane with Median	D – Shared Cycle Lane with Median	E – Exclusive Cycle Lane with Barrier
Lane Width	4 vehicle lanes at 3.25 m 2 cycle lanes at 2.0 m	2 vehicle lanes at 3.25 m 2 shared lanes at 4.75 m	4 vehicle lanes at 3.25 m 2 cycle lanes at 2.0 m	2 vehicle lanes at 3.25 m 2 shared lanes at 4.75 m	4 vehicle lanes at 3.25 m 2 cycle lanes at 2.0 m
Bicycle Lane or Shared Lane	Exclusive	Shared	Exclusive	Shared	Exclusive
Sidewalk Width	(4.45 m) 3.95 m	(4.95 m) 4.45 m	(3.45 m) 2.95 m	(3.95 m) 3.45 m	(3.95 m) 3.45 m
Median	No	No	Yes (1.5 m)	Yes (1.5 m)	No
Total Bridge Widening	8.9 m 3.5 m for pedestrians 4.0 m for cyclists 1.4 m for motor vehicles	8.9 m 4.5 m for pedestrians 4.4 m for motor vehicles/cyclists	8.9 m 1.5 m for pedestrians 4.0 m for cyclists 1.4 m for motor vehicles	8.9 m 2.5 m for pedestrians 4.4 m for motor vehicles/cyclists	8.9 m 2.5 m for pedestrians 4.0 m for cyclists 1.4 m for motor vehicles
Curb Barriers	No	No	No	No	Yes
Design Consistency	No – cycle lanes are shared west of the bridge	Yes	No – cycle lanes are shared west of the bridge	Yes	No – cycle lanes are shared west of the bridge
Pedestrian Comfort/Safety ¹	Good	Good	Poor – narrow sidewalk, median encourages unsafe crossing maneuvers	Poor – median encourages unsafe crossing maneuvers	Good
Cyclist Comfort/Safety ¹	Good ²	Fair	Good ²	Fair	Poor
Driver Comfort/Safety ¹	Fair	Poor	Good	Fair	Poor
Opportunity for Streetscaping	Good ³	Good ³	Poor	Poor	Fair ⁴
Lighting Alternatives	Fair ³	Good ³	Fair ³	Fair ³	Poor

1 All cross-sections have a high degree of safety associated with them, however perception and comfort varies

2 assumes separate bicycle lane preferred on bridge with approach grade of 3.5%

3 rating assumes that lighting poles could be located up to 0.5m back from curb (including on median) which we would consider essential to achieve minimum streetscape objectives related to pedestrian comfort

4 sidewalk narrower than 4 m but lighter, more open railing possible

3. Laurier - Nicholas Intersection

The preferred alternative for the Laurier - Nicholas intersection is shown on Annex D. This solution proposes the following:

- Eliminates all right turn channelization lanes and islands in order to reduce pedestrian crossing distances and improve pedestrian security and comfort.
- Turning radii are tightened at the north-east and south-east quadrants in order to further reduce pedestrian crossing distances. This is possible since Laurier Avenue is not a truck route east of Nicholas Street.
- The overall intersection area is therefore significantly reduced resulting in an increase in available green space.
- An eastbound right turn lane is provided to partially replace the elimination of the channelization lane.
- Compound 20 metre / 50 metre turning radii are provided for the eastbound right turn to minimize pedestrian crossing distances while making provision for turning trucks to stay in the curb lane. This is required in order to minimize conflict with southbound through traffic.
- A tightened 15 metre radius is provided for the southbound right turn to reduce pedestrian crossing distances. This reduced radius is possible since volumes at this quadrant are much less than the south west quadrant.
- The southbound merge lane is eliminated to free up additional green space and provide for lengthening the northbound double left turn lanes as required to eliminate excess queuing which currently blocks the northbound through lane in the AM peak.
- A slight modification of the north approach allows a fourth lane to be implemented south of the DND road thereby reducing the amount of merging and weaving required from the two lanes of Nicholas Street meeting the two lane Waller Street truck route and the DND Road at that point.

Traffic analysis shows that even with addition of the eastbound right turn lane, the eastbound right turn movement will fail (Level of Service F) at times during the PM peak with a volume to capacity ratio of 1.32. Consideration was given to double eastbound right turn lanes, however this did not bring about significant improvement since turning movements are not permitted during red lights for double right turns.

Alternatives for the Laurier Avenue / Nicholas Street intersection were developed and evaluated as shown in Table 3. The addition of an eastbound left turn lane was considered, however analysis showed that the intersection failed due to the additional signal phasing required, irrespective of whether a single or double eastbound through lane was provided.

Table 3
Assessment of Alternatives for Laurier Avenue - Nicholas Street Intersection

Factor	Existing Intersection	1 2 thr., 1 rt.	2 2 thr., 2 rt.	3 1 lt., 1 thr., 1 rt.	4 1 lt., 2 thr., 1 rt.
Level of Service	E	E	E	F	F
Pedestrian Walking Distances across West Approach (See note below)	40 m	22 m 23.5 m with median	26 m 27.5 m with median	22 m 23.5 m with median	26 m 27.5 m with median
Cyclist Comfort/Safety ¹	Poor	Good	Good	Good	Fair
Pedestrian Comfort/Safety ¹	Poor	Good	Fair	Poor	Poor
Effects on Existing Landscaping	No Change	x removed	(x + 30%) removed	x removed	(x + 30%) removed
Intersection Pedestrian Challenge – Features Index	56.3	25	25	30	30

All cross-sections have a high degree of safety associated with them, however perception of degree of comfort varies.

The preferred alternative for the Laurier - Nicholas intersection has the following benefits:

- improved pedestrian security due to elimination free-flow right turn channelization lanes;
- improved cyclist security due to provision of dedicated cyclist lane at intersection and west approach;
- increase in available green space at all four quadrants of intersection;
- improved vehicular operations by reduction in merging and weaving in the north approach;
- improved pedestrian security due to reduced crossing distances as shown in Table 4:

Table 4
Pedestrian Crossing Distances (metres)
Laurier Avenue - Nicholas Street Intersection

Approach	Existing	Proposed
North	50m	38m
South	53m	36m
West	40m	22m
East	37m	16m

4. Queen Elizabeth Drive and Ramps to Laurier Avenue

The preferred alternative proposed for Queen Elizabeth Drive and the ramps connecting to Laurier Avenue are as shown on Annex C. The following are main elements proposed:

- Elimination of the pier in the median allows the elimination of the median itself and subsequent narrowing of the overall roadway width to 9.0 metres (curb to curb) below the bridge.
- The ramp throats at Laurier Avenue are relocated easterly from their current locations to provide a tighter geometry where the ramps meet Laurier Avenue. This will reduce the speed of vehicles accessing and egressing the ramps in order to improve security for pedestrians crossing the ramps at Laurier Avenue or Queen Elizabeth Drive.
- The south ramp access to Queen Elizabeth Drive is also modified to eliminate the free flow merge thereby forcing traffic to stop. This improves safety by eliminating the conflict point with the exit from the Drill Hall parking lots. It also improves pedestrian security by reducing vehicle speeds and eliminating the free-flow crossing.
- A contra-flow bicycle lane is proposed for the south ramp to provide a cyclist connection from Queen Elizabeth Drive to Laurier Bridge eastbound. The contra-flow bicycle lane would be separated from the vehicle lane by a painted line, in accordance with current standards.
- A contra-flow bicycle lane was also considered for the north ramp, however is not recommended due to safety concerns related to the turning movement for westbound cyclists to access the lane from the downhill grade on the bridge. These concerns can only be addressed by requiring the cyclists to dismount and walk a short distance. Compliance, however may be difficult to achieve.
- The intersection of the south ramp with Queen Elizabeth Drive has a three way stop and is designed to accommodate trucks making left turns to access the National Arts Centre.
- The proposed design of the intersection of the north ramp with Queen Elizabeth Drive was coordinated with the National Capital Commission to create the appearance that the Driveway ends at that point and to direct vehicles towards the ramp as opposed to towards the truck access to the National Arts Centre.
- Sidewalks are proposed on both sides of Queen Elizabeth Drive, including a 5.0 metre wide sidewalk under the bridge on the west side to provide an improved pedestrian connection between Confederation Park and Festival Plaza.
- the Canal promenade is proposed to be reconstructed to be continuous at constant grade, eliminating the need to go up and down stairs when walking under the bridge.
- New stairs connecting Queen Elizabeth Drive to the Canal promenade are proposed and the area under the bridge between Queen Elizabeth Drive and the Canal would be sloped with cobblestones.

- A sidewalk is proposed along the north curb of the north ramp. A portion of this sidewalk is depressed in order to allow its use as a special events vehicle lay-by during events in Confederation Park, as requested by the National Capital Commission.
- A sidewalk is also proposed along south curb of the south ramp.

The recommended alternative for Queen Elizabeth Drive and ramps connecting to Laurier Avenue has the following benefits:

- Improved pedestrian security due to inclusion of sidewalks on both sides of roadway.
- Improved pedestrian security due to reduced vehicle speeds resulting from three way stop at the south ramp intersection and pedestrian crosswalks across all sides of the intersection.
- Improved pedestrian security and vehicular safety due to elimination of the free-flow merge of the south ramp to Queen Elizabeth Drive and elimination of conflict point with Drill Hall exit.
- Improved pedestrian security due to reduced crossing distances where ramps meet Laurier Avenue and Queen Elizabeth Drive.
- Improved pedestrian security due to reduced vehicle speeds resulting from tightened ramp geometry and forced stop where each ramp ends.
- Increase in available green space due to narrowing of roadway from elimination of the median on the roadway under the bridge and elimination of the free-flow south merge ramp
- Improved pedestrian comfort due to elimination of need to use stairs on Canal promenade.
- Improved cyclist connection due to the addition of the contra-flow lane on the south ramp.

5. Colonel By Drive

Modifications are recommended for Colonel By Drive as shown on Annex C. The following are main elements proposed:

- Similarly to Queen Elizabeth Drive, the elimination of the pier in the median allows the elimination of the median itself and subsequent narrowing of the overall roadway width to 9.0 metres (curb to curb) below the bridge.
- A new sidewalk is added on the east side of Colonel By Drive to provide an improved pedestrian connection from the path south of the bridge to the DND road north of the bridge.
- Existing sidewalks and path connections on the west side of the roadway are maintained.

The recommended alternative for Colonel By Drive has the following benefits:

- Improved pedestrian security due to inclusion of sidewalks on both sides of roadway.
- Increase in available green space due to narrowing of roadway due to elimination of the median on the roadway under the bridge

6. Pedestrian Connections

The requirement for additional pedestrian connections to the bridge was identified early in the study to make it easier and safer for pedestrians to access the sidewalks on the bridge and also to provide an alternate to discourage mid-block crossings currently prevalent on the bridge.

The following additional pedestrian connections are proposed as shown on Annex C:

- New stairs on both the north and south sides of the west abutment. These stairs would be aligned symmetrically such that each set of stairs would be equally accessible. This would be a significant improvement over the existing arrangement of stairs in which the north stairs are far from the abutment and therefore not as accessible as the south stairs, promoting the unsafe mid-block crossings.
- New pedestrian paths to access the stairs at the west abutment. To the south, this path would connect from the north west side of the Drill Hall Parking Lot to the intersection with the ramp from Laurier eastbound, making use of the crosswalks at the three way stop on Queen Elizabeth Drive.
- These new paths to the west abutment will also connect to a new 5.0 metre wide sidewalk on the west side of Queen Elizabeth Drive to provide an improved link between Confederation Park and Festival Plaza.
- Construction of new stairs on the south side of the east abutment and a new pedestrian path adjacent to the stairs for access to Colonel By Drive. This will provide a totally new pedestrian link connecting the east abutment to Colonel By Drive and the new Mackenzie King Station located to the north.
- Reconstruction of the spiral stairs connecting the north sidewalk of the bridge to the east side of the Canal. The existing spiral stairs are heavily deteriorated and near the end of their useful life.

Consideration was given to a grade-separated pedestrian link under or over Laurier Avenue west of the bridge however this was not recommended due to concerns regarding security, impact on the park and cost. Consideration was dropped at the request of Transportation Committee and Council.

Construction of stairs from the south side of the bridge to the east side of the Canal was also considered but is not recommended for aesthetic reasons, due to blocking of views from Colonel By Drive, and because the new stairs and path at the east abutment will provide a convenient alternate.

The benefits of the revised pedestrian connections are:

- improved pedestrian security by providing better located stairs at the west abutment to discourage mid-block crossings of Laurier Avenue on the bridge;
- improved pedestrian security by providing a south path accessing these stairs at a crosswalk as opposed to the current path which crosses the ramp mid-block;
- improved pedestrian opportunities by widened sidewalk on west side of Queen Elizabeth Drive and connecting paths for link between Confederation Park and Festival Plaza;
- improved pedestrian opportunities by new connection to Colonel By Drive with new stairs and path at east abutment and new sidewalk on east side of Colonel By Drive.

PUBLIC AND STAKEHOLDER CONSULTATION

This project was developed through extensive stakeholder and public consultation initiated during the Transportation Operational Study (TOS) during 1993-95 and carried through during the current Environmental Assessment Study phase. The Technical Advisory Committee (TAC) and Public Advisory Committee (PAC) formed during TOS were reinstated during the current study to validate conclusions reached during the TOS.

Public consultation was also carried out during the TOS including several meetings of TAC and PAC, meetings with focus groups and three Public Information Centres.

The following agencies were represented on the TAC:

- Region of Ottawa Carleton - ETD: Mobility Services and Engineering Divisions, Planning and Development Approvals Department
- City of Ottawa
- National Capital Commission
- Public Works and Government Services Canada (PWGSC)
- Parks Canada
- OC Transpo
- Ministry of Transportation

The following agencies and interest groups were included in the PAC:

- Lisgar Collegiate Institute
- Lisgar Collegiate Institute Parent Advisory
- Ottawa Courthouse
- Public Works and Government Service Canada -(National Defence Headquarters)
- Public Works and Government Service Canada -(Drill Hall)
- National Arts Centre
- Rideau Centre
- Ottawalk
- Action Sandy Hill
- Centretown Citizens Community Association
- Citizens for Safe Cycling
- Cycling Advisory Group
- University of Ottawa
- Local Architecture Conservation Advisory Committee (LACAC)
- Disability Issues Advisory Committee
- Federation of Citizen's Association
- Ottawa Taxi Owners and Brokers
- Ottawa Board of Trade
- Greater Ottawa Truckers
- Emergency Services (Police, Fire and Ambulance)

Three meetings of TAC and two meetings of the PAC were held during the current study, with the last meeting being a joint meeting.

In addition to the TAC and PAC, several focus group meetings were held with significant individual stakeholders in order to explore specific issues in greater detail or to make presentations to the groups at their request. These included the following:

- National Capital Commission
- Department of National Defence and Public Works and Government Service Canada
- LACAC
- Cycling Community
- Lisgar Collegiate
- Disabilities Issues Advisory Committee

A Utilities Coordinating Committee (UCC) was also formed to initiate discussions concerning the project in preparation for relocations required prior to construction. The following utility companies participated in the UCC:

- Enbridge Consumers Gas
- Bell Canada
- Rogers Communications
- Ottawa Hydro
- Ontario Hydro
- Region of Ottawa-Carleton - Environmental Projects Branch (Watermains)
- City of Ottawa - Sewers

A Public Information Centre (PIC) was also held during the current study to notify the public of the recommended alternatives for the project and to solicit input. The PIC was held on May 16, 2000 in Jean Pigott Hall of the Regional Headquarters building. Notification of the PIC was carried out through distribution of flyers to 10,500 businesses and residences in the area bordered by Somerset St., King Edward Ave., Bronson St. and Rideau/Wellington Streets. In addition, advertisements were placed in the community newspapers Alta Vista News, Glebe and Ottawa South News and L'Express. Furthermore, e-mail notices of the PIC were sent to all staff in Regional Headquarters plus to representatives of the Department of National Defence, Drill Hall, Ottawa Courthouse and Lisgar Collegiate High School.

A summary of statistics for the PIC and comments received is provided in Annex E.

In addition to the PIC, a Public Hearing for the project, as required by Sections 297 and 300 of the *Ontario Municipal Act*, is scheduled for 06 September 2000, coincident with review of this report. Advertising for this Public Hearing is to be carried out for four weeks in the Ottawa Citizen, Ottawa Sun and Le Droit in accordance with Regional policy.

PREPARATION OF ENVIRONMENTAL STUDY REPORT

The Environmental Study Report (ESR) will be finalized following approval of the recommendations contained in this report. It will then be filed for a 30 day public review period as required by applicable legislation.

The report will document the process followed in determining and evaluating various alternatives and selection of the preferred alternative.

TRAFFIC MANAGEMENT DURING CONSTRUCTION

It is proposed to implement a traffic management plan during the construction operations to minimize impact on users, while maintaining access to abutting properties and developments. Details of the traffic management will be developed as part of the detailed design of the project.

It is proposed that the construction operations be undertaken in stages to maintain a minimum of two lanes of traffic and one sidewalk at all times.

Complete closure of the bridge or provision of four lanes during construction operations are not considered viable options.

REGIONAL CYCLING ADVISORY GROUP COMMENTS

Regional Cycling Advisory Group and other cycling groups were important contributors to the project as members of the Public Advisory Committee. A presentation was also made to review alternatives being considered and to receive their input during early stages of the study.

OTTAWA-CARLETON CENTRE ACCESS

The Project Team has been advised that Transition Board is considering the possibility of relocating the main entrance to the Regional Headquarters building from Lisgar Street to Laurier Avenue. This project would be impacted if this relocation was to proceed. No details are available at this time. An update will be provided during presentation of this report to Transportation Committee.

PROPOSED SCHEDULE

The target date for the start of construction operations relating to this project is early August 2001, immediately following completion of the Francophone games. The construction activities are to be coordinated with Phase 2 of Laurier Avenue Reconstruction - Nicholas Street to Charlotte Street project and with other significant projects in the Core Area.

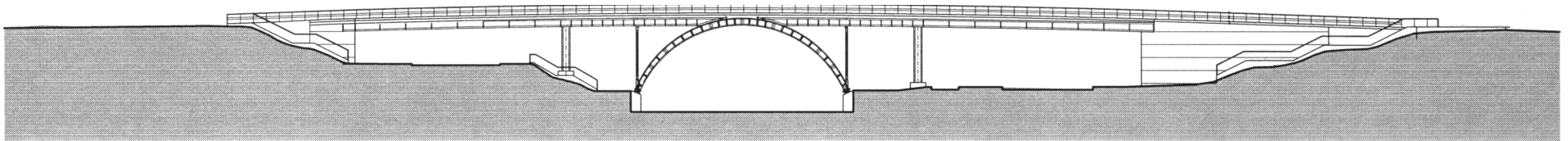
Relocation of the gas main and rehabilitation/relocation of the watermain are proposed to be undertaken prior to the start of construction operations relating to main project.

FUNDING

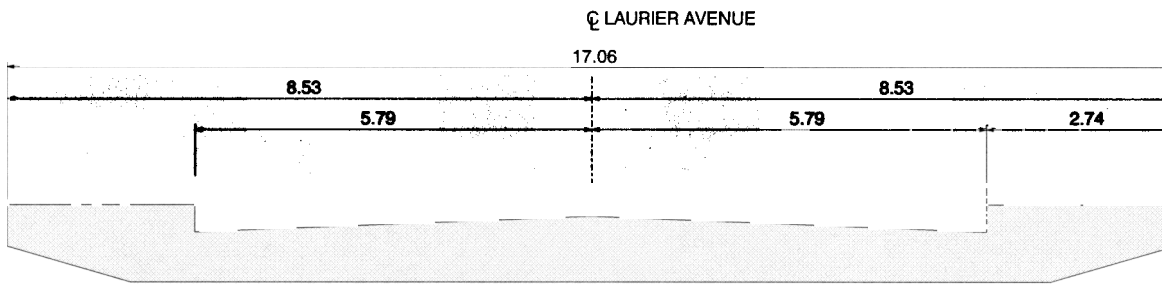
The Baseline Budget for this project is 19.5 million dollars including works carried out since 1990. This amount is exclusive of related water main works which will be funded from the water main rehabilitation account. A request for funding above and beyond that already approved by Council and provided by the Federal Government as part of the Bridge Transfer Agreement will be made in the 2001 Capital Budget.

*Approved by
Jim Miller, P.Eng.*

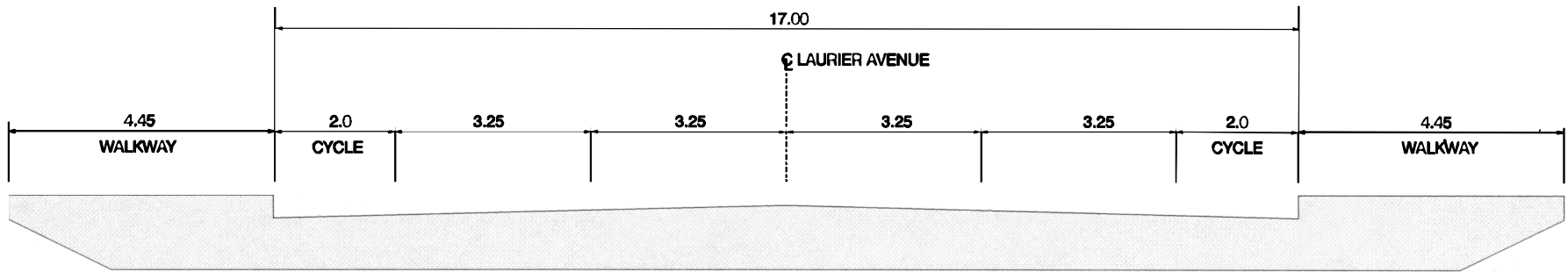
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SOUTH ELEVATION



**EXISTING STRUCTURE
STRUCTURE EXISTANTE**



**ALTERNATIVE A - EXCLUSIVE CYCLE LANE
ALTERNATIF A - VOIE CYCLABLE SEULEMENT**

FIGURE 1 - ANNEX B



**LAURIER BRIDGE REHABILITATION
ENVIRONMENTAL STUDY REPORT**

MRC
McCORMICK BANKIN
CORPORATION

ANNEX C

PLATE NO.
1

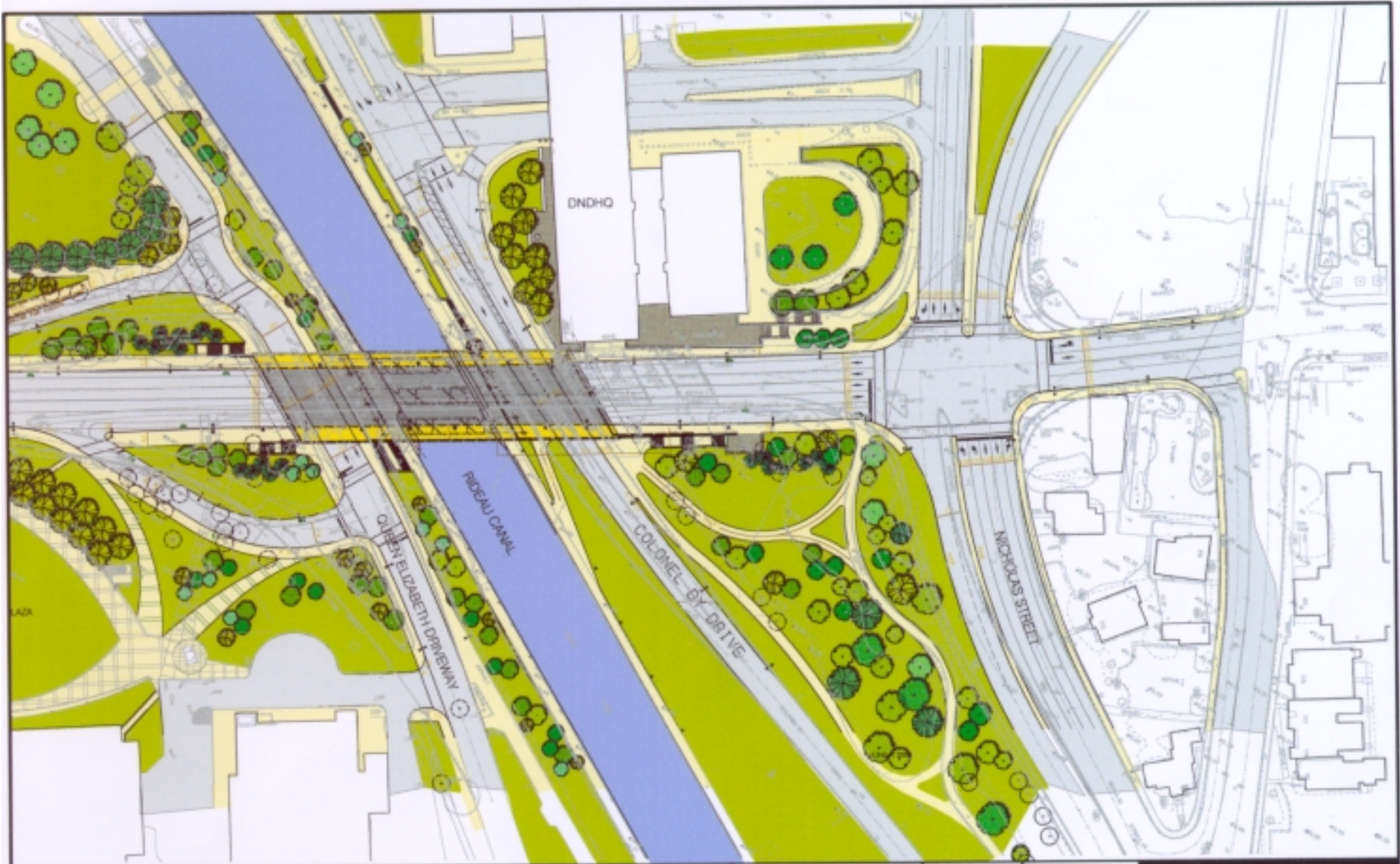
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Date	Date

Date: JUNE 27, 2000

Scale: N.T.S.

ENVIRONMENT AND TRANSPORTATION DEPARTMENT



**LAURIER BRIDGE REHABILITATION
ENVIRONMENTAL STUDY REPORT**

MRC

MCCORMICK BANER
CORPORATION

ANNEX C

PLATE NO.

2



Ottawa-Carleton

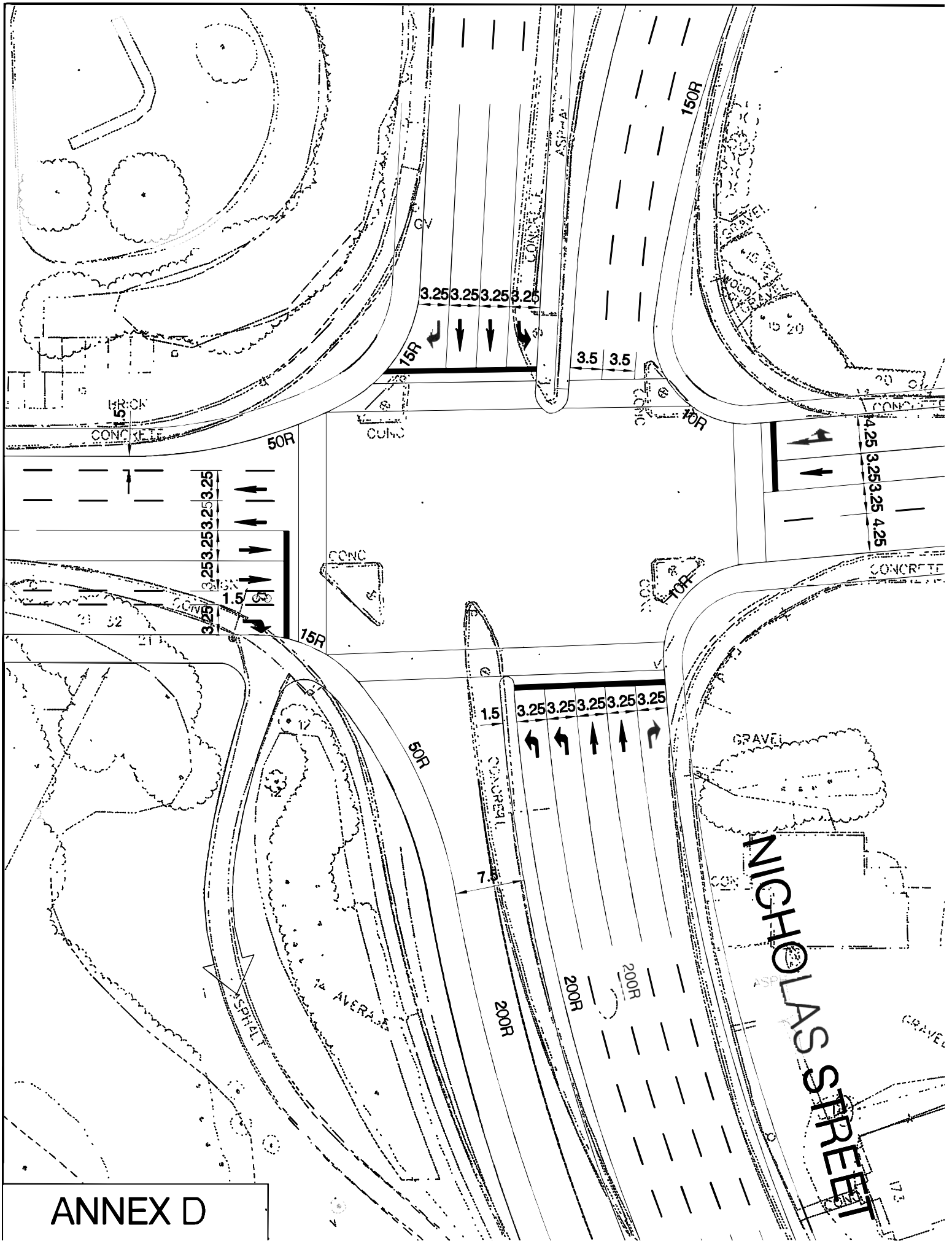
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Date: APR 27, 2000

Scale: N.T.S.

ENVIRONMENT AND TRANSPORTATION DEPARTMENT



NICHOLAS STREET

ANNEX D

1. INTRODUCTION

This report summarizes the comments and concerns expressed by the public during the public information centre (PIC).

The PIC was held to:

- Provide you with the opportunity to review and comment on all aspects of the study including:
 - the pedestrian and cyclist linkages
 - the alternative cross-sections and intersection configurations considered in this study
 - the preferred bridge alternative
- Present the next steps
- Receive your comments and concerns regarding any aspect of this project

2. TIME AND LOCATION

The PIC was held in an informal “open house” format with members of the Study Team available to discuss the study and the displays on a one-to-one basis. The PIC was held at the following time and location

Ottawa-Carleton Centre, Cartier Square, 111 Lisgar Street – Rotunda
 Tuesday, May 16 2000
 4:00 p.m. to 9:00 p.m.

3. ATTENDANCE

Registration sheets were placed at the entrance to the PIC. Thirty-seven of the attendees registered. The estimated attendance was forty-five.

4. STUDY TEAM REPRESENTATIVES

The following members of the Study Team were available at the PIC to discuss the study with the Public:

Virendra Sahni	Region of Ottawa-Carleton
Bruce Mason	Region of Ottawa-Carleton
Tony Wing	McCormick Rankin Corporation
Marie Carter	McCormick Rankin Corporation
Sylvain Montminy	McCormick Rankin Corporation

5. METHOD OF ADVERTISING

Bilingual brochures advertising the PIC were sent to all Regional HQ staff, the Courthouse building, the Drill Hall, Lisgar Collegiate, NDHQ, the University of Ottawa, and 10,500 homes between the following roads:

- Somerset between King Edward and Bronson
- King Edward between Wellington/Rideau and Somerset
- Bronson between Wellington/Rideau and Somerset
- Rideau/Wellington between King Edward and Bronson

In addition, notices were placed in the following newspapers:

- L'Express on May 11th (Ward 12)
- Alta Vista News on May 11th (Ward 18)
- Glebe and Ottawa South on May 11th (Ward 17)

A copy of the published notice and brochure is contained in Appendix A.

6. MATERIAL AVAILABLE FOR PUBLIC REVIEW

Display panels were placed around the room and a PowerPoint presentation was left running. The PowerPoint presentation provided an explanation of the history of the bridge and the background of the study. The panels showed the intersection alternatives considered for the Nicholas/Laurier intersection, the cross-sections on the bridge considered and the alternative bridge configurations and materials. In addition, the comparative analyses of the alternatives were provided in table format.

Comment sheets were available for the public to provide written input to the study.

7. SUMMARY OF WRITTEN COMMENTS

The members of the public were encouraged to fill out comment sheets to express their views. Thirteen comments sheets were received at the PIC.

The following is a summary of the comments:

- The bridge need not be widened, only need one lane per direction to handle off-peak traffic.
- NDHQ and employees must be actively involved in the planning of the walking network.
- Ensure that pedestrian risks are not increased by widening the bridge.
- Nicholas/Laurier intersection should have medians or islands as on Elgin Street.
- Concrete piers preferred.
- Approve of priority to pedestrians and cyclists and improvements that discourage jaywalking.
- Support proposed options re lane designations and design.
- Preferred alternative is best.
- Opening views under the bridge is good.
- Suggest widening pathway to 4.5 m.

- Prefer concrete piers, cross bracing intrusive and industrial looking.
- Prefer option “C” that maintains the columns in the middle of the street.
- Prefer columns to be steel.
- Guard rail should be similar to the historical one.
- Original heritage lights should be restored.
- Concrete used should have rugged look similar to the stone in the canal guard rail.
- Use steel under bridge.
- Extend pedestrian railings on west approach to prevent short cutting down the embankment.
- Provide decorative relief to abutment and wing walls.
- Provide concrete strips at pile caps in canal for winter access for skating.
- Light underside of arches for boats and skating.
- Provide lighting on approach pathways.
- Preference for steel columns.
- Concern that once Laurier Bridge has been widened, the designated uses of the bridge will be redesignated to vehicular only, making a six-lane bridge.
- Never sacrifice bicycle lanes and pedestrian walks for extra vehicles.
- Impact of a six lane bridge on the neighbourhood would be disastrous and unacceptable.
- Concrete piers aesthetically pleasing and structurally safer.

8. CONCLUSION/SUMMARY

The PIC resulted in a low turnout from the local residents, however, the local employees did show a level of interest which resulted in the comments received. Generally, the public was in favour of the preferred alternative.