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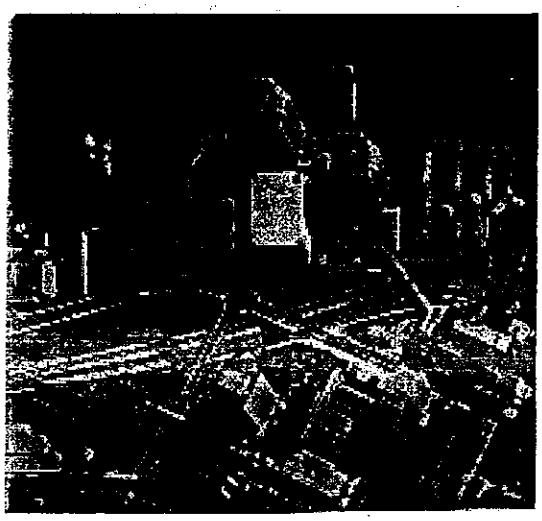
Halifax Regional Municipality

Cogswell Street Interchange Study

Vaughan Engineering Project No. 20.3180



March 30, 2001

Prepared for Halifax Regional Municipality
by ***Vaughan Engineering***
in association with
ATi Consulting Corporation
Atlantic Road & Traffic Management

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Executive Summary

- **Introduction** - The genesis of this study arose from the perception in many quarters that the Cogswell Street Interchange is outmoded. Advocates of replacing the interchange believe it is a vestige of an inappropriate concept, that it is unattractive, and that it occupies a large land area that could, at least in part, be freed up for development. With respect to the last point, furthermore, advocates of removal have suggested that it should be possible cover the cost of replacement through sale of the resulting surplus land, and taxes derived from its development. Currently, some argue further that the interchange is due for renewal and removal of its overpasses, retaining walls, and asphalt is a bolder, long-term solution.

- **Functional Engineering Design** - The two key evaluation criteria for this study are roadway geometry and traffic level of service. Level of service is affected by the number of available lanes and turning movements, the use of traffic signals, and various other factors. Level of service relates to roadway performance in accommodating the flow of traffic. Geometry refers to the curvature of roadways and their grade or slope. Engineers design roads to accepted geometric standards set by the Traffic Association of Canada (TAC), as well as provincial and municipal standards. Curves that are too tight for the planned speed limits, intersections that meet at awkward angles, or excessive slopes will compromise the safety of the facility.

The Consulting Team developed ten concepts for assessment. Plans in **Appendix B** portray all ten. These are variations of the following four basic concepts:

- **Concept 1**: Single Arterial
- **Concept 2**: Parallel Arterial Streets
- **Concept 3**: One-way pair system
- **Concept 4**: Single Intersection.

Designers sought to extend of Cogswell Street directly to Upper Water Street with at grade connections to the north-south streets.

A resulting vertical slope on Cogswell Street of 11 to 12 per cent or more, however, exceeds accepted standards, Given the Arterial classification of Cogswell Street, the Consulting Team considered this grade unacceptable. To develop feasible alternatives further, the study process included the following steps:

- The key concepts were modified to achieve more reasonable vertical slopes. **Concepts 1(b), 2b,** and **3(b)**, included ideas to offset intersections and create service roadways to deal with the slopes.

- **Concept 2(c)** was developed following some preliminary traffic analysis that identified key traffic movements to be accommodated. It is similar to **Concept 1(b)** with the addition of a connection between the sections of Upper Water Street.

- The one-way pair alternatives (**3(a)** and **3(b)**) were first conceived with Barrington Street one-way inbound and Hollis Street one-way outbound. This was considered contrary to the goal of the Downtown Barrington Strategy to maintain Barrington as a two-way street. **Concept 3(c)**, therefore, was developed to connect the one-way system to the Hollis Street/Lower Water Street pair.

- **Concept 4** provides one main intersection connecting all of the roadways in the Study Area.

The Consulting Team selected four feasible alternatives for further traffic analysis. **Figures 2.1, 2.2, 2.3,** and **2.4** show these alternatives, identified, respectively, as **Concepts 1(b), 2(c), 3(c)** , and **4**.

- **Performance Analysis** - Performance Analysis involved establishing baseline 2000 peak hour volumes for existing traffic movements on the ramps, intersections, and streets of the area. Existing traffic volumes were redistributed to the four street and intersection concepts described in **Section 2.3.2**. Synchro 5.0/SimTraffic 5.0 computer models were used to evaluate each concept. The HRM QRSII transportation planning model was used to determine potential traffic volume growth to 2026. The analysis concluded that there are two movements that are key to providing an acceptable level of service:

  1. Northbound left turns from Cogswell
  2. Southbound traffic to Hollis Street.

  Concept 3(c), the one-way pair, did not provide a satisfactory level of performance because several heavy traffic movements were forced to follow 'unnatural' routes through the area. **Concept 4** offered the simplicity of just one intersection; however, it requires that both 'problem' movements mentioned make left turns through the intersection.

  Concepts 1(b) and **2(c)** involve similar direct connections between the four-lane section of Barrington Street and the Hollis/Water one-way pair. **Concept 2(c)** performed marginally better than **1(b)**. In addition, **Concept 2(c)** provides better property access and more suitable land parcels for development. Projections to 2026 indicate the **Concept 2(c)** intersection system should provide good to acceptable levels of performance in the future for all major traffic movements.

- **Preferred Concept** - All of the concepts explored in this study will transform the Study Area. The objective of the study was to determine whether or not the interchange can be replaced with an at-grade facility operating at an acceptable level of service for the current and horizon year traffic conditions. **Concept 2(c)** achieves this objective. The level of service provided is consistent with what can be expected in an urban environment.

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Figure 2-2 shows the preferred concept. The parallel streets proposed will perform different functions. The upper or westerly street is a proposed five-lane arterial. The lower or easterly street is a proposed two-lane collector. Cogswell Street intersects the Arterial at a 'T' intersection. Barrington Street (from the CBD) intersects both the Arterial and the Collector.

Replacement of the interchange is intended to affect abutting land use positively. It should enhance the access to existing land uses. As important, the project is intended to provide the opportunity to develop new, complementary land uses within the Study Area. In total, **Concept 2(c)** will provide roughly 5.8 acres of developable land with minimal impact on property not currently occupied by transportation infrastructure and manageable effects on existing abutting land uses. The estimated construction cost of **Concept 2(c)** is $9.1 million, including demolition of the existing structures and construction of new infrastructure. The estimate does not include taxes and financing. Assumptions underlying this estimate are provided in the report.

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1 Introduction

In July 2000, Halifax Regional Municipality (HRM) commissioned Vaughan Engineering Limited to study the Cogswell Street Interchange. The following report documents the study. It includes a discussion of design alternatives, traffic impacts and planning issues. The purpose of the study was to examine the technical feasibility of replacing the Cogswell Street Interchange. Specifically, HRM asked Vaughan and its consulting partners to address the question: Can essential traffic and roadway services be provided with an at-grade road network?

External groups provided advice as the study proceeded. While many people have an interest in the redevelopment of the area, key groups were contacted to help shape the direction of the study and provide opinion. These included Downtown Halifax Business Commission, Executive Resources Inc., and HRM Tourism, Culture and Heritage.

1.1 Background

The Cogswell Street Interchange has a unique place in the development of the Halifax transportation network. It is a major component of the Barrington Street arterial that joins the container terminal and Downtown Halifax to the Macdonald and MacKay Bridges, and the Fairview Overpass. The City of Halifax, however, meant it to be the start of Harbour Drive, which the City of Halifax once intended to join the south end container terminal to Barrington Street through the downtown. Today it sits alone at the edge of the historic downtown grid because of a celebrated battle to stop Harbour Drive and preserve Historic Properties won by citizen activists in the early 1970s.

Despite the failure to develop all of Harbour Drive, Cogswell Street Interchange has filled an important role. It sorts traffic using Barrington, Hollis and Water Streets in the Downtown to Barrington North, Upper Water Street, Cogswell, and Cornwallis. It performs well in this function.

Many citizens continue to feel, nonetheless, that the interchange is out of place. Its concrete ramps and retaining walls are out of character with traditional downtown streetscapes. The interchange is occupying valuable land that could be more effectively

developed to augment the downtown and increase the municipal tax base. It creates a barrier between the Central Business District and the Gottingen Street Commercial Area, which was once an important complement. It is now also obstructing important waterfront developments such as the Sheraton Hotel, the two Purdys Towers, and the new Casino.

Advocates of change believe that HRM should remove the interchange to create a more benign entry to the downtown and improve the pedestrian environment, freeing up land for development. Previous studies by consultants and DalTech students have examined possible approaches. The Consulting Team reviewed these earlier examinations and expanded on them within this study.

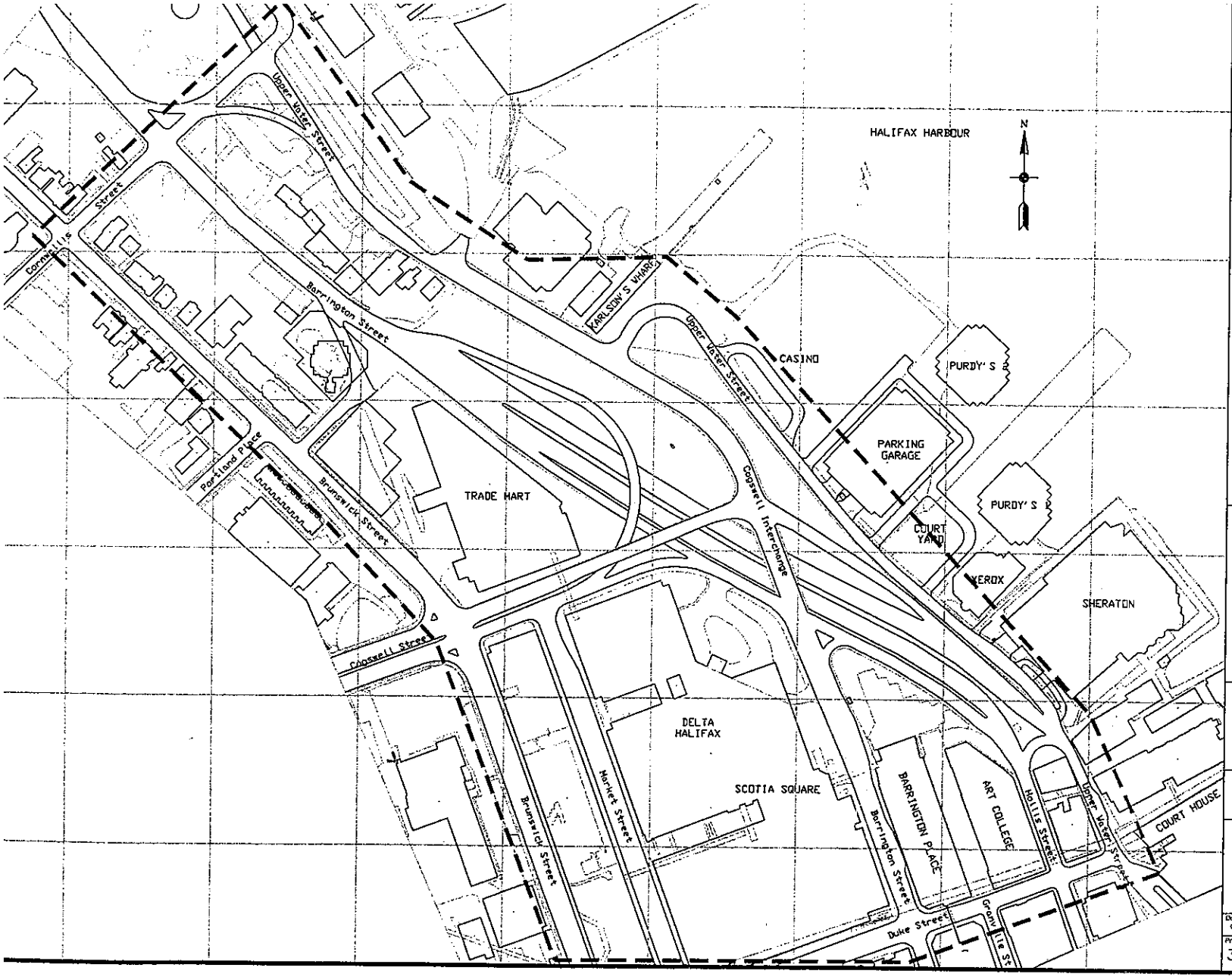
1.2 Objectives of the Study

The genesis of this study arose from the perception in many quarters that the Cogswell Street Interchange is outmoded. Advocates of replacing the interchange believe it is a vestige of an inappropriate concept, that it is unattractive, and that it occupies a large land area that could, at least in part, be freed up for development. With respect to the last point, furthermore, advocates of removal have suggested that it should be possible cover the cost of replacement through sale of the resulting surplus land, and taxes derived from its development. Currently, some argue further that the interchange is due for renewal and removal of its overpasses, retaining walls, and asphalt is a bolder, long-term solution.

Before HRM can explore the development potential of the site, nevertheless, the Department of Public Works and Transportation needs to be confident that alternative roadways can provide a satisfactory level of service. This means that new roadways can manage traffic without undue congestion and that drivers can make traffic movements safely. Determining the technical feasibility of proposed construction is also important. This involved answering the following questions:

- Can roadways be constructed to accepted engineering standards for curvature and slope?
- What potential pedestrian connections can be accommodated across the area?
- What are the consequences for other public infrastructure (i.e., water and sewer lines, electrical conduits, etc.)?
- How much land can be made available for development?

The Study Area encompasses the road network infrastructure generally within the area bounded by Cornwallis Street, Upper Water Street, Duke Street, and Brunswick Street (**Figure 1-1**). The study evaluated potential roadway changes in this area only. The Consulting Team then assessed potential alternatives in the context of current traffic service and projected traffic needs using intersection simulation software.



Legend

Study Area

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HALIFAX REGIONAL MUNICIPALITY

COGSWELL STREET INTERCHANGE STUDY

STUDY AREA

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FIGURE 1.1

Each alternative was also assessed against other quantitative and qualitative criteria. Criteria considered in each instance include:

- The land area made available,
- Configuration and position of land parcels created,
- Grades of all roadways created,
- Suitability for pedestrian traffic,
- Suitability for transit facilities, and
- Aesthetic considerations.

The preferred alternative was also costed in consideration of the potential costs to rehabilitate the existing Cogswell facility.

1.3 Methodology

The study team assembled information from previous studies as well as GIS mapping and historical traffic counts from HRM. In addition, HRM conducted AM and PM traffic counts for the following intersections:

- Duke and Barrington,
- Duke and Hollis,
- Duke and Lower Water,
- Upper Water and Barrington North/Service Road,
- Barrington and Cogswell Ramps South,
- Barrington and Cogswell Ramps North,
- Cogswell Eastbound Split and Barrington Southbound Exit Ramps,
- Cogswell and Brunswick,
- Service Road and Upper Water,
- Upper Water and Cornwallis/DND Exit, and
- Barrington and Cornwallis.

Initially, the Consulting Team developed four basic conceptual designs and used an iterative process to modify and further develop the alternatives. The basic designs were modified to address various constraints including vertical slope, access to properties, and traffic patterns. In total the Consulting Team created ten variations included in **Appendix B**. Of these ten, four were considered to meet the geometric criteria and were further evaluated with respect to traffic services.

Traffic analysis redistributed the traffic to the alternative road networks in the same pattern currently experienced. This may be considered a limitation of the analysis since the reconfiguration of the area will influence drivers' choices causing different traffic patterns. The methodology focuses on the designated Study Area. It is further discussed in **Chapter 3**.

The concepts were also evaluated by the team and the external groups with respect to land development potential. At this level of the study, only a review of the parcel sizes, shapes and grades were undertaken. As well, the impact of the proposed roadways on the land use, with respect to access, aesthetics, and on-street parking were considered.

Following traffic analysis, a preferred concept was established. This concept was than evaluated with respect to cost and impacts to municipal services.

2 Functional Engineering Design

As noted, the two key evaluation criteria for this study are roadway geometry and traffic level of service. Level of service is affected by the number of available lanes and turning movements, the use of traffic signals, and various other factors. Level of service relates to roadway performance in accommodating the flow of traffic. Geometry refers to the curvature of roadways and their grade or slope. Engineers design roads to accepted geometric standards set by the Traffic Association of Canada (TAC), as well as provincial and municipal standards. Curves that are too tight for the planned speed limits, intersections that meet at awkward angles, or excessive slopes will compromise the safety of the facility.

2.1 Design Issues

The Consulting Team identified issues influencing the creation of an at-grade road network through review of previous projects and reports, as well as through meetings with external groups. Key issues include access to the waterfront properties, pedestrian circulation, connection to other commercial areas (Barrington Street and Gottingen Street), and the creation of land parcels suitable for development. In addition, the desired function of the new road network was established based on the current function of the interchange.

2.1.1 The Existing Interchange

The Cogswell Street Interchange consists of the elevated intersection of Cogswell and Barrington South over an uninterrupted section of four-lane arterial roadway. As well, a directional ramp swings over Barrington Street to connect traffic eastbound on Cogswell to Barrington northbound. The primary design consideration was to eliminate these various structures.

To satisfy the intent of the study, the Consulting Team decided that the at grade network should provide all traffic movements currently offered by the interchange. For example, initial discussions included the possibility of ending Cogswell Street at Market Street. This would have circumvented the challenge of dealing with the slope of Cogswell but

would have eliminated an important connection available through the existing interchange.

2.1.2 Historic and Existing Land Use

At the outset of the design process, the Consulting Team recognized that the return to a downtown grid network typical of historic Halifax was desirable. The team reviewed historical plans and photos to become familiar with the Study Area as it was before the interchange. Team members also looked at three models developed by architecture students at Dalhousie University, which involved extensive reconstruction of the surrounding lands as well as roadway changes.

We recognized in practice, however, that developments in the Study Area since the 1960's such as Scotia Square, the Trade Mart, and major buildings east of the waterfront limit possibilities. Consideration of widespread redevelopment is not within the Terms of Reference for this study. All design concepts, therefore, assume that existing land uses will not be modified. We also avoided substantial infringement of their properties.

2.1.3 Waterfront Properties

The Purdys Wharf complex, the Sheraton, and the Casino Nova Scotia, which are on the waterfront next to the Cogswell Interchange, were all built since 1980. They were not considered when the interchange was built in the early 1970s. These important, large-scale developments are consequently difficult to access from the interchange. Retaining walls 15 to 20 feet high obscure them from view and create a feeling of detachment from the rest of the downtown. Removal of these walls and improved land access were, therefore key design considerations.

2.1.4 Barrington Street South of the Interchange

The November 1998 report "Downtown Barrington - A Strategy for the Rejuvenation of Barrington Street" developed a vision for Barrington Street within the Central Business District (CBD), which begins south of the interchange. Goals identified in the strategy include encouraging pedestrian activity and reducing traffic volumes and speeds. The document also suggests traffic calming techniques such as providing on-street parking, allowing left turns, and reducing transit trips. Ideas for the interchange that direct more traffic to Barrington Street through the CBD are generally incompatible with these goals.

The report suggests that HRM should build a new transfer facility in the area beside Scotia Square. The facility will address concerns with the impact of the large volume of transit buses on the narrow downtown portion of Barrington. The transfer station would collect commuters and distribute them downtown in smaller propane powered buses. In addition, the Consulting Team examined the possibility of allowing only transit vehicles in the section of Barrington Street between Duke Street and the interchange.

2.1.5 Land Development

As a prime consideration in this project is to free up land for development, the Consulting Team sought solutions that created large, accessible parcels within the Study Area. We

also considered the shape of the resulting properties as square or rectangular shapes are more adaptable. Freeing greater area to the south is also advantageous to enhance the relationship between the interchange area and downtown Barrington Street, including Scotia Square.

2.1.6 Pedestrian Circulation

Much of the criticism of the current Cogswell Street interchange revolves around its inhospitability for pedestrians. The new street network should enhance pedestrian flows to the downtown, the waterfront, and Gottingen areas. The removal of grade separations should immediately improve this condition. As well, street alignment, width, intersection spacing, and traffic speeds will influence the safety and comfort level of the pedestrian traffic.

2.2 Design Criteria

Alternative roadway configurations must be designed to satisfy engineering standards developed to ensure safe, efficient operation. Criteria specifying function, speed, and geometry are the key design constraints. Concepts presented following observe standards appropriate to the intended function of the roadways as the primary access/egress point for downtown Halifax.

2.2.1 Roadway Classification

HRM has established a street classification system. The system clearly defines the role of each street in the overall network with respect to traffic service versus land service. The following classifications apply for key routes within the Study Area:

Route	Classification
Bridges to Barrington/Hollis/Lower Water	Arterial
Cunard/North Park/Cogswell	Arterial
Barrington Street south of the Interchange	Collector
Upper Water Street	Local

Each classification reflects the actual and intended use of the streets (i.e., the traffic flow characteristics). The primary function of an Arterial is to facilitate traffic movement. Collector roadways service land as well as traffic needs. The geometric design standards for the streets are established based on the classification.

2.2.2 Speed

The terrain of the area is the primary consideration for the selection of street design speeds. As well, the desired or expected operating speed influences the selection of design speed. The legal posted limit of Barrington Street to the north of Cornwallis is 50 km/hr. The legal limit on Barrington Street in the CBD is 50kmh. Traffic signals, adjacent

land use, and congestion along the route, however, reduce the speed achieved. With a posted speed of 50 kmh, a design speed of 70kmh is desirable. However, given the terrain and a desire to restrict speed to increase pedestrian comfort and safety, a design speed of 60km/hr is probably achievable for the arterials.

2.2.3 Alignment

A key challenge of the study was to deal with the severe vertical slopes typical of east-west streets in downtown Halifax (e.g., Duke Street and Sackville Street). The maximum grade permissible on roadways generally depends on roadway classification, traffic volumes, and anticipated speeds. HRM standards for arterial roadways suggest a maximum vertical slope of 6 per cent. This is consistent with national design standards, although the TAC does consider grades up to 8 to 9 per cent acceptable on arterials. Engineers have developed the standard based on the intended design vehicle for the roadway. Heavy trucks and buses have difficulty climbing grades greater than 6 to 8 per cent. In addition, at steep grades (greater than 6 to 8 per cent) passenger vehicles are likely to slide in poor, slippery road conditions. This is a particular concern in "stop and go" traffic conditions experienced through a series of signalized urban intersections.

Since the grades of the sidewalks will match the grade of the roadway, we also considered manageability for pedestrians. Pedestrians, especially the elderly and the physically challenged, face the same challenges as vehicles on steeper grades. Excessive slopes may, therefore, present dangers, and may discourage some citizens from enjoying the downtown.

In establishing a design grade for the area, the existing 8 per cent grade on Cogswell Street between Gottingen and Brunswick was considered acceptable. Maximum grades of approximately 8 per cent for Cogswell Street are an important constraint to the design given the topography of the area. The criterion also shapes the land parcels created within the Study Area.

2.2.4 Cross section Elements

HRM has established standard design cross sections for various roadway classifications. **Appendix C** includes standard drawings for the Urban Arterial and Collector Streets. These provide a design guide with the recognition that streetscape priorities and provisions for on-street parking may influence the cross-section.

2.2.5 Truck Traffic

In addition to its classification as an arterial, Barrington to Hollis/Lower Water Streets is an HRM designated truck route. This route provides access the South End Container Terminal. Cogswell Street is also a designated truck route. This designation influences the features of the proposed roadways since grades, turning radii, and pavement structures must be designed to accommodate heavy vehicles.

2.3 Concept Designs

The City of Halifax built the Cogswell Interchange in anticipation of Harbour Drive. It has capacity to accommodate existing and projected traffic volumes at a superior level of service. Because it operates at a high level of service, the interchange often appears "empty" when one passes through it. But the level of service provided and the class of infrastructure, is inconsistent with the surrounding road network just as the land use is inconsistent with the downtown core.

2.3.1 Development of Concept Drawings

As previously noted, the Consulting Team developed ten concepts for assessment. Plans in **Appendix B** portray all ten. These are variations of the following four basic concepts:

- **Concept 1**: Single Arterial
- **Concept 2**: Parallel Arterial Streets
- **Concept 3**: One-way pair system
- **Concept 4**: Single Intersection.

Designers sought to extend of Cogswell Street directly to Upper Water Street with at grade connections to the north-south streets. Three plans -- **Concepts 1a, 2a,** and **3a** shown in **Appendix B** -- reflect this ideal.

These concepts, however, illustrate the resulting severe vertical slope on Cogswell Street. The two fixed points in the alignment, the intersection with Market Street and the intersection with Upper Water Street have elevations above sea level of 21 metres and 3 metres respectively. This is an 18 metre (59 foot) drop over a distance of approximately 185 metres (607 feet). This represents a vertical slope of 10 per cent. Furthermore, provision for acceptable intersection designs within the alignment increases this grade to 11 to 12 per cent or steeper, which is unacceptable for an Arterial street. To develop feasible alternatives further, the study process included the following steps:

- The key concepts were modified to achieve more reasonable vertical slopes. Concepts 1(b), 2b, and 3(b), included ideas to offset intersections and create service roadways to deal with the slopes.
- **Concept 2(c)** was developed following some preliminary traffic analysis that identified key traffic movements to be accommodated. It is similar to **Concept 1(b)** with the addition of a connection between the sections of Upper Water Street.
- The one-way pair alternatives (**3(a)** and **3(b)**) were first conceived with Barrington Street one-way inbound and Hollis Street one-way outbound. This was

considered contrary to the goal of the Downtown Barrington Strategy to maintain Barrington as a two-way street. **Concept 3(c)**, therefore, was developed to connect the one-way system to the Hollis Street/Lower Water Street pair.

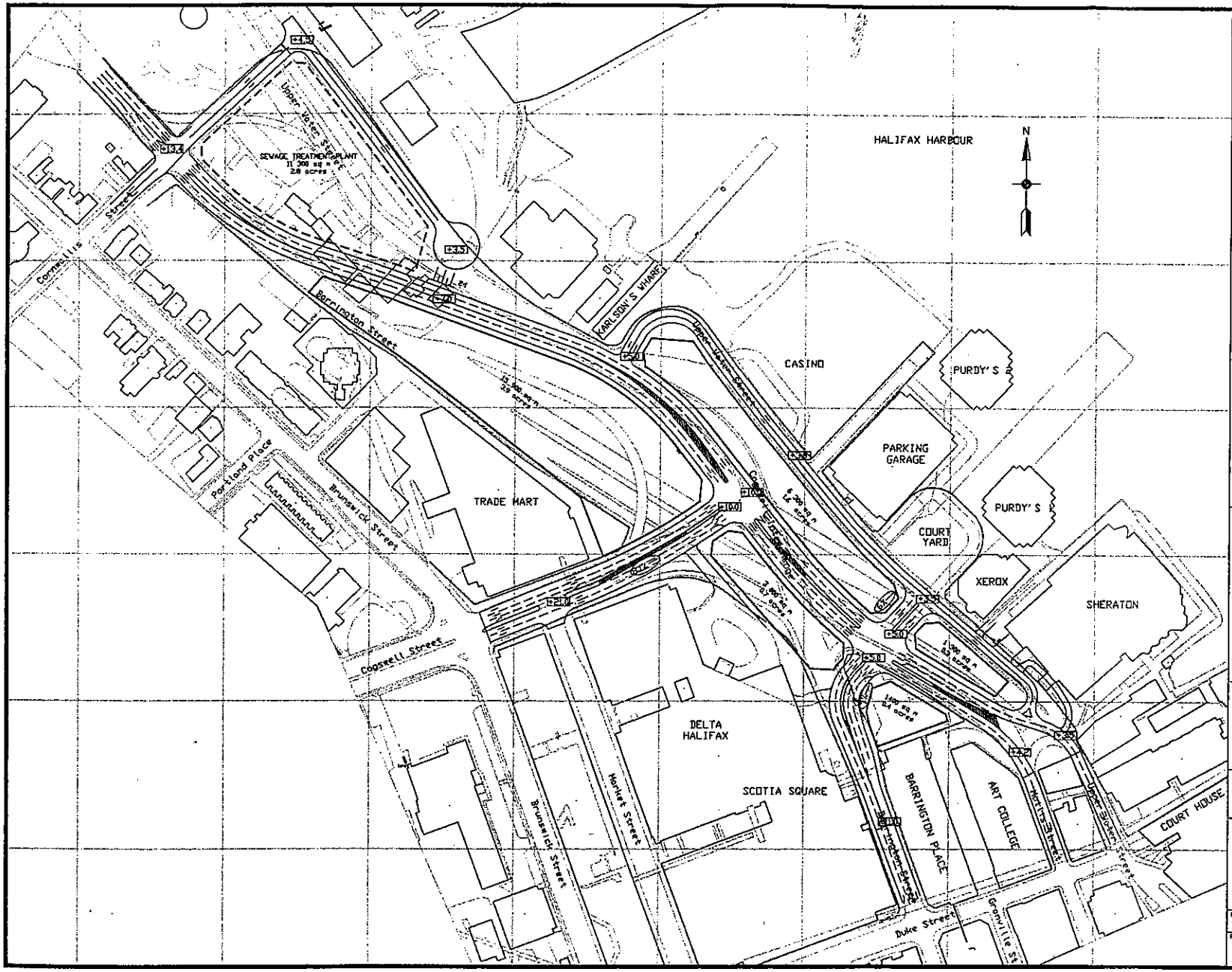
- **Concept 4** provides one main intersection connecting all of the roadways in the Study Area.

The Consulting Team selected four feasible alternatives for further traffic analysis. **Figures 2.1, 2.2, 2.3,** and **2.4** show these alternatives, identified, respectively, as **Concepts 1(b), 2(c), 3(c)** , and **4**. **Table 2-1** provides a summary of the four concepts with respect to the evaluation criteria outlined above.

2.3.2 The Brunswick Street Connection

The study process also explored the feasibility of connecting Barrington Street to Brunswick Street through the Trade Mart area (**Figure 2-5**). The connection should reduce traffic, particularly bypass traffic, in the downtown core. It would restore an option that was available to drivers into the 1980s when Proctor Street was removed in this area. The connection is possible, but only with removal or redevelopment of the existing parking structure and removal of the Trade Mart loading dock area.

If the vertical alignment of Barrington Street to the north of the Trade Mart is kept high, a grade between 7 and 8 per cent is achievable. A five-legged intersection at Cogswell Street is undesirable, but it may be possible to terminate Brunswick Street at Portland Place or end in a cul-de-sac as shown in **Figure 2-5**. Approximately 600 vehicles use Brunswick Street southbound in the AM peak hour. It is likely that most of these vehicles originate from Barrington Street and could use the new connector. As well, the connector could share the heavy left turn movement from Cogswell to Barrington. The design would result in an additional signalized intersection on Barrington Street approximately halfway between the Cornwallis and Cogswell Street intersections. The idea is interesting and may warrant further consideration.



TOTAL ESTIMATED LAND AREAS

	Road Construction	Developable Land	Sewage Treatment Plant
Sq m	25 500	27 900	11 300
Acres	6.3	6.9	2.8

Legend

- +3.5 — Proposed Slope
- +6.5 — Proposed Elevation
- Proposed Edge of Pavement
- Proposed Property Boundary
- Existing HRM Property Boundary (Interchange Area)
- Proposed Sewage Treatment Plant Boundary

CONCEPT ONLY

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HALIFAX REGIONAL MUNICIPALITY

COGSWELL STREET INTERCHANGE STUDY

CONCEPT (1b) SINGLE ARTERIAL

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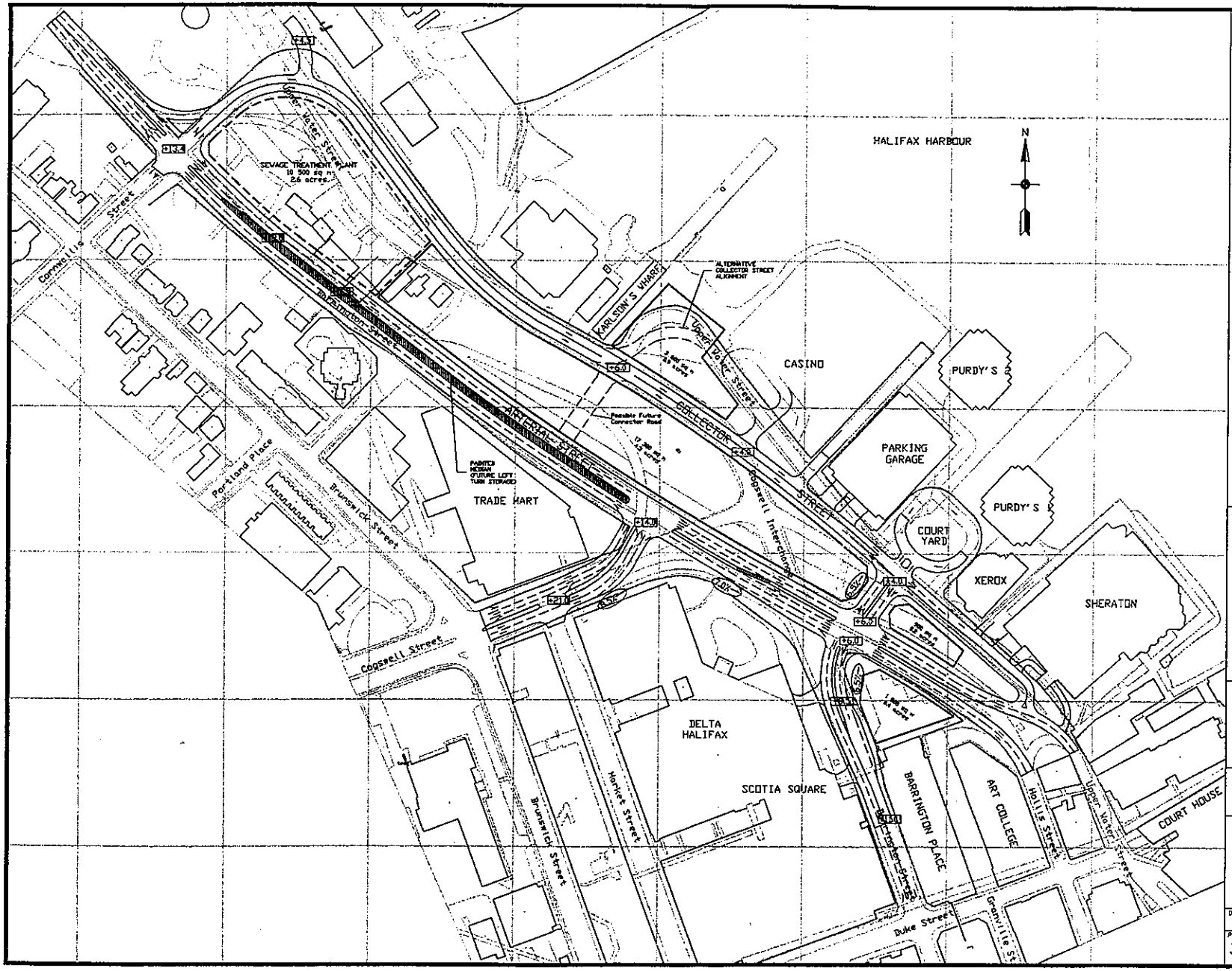
FIGURE 2.1



TOTAL ESTIMATED LAND AREAS

	Road Construction	Developable Land	Sewage Treatment Plant
Sq m	32 700	23 600	10 500
Acres	8.1	5.8	2.6

Legend

- Proposed Slope
- Proposed Elevation
- Proposed Edge of Pavement
- Proposed Property Boundary
- Existing NRM Property Boundary (Interchange Area)
- Proposed Sewage Treatment Plant Boundary

CONCEPT ONLY

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COGSWELL STREET INTERCHANGE STUDY

CONCEPT (2c) PARALLEL ARTERIAL SYSTEM

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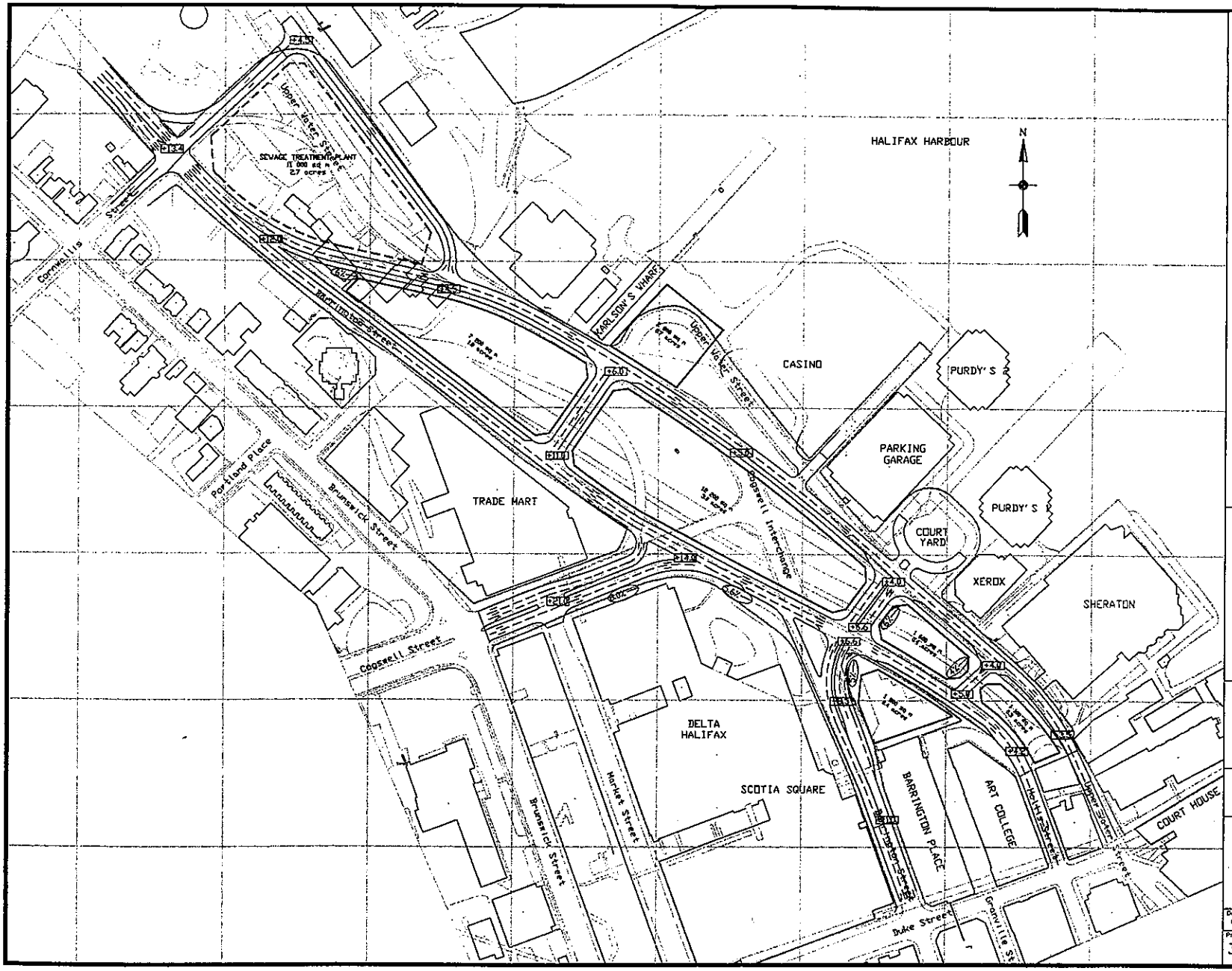
Project No. 3180

FIGURE 2.2



TOTAL ESTIMATED LAND AREAS

	Road Construction	Developable Land	Sewage Treatment Plant
Sq m	25 900	26 700	11 000
Acres	6.4	6.6	2.7

Legend

- (3.32%) Proposed Slope
- +6.5 Proposed Elevation
- Proposed Edge of Pavement
- Proposed Property Boundary
- Existing HRM Property Boundary (Interchange Area)
- Proposed Sewage Treatment Plant Boundary

CONCEPT ONLY

Vaughan Engineering

HALIFAX REGIONAL MUNICIPALITY

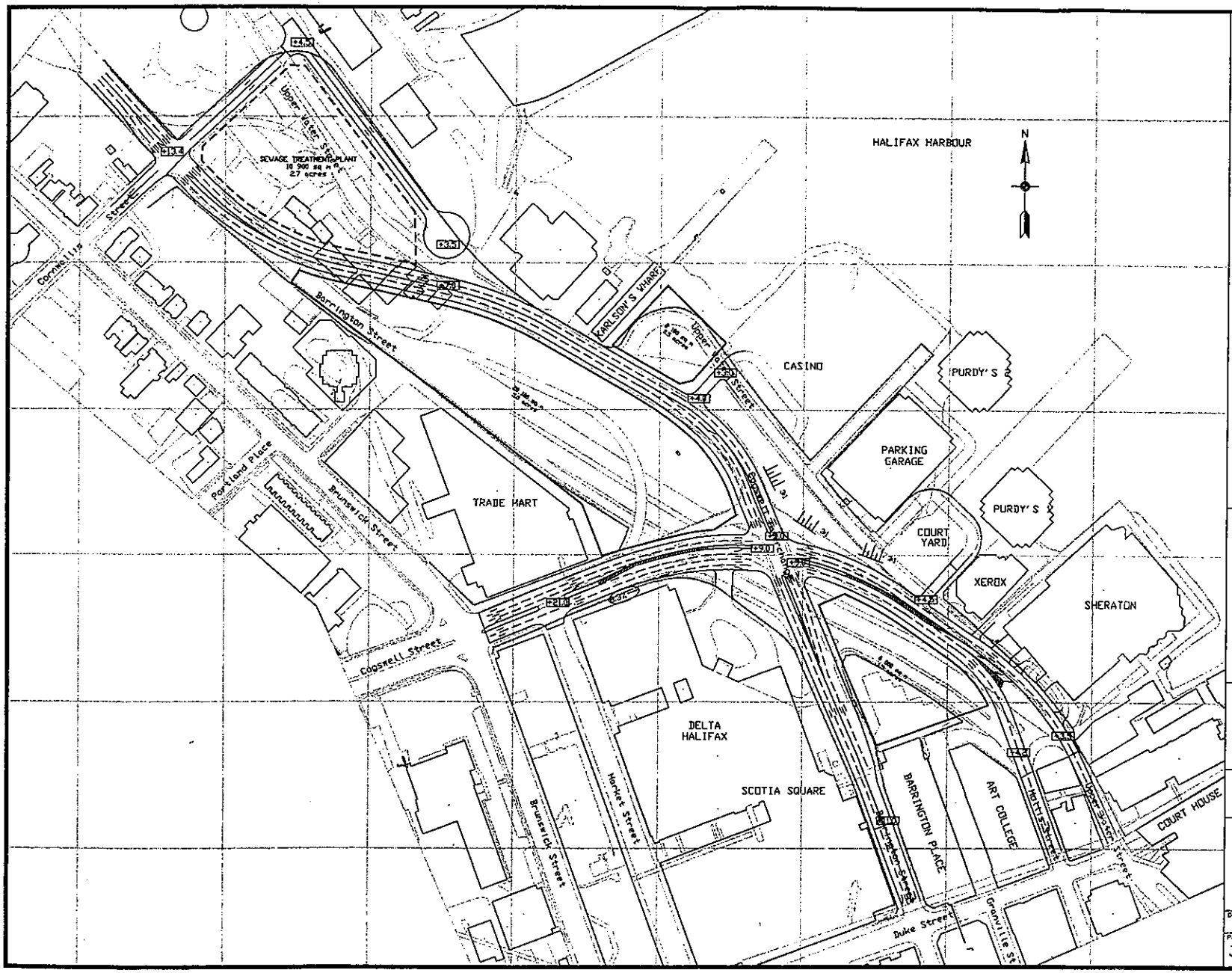
COGSWELL STREET INTERCHANGE STUDY

CONCEPT (3c) ONE WAY PAIR SYSTEM

Date	Scale	Drawn	Checked
01/03/22	1:2500	TG	BL

Project No. 3180

FIGURE 2.3



TOTAL ESTIMATED LAND AREAS

	Road Construction	Developable Land	Sewage Treatment Plant
Sq m	23 800	28 200	10 900
Acres	5.9	7.0	2.7

Legend

- 3.3% — Proposed Slope
- +6.5 — Proposed Elevation
- Proposed Edge of Pavement
- Proposed Property Boundary
- Existing HRM Property Boundary (Interchange Area)
- Proposed Sewage Treatment Plant Boundary

CONCEPT ONLY

Vaughan Engineering

HALIFAX REGIONAL MUNICIPALITY

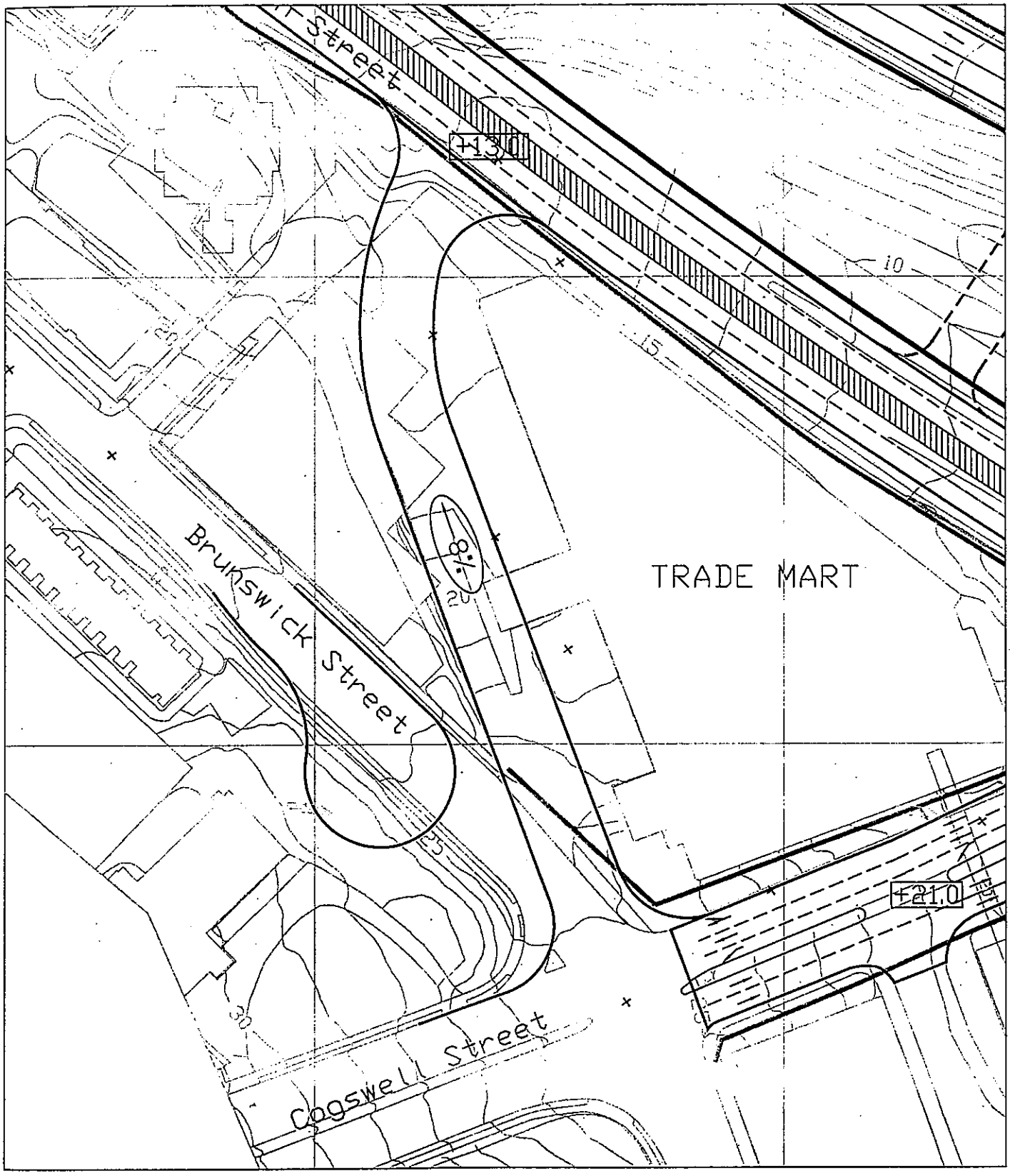
COGSWELL STREET INTERCHANGE STUDY

CONCEPT 4 SINGLE INTERSECTION

Date	Scale	Drawn	Checked
01/03/22	1:2500	TG	BL

Project No. 3180

FIGURE 2.4



COGSWELL STREET INTERCHANGE STUDY
BRUNSWICK STREET CONNECTOR

DATE: 01-01-26

NOT TO SCALE

Vaughan Engineering

FIGURE 2-5

E-Mail: vaughan@mgnet.ca Telephone: (902) 425-3980 Fax Number: (902) 423-7593

Table 2-1: Comparison of Leading Alternatives

Concept	Description	Geometric Features	Key Traffic Impacts	Land Access	Developable Land	Comments
1(b)	SINGLE ARTERIAL					
	- Connects north end of Barrington to Hollis/Lower Water Streets - Recognizes main flow of traffic. - Cogswell Street and Barrington Street T into the Arterial	- Four-lane Arterial - Upper Water Street along waterfront remains in existing location as a service road	- The am operates at an acceptable level of service. - Improvements required to accommodate pm peak traffic	- Service road to the waterfront - Improved access to Sheraton and waterfront properties	- 6.8 Acres - 5 parcels	- Small, awkward parcels of land
2(c)	PARALLEL STREETS					
	- Connects the north end of Barrington to Hollis/Lower Water Street. Recognizes main flow of traffic. - Upper Water Street is a parallel collector street	- Five-lane arterial - Two-lane collector street	- Acceptable level of service for the am and pm peak hour traffic	- Collector street would provide primary access - Improved access to Sheraton and waterfront properties	- 5.8 Acres - 4 parcels	- Alignment of collector is flexible
3(c)	ONE-WAY PAIR SYSTEM					
	- Extension of existing one-way pair Lower Water Street/Hollis Street through the study area - Barrington Street from CBD intersects at 90°	- Two core lanes on each one-way street with third parking or turning lane	- Unsatisfactory level of service for Cogswell left turns to Barrington	- All existing and new access would be via one-way streets	- 6.6 Acres - 6 Parcels	- One-way, narrower streets may be more pedestrian friendly - One-way system is disadvantage to businesses
4	SINGLE INTERSECTION					
	- Connects the north end of Barrington to the south end of Barrington - Connects Cogswell to Lower Water and Hollis Streets	- Intersecting arterials have four core lanes - Skew of intersection is undesirable	- Unsatisfactory level of service for southbound movement to Hollis Street	- Partial service road maintained to the waterfront - New access would be via an arterial	- 7.0 Acres - 3 Parcels	- The large intersection is not pedestrian friendly - Slopes to waterfront properties are undesirable

3 Performance Analysis

The three overpass structures, directional and diamond ramps, and the section of 'free flow' four-lane divided street that comprise the Cogswell Interchange provide a high level of traffic performance. Even under heavy AM and PM peak hour traffic conditions, traffic moves virtually unnoticed on the directional ramps and the four-lane section of Barrington Street.

Performance Analysis involved establishing baseline 2000 peak hour volumes for existing traffic movements on the ramps, intersections, and streets of the area. Existing traffic volumes were redistributed to the four street and intersection concepts described in **Section 2.3.2**. Synchro 5.0/SimTraffic 5.0 computer models were used to evaluate each concept. The HRM QRSII transportation planning model was used to determine potential traffic volume growth to 2026.

3.1 Evaluation of Traffic Volumes for The Existing Interchange

AM and PM peak hour traffic counts were obtained by HRM staff during November 2000. HRM also provided volumes for intersections and ramps within the Study Area, and for intersections designated as the Study Area boundaries. **Figures A-1 and A-2**, respectively, show the AM and PM peak hour volumes for the existing street network. Duke Street intersections with Lower Water, Hollis, and Barrington Streets form the southern boundary of the area. The northern boundary is at the Cornwallis Street intersections with Barrington Street and the DND entrance at Upper Water Street. The western boundary of the Study Area is the Brunswick/Cogswell Street intersection.

3.1.1 Existing Volumes

Barrington Street and the Hollis/Lower Water one-way couplet form the major north-south street connection into and through the CBD. Both AM and PM peak hour volumes on Barrington Street just south of Cornwallis Street are 2350 vehicles per hour (vph). The Hollis/Water one-way pair carries 1800 vph in the AM peak and 1650 vph during the PM peak hour. This north-south traffic moves freely without intersection or land access conflicts in the 500 metre section of four-lane street between Cornwallis Street and the convergence of Hollis and Lower Water Streets just north of Historic Properties.

The following additional observations concerning existing volumes in the Study Area are relevant to the assessment of alternative roadway concepts outlined below:

3. Significant volumes of traffic moving to and from the Purdys Wharf area and Casino Nova Scotia use Upper Water Street.

4. Traffic volumes entering and exiting the DND south entrance at Upper Water Street are low during 'normal' AM and PM peak hours. DND morning and afternoon peaks are at least an hour earlier than street peak hours, so DND traffic and other Study Area traffic tend not to conflict.

5. The lack of a direct connection between the southern part of Barrington Street by Scotia Square and the northern part near Cornwallis Street adds significant volumes to Upper Water Street.

6. No ramp connects Barrington Street southbound to Cogswell Street. Southbound traffic destined for Cogswell or Brunswick Street areas must exit right at Cornwallis Street and use Brunswick Street to the Cogswell/Brunswick intersection.

7. Construction of the new ramp from Barrington Street northbound to the Macdonald Bridge and closure of access to Brunswick Street have shifted traffic patterns in the Study Area. Trips from the hospitals, universities, and other areas south of Cogswell Street and Quinpool Road, that formerly used the Brunswick Street bridge access, now use the Cogswell-Barrington directional ramp to reach Barrington Street northbound, just south of Cornwallis Street. Although AM peak volumes (250 vph) are moderate, the PM peak volume (760 vph) is significant.

3.1.2 Intersection Performance Evaluation Methodology

The Consulting Team used Synchro 5.0 and SimTraffic 5.0 to evaluate the performance of existing and 'concept' intersections and street networks. Synchro 5.0 provides the usual volume/capacity ratio, delay, and level of service (LOS) based on delay. LOS criteria are stated in terms of average control delay per vehicle, which includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Level of service is graded from A through F. LOS 'A' describes an intersection approach with a very low control delay of up to ten seconds per vehicle. On the other hand, LOS 'F' describes an intersection with control delay greater than 80 seconds (at a signalized intersection), which is considered unacceptable by most drivers. **Table 3-1** summarizes conditions expected for various control delay values.

Table 3-1: **Control Delay Level of Service (LOS) Criteria for Intersections**

LOS	Signalized Intersections Control Delay (seconds per vehicle)	LOS Description	Two Way Stop Controlled (TWSC) Intersections - Control Delay (seconds per vehicle)
A	less than 10.0	Very low delay; most vehicles do not stop (Excellent)	less than 10.0
B	between 10.0 and 20.0	Higher delay; more vehicles stop (Very Good)	between 10.0 and 15.0
C	between 20.0 and 35.0	Higher level of congestion; number of vehicles stopping is significant, although many still pass through intersection without stopping (Good)	between 15.0 and 25.0
D	between 35.0 and 55.0	Congestion becomes noticeable; vehicles must sometimes wait through more than one red light; many vehicles stop (Satisfactory)	between 25.0 and 35.0
E	between 55.0 and 80.0	Vehicles must often wait through more than one red light; considered by many agencies to be the limit of acceptable delay	between 35.0 and 50.0
F	greater than 80.0	This level is considered unacceptable to most drivers; occurs when arrival flow rates exceed the capacity of the intersection (Unacceptable)	greater than 50.0

Table 3-2: **Description of Intersection Capacity Utilization Levels of Service**

LOS	Intersection Capacity Utilization (ICU)	LOS Description
A	less than 0.60	The intersection has no congestion. All traffic should be served on the first cycle. (Excellent)
B	between 0.60 and 0.70	The intersection has very little congestion. Almost all traffic will be served on the first cycle. (Very Good)
C	between 0.70 and 0.80	The intersection has no major congestion. Most traffic should be served on the first cycle. Traffic fluctuations, accidents, and lane closures may cause some congestion. (Good)
D	between 0.80 and 0.90	The intersection normally has no congestion. The majority of traffic should be served on the first cycle. Traffic fluctuations, accidents, and lane closures can cause significant congestion. (Satisfactory)
E	between 0.90 and 1.00	The intersection is right on the verge of congested conditions. Many vehicles are not served on the first cycle. Minor traffic fluctuations, accidents, and lane closures can cause significant congestion. (Acceptable)
F	between 1.00 and 1.10	The intersection is over capacity and likely experiences congestion periods of 15 to 60 minutes per day. Residual queues at the end of green are common. Minor traffic fluctuations, accidents, and lane closures can cause increased congestion. (Unacceptable)
G	between 1.10 and 1.20	The intersection is 10 per cent to 20 per cent over capacity and likely experiences congestion periods of 60 to 120 minutes per day. Long queues are common. Motorists may be choosing alternate routes, if they exist, or making fewer trips during the peak hour. (Unacceptable)
H	greater than 1.20	The intersection is 20 per cent over capacity and could experience congestion periods of over 120 minutes per day. Long queues are common. Motorists may be choosing alternate routes, if they exist, or making fewer trips during the peak hour. (Unacceptable)

Synchro 5.0 also calculates Intersection Capacity Utilization (ICU) measures. These measures provide additional insight to intersection performance and the capacity available to handle future growth, traffic fluctuation, and incidents. ICU provides information for traffic planning purposes, such as future roadway design and congestion management programs. **Table 3-2** includes descriptions for ICU values, which are graded from 'A' through 'H.'

Synchro 5.0 also provides a measure of the performance provided by a group of intersections acting as a traffic system or network. The frustration experienced by a motorist travelling through a system of intersections depends on traffic delays, number of stops, and time that queue buildup blocks access to right or left-hand turning lanes. The Performance Index (PI) is a combination of the delays, stops, and queuing penalty. PI values are relative, so that lower values indicate better performance.

3.1.3 Performance Evaluation of Existing Intersections

Modelling evaluated AM and PM peak hour volumes for the two signalized intersections in the Cogswell Street Interchange area, as well as for the Barrington/Cornwallis Street intersection in the existing context. The performance analysis also included the unsignalized merge intersection of the Barrington Street southbound exit ramp and the Cogswell Street eastbound approach by the Cogswell Tower of Scotia Square. **Table 3-3** documents values for intersection performance measures.

Table 3-3: **Levels of Performance for Existing Intersection Configurations**

Intersection	Level of Performance Measures					
	Highest Approach v/c	Control Delay	Delay LOS	ICU	ICU LOS	System Performance Index
Evaluation of AM Peak Hours						
Barrington @ Cornwallis	0.86	15.9	B	0.89	D	
Barrington SB/Cogswell EB Ramp	-	-	-	0.61	B	
Barrington @ Cogswell/Hollis Ramps	0.55	11	B	0.54	A	
Barrington @ Water/Cogswell Ramps	0.32	4	A	0.29	A	59
Evaluation of PM Peak Hours						
Barrington @ Cornwallis	0.77	12.8	B	0.82	D	
Barrington SB/Cogswell EB Ramp	-	-	-	0.41	A	
Barrington @ Cogswell/Hollis Ramp	0.49	12.6	B	0.42	A	
Barrington @ Water/Cogswell Ramps	0.43	3.9	A	0.37	A	80.3

3.1.4 Summary of Performance Evaluation for Existing Intersections

The Barrington at Cornwallis intersection at the north end of the Study Area provides good to satisfactory service in both morning and afternoon peak hours. The intersections within Cogswell Street Interchange are providing good to excellent levels of performance. Intersection Capacity Utilization (ICU) values provide a realistic evaluation of the performance provided by the four intersections.

In summary, other than the obvious anticipated traffic problems related to removing a grade separation between major opposing volumes, the new road network must accommodate the following two high volume connections:

1. Almost 1200 vph travel southbound on Barrington Street and proceed to Hollis Street during the morning peak hour. To accommodate existing traffic through the Study Area, the roadways must provide for the orderly movement of traffic along this corridor;

2. The directional ramp from Cogswell Street eastbound to Barrington Street northbound, has an AM peak volume of 250 vph and a PM peak hour volume of 760 vph. It is suspected that a significant portion of this traffic is travelling to Barrington Street to reach the access ramp to the Macdonald Bridge. Since drivers already use the Gottingen Street and North Street approaches to the Bridge heavily, accommodating this traffic within the Study Area appears desirable.

3.2 Redistribution of Volumes to Concept Networks

Existing AM peak hour volumes (**Figure A-1**) have been redistributed to the four network concepts considered to have potential to accommodate existing traffic through the Study Area. PM peak hour volumes (**Figure A-2**) were also redistributed to the network for **Concept 2(c)**. **Concept 2(c)** appeared to provide reasonable and well sited 'blocks' of land suitable for development, while still providing a good level of performance for moving vehicles into and through the Study Area.

Existing traffic volumes were redistributed so that all traffic movements into or through the Study Area were accommodated within the Study Area. The objective of this study was to consider various at-grade street and intersection concepts that could be used to replace the interchange, while still providing reasonable service to accommodate all existing traffic now using the interchange. All existing traffic entering or exiting the Study Area at boundary intersections was redistributed to each street network and intersection concept. Traffic was not diverted to the street network outside the Study Area.

We redistributed traffic volumes for the following concepts:

- **Concept 1(b)** - AM peak hour (**Figure A-3**);

- **Concept 2(c)** - AM peak hour (**Figure A-4**);
- **Concept 2(c)** - PM peak hour (**Figure A-5**);
- **Concept 3(c)** - AM peak hour (**Figure A-6**); and
- **Concept 4** - AM peak hour (**Figure A-7**).

3.3 Level of Service Analysis of Concepts

The initial level of performance evaluation included a review of SimTraffic 5.0 traffic simulation models of AM peak traffic moving through the existing interchange and the four concept street and intersection systems. The Consulting Team completed AM peak hour level of performance analyses for all four concepts listed above. When analysis demonstrated that **Concept 2(c)** provided the best balance of street network layout, for development potential, and level of traffic service, a PM peak analysis was undertaken for it alone.

3.3.1 Initial Evaluation of Four Concepts

Performance Indices for existing and concept evaluations shown in **Table 3-4** illustrate the suitability of each street and intersection system for traffic management. Lower values indicate better performance.

Table 3-4: **Performance Index Evaluation**

Street/Intersection Concept	Performance Index Values	
	AM Peak Hour	PM Peak Hour
EXISTING STREET NETWORK	59	80.3
Concept 1(b) - Single Arterial	107	-
Concept 2(c) - Parallel Arterial Systems	89.3	102.7
Concept 3(c) - One-way pair System	1915.3	-
Concept (4) - Single Intersection	156	-

Concept 3(c), the one-way pair, did not provide a satisfactory level of performance because several heavy traffic movements were forced to follow 'unnatural' routes through the area. Traffic from Cogswell eastbound to Barrington northbound must travel south on Barrington and then use the short crossover connector between Barrington and Upper Water at the Purdys II entrance. Barrington Street northbound traffic seeking to travel west on Cogswell would have to use the crossover connector, travel north on Upper

Water, use a crossover from Upper Water to Barrington, and then travel southbound on Barrington to exit to Cogswell Street.

Concept 4 offered the simplicity of just one intersection; however, it requires that both 'problem' movements mentioned in **Section 3.1.4** to turns left through the intersection. The Barrington southbound to Hollis movement (1200 vph) and the Cogswell eastbound to Barrington northbound movement (250 vph) both require dual left turn lanes. Even with two left turn lanes, the level of service for southbound left turn to Hollis Street would be unacceptable during the AM peak hour.

Concepts 1(b) and **2(c)** involve similar direct connections between the four-lane section of Barrington Street and the Hollis/Water one-way pair. The major Barrington southbound to Hollis movement (1200 vph) could flow directly into Hollis Street. **Concept 2(c)** yielded a marginally better Performance Index in the AM peak. In addition, **Concept 2(c)** was preferred over **1(b)** because:

- **Concept 2(c)** retains much of the Upper Water Street alignment from the Sheraton Hotel to Cornwallis Street. The accesses to the Purdys Wharf/Casino Nova Scotia area, and the DND Scotian will continue to operate much as they do in the existing street system.

- Without the connection between Upper Water and Cornwallis, all traffic through the area will be forced to use Barrington Street. Northbound PM peak hour traffic would probably not be manageable for **Concept 1(b)**, unless an additional northbound lane was provided on Barrington at Cornwallis.

- The **Concept 2(c)** alignment for Barrington Street is on the west side of the site, close to the Trade Mart, so that land for development will be better connected to the downtown.

3.3.2 Detailed Evaluation of Concept 2(c)

The AM and PM peak hour volumes for the Barrington/Cornwallis Street intersection and the three signalized intersections **Concept 2(c)** were analysed using Sychro 5.0. **Table 3-5** summarizes values for intersection level of performance measures.

As Performance Indices in **Table 3-4**, above, show, the **Concept 2(c)** intersection system will not handle traffic as smoothly as the existing interchange. 'Control delay' analysis indicates that the three Barrington Street intersections will, nevertheless, provide very good to good LOS 'B' and 'C,' which is similar to the existing Barrington at Cornwallis intersection. The Intersection Capacity Utilization (ICU) analysis (**Table 3-5**) further indicates that the intersections will have from 10 per cent to 20 per cent reserve capacity, except for the PM peak hour at the Barrington at Cornwallis intersection, which has only a 6 per cent capacity reserve. The redistribution of traffic for **Concept 2(c)** increases the Barrington Street northbound movement at the Cornwallis Street intersection from 1380 vph to 1730 vph, or an addition of 350 vph during the PM peak hour. This reduces

turning opportunities for the 80 southbound vehicles turning left per hour. Barrington Street through traffic will however enjoy a high level of performance.

Table 3-5: **Levels of Performance for Concept 2(c) Intersection Configurations**

Intersection	Level of Performance Measures for Concept 2(c)					
	Highest Approach v/c	Control Delay	Delay LOS	ICU	ICU LOS	System Performance Index
Evaluations of AM Peak Hour						
Barrington @ Cornwallis	0.86	16.2	B	0.89	D	
Barrington @ Cogswell	0.96	16.2	B	0.90+	E	
Barrington @ Hollis	0.84	12.5	B	0.78	C	
Upper Water @ Purdys Wharf	0.16	5.8	A	0.19	A	89.3
Evaluation of PM Peak Hours						
Barrington @ Cornwallis	0.98	12.7	B	0.94	E	
Barrington @ Cogswell	0.83	21.3	C	0.85	D	
Barrington @ Hollis	0.79	18	B	0.83	D	
Upper Water @ Purdys Wharf	0.22	6.8	A	0.24	A	102.7

3.3.3 2026 Volume Projections

Although **Concept 2(c)** provides satisfactory levels of performance for 2000 AM and PM peak hour volumes, an analysis using future volume projections (**Table 3-6**) was required to ensure that the at-grade concept will 'stand the test of time.'

HRM maintains a QRSII transportation planning model developed through several studies over the past decade. The most recent model update was done for the 1999 Integrated Servicing Study (ISS). The model was calibrated for households and employment in 1996, the most recent Census year, and for projected conditions in 2026. This updated model was used by the Consulting Team to evaluate potential traffic volume growth in the Study Area to 2026 (**Table 3-6**). Since the QRSII model was designed as a 'regional' model to provide volume projections for regional primary arterial streets and highways, it usually is not expected to provide precise projections of individual street sections, such as those in the Study Area. The model can, however, provide an 'order of magnitude' indication of area volume changes over time.

The QRSII model provided PM peak hour volumes for traffic movements entering and exiting the Study Area. **Table 3-6** records 2000 PM peak hour counts used in this study as well as the following QRSII output:

1. 1996 volume estimates were produced for the 1996 street network used in the ISS study. This network permitted access from Brunswick Street to the Macdonald Bridge. It did not include the recently constructed Barrington Street ramp.

2. 1996 volume estimates were produced for an updated street network that included changes related to the Barrington Street ramp.

3. 2026 volume projections were produced for the network and land use data used in the 2026 ISS model.

Due to the way traffic zone connectors are coded, there are some locations (see shaded areas in **Table 3-6**) where estimated volumes do not compare with actual counted volumes. However, when all vehicles entering and exiting the Study Area are totalled, as shown in the bottom rows of **Table 3-6**, a more consistent pattern of volume growth emerges.

The QRSII analysis indicates that volumes in the Study Area are expected to increase by about 15 per cent over the thirty-year period from 1996 to 2026. This rate, which is equivalent to 0.5 per cent per year, is consistent with the level of population growth experienced in the region over the past 30 years. Even in the context of elevated growth expectations for the region, it is reasonable for the downtown, which is already intensively developed. Using this growth rate, volumes in the Study Area are estimated to increase by 13 per cent from 2000 to 2026.

3.3.4 Level of Performance Evaluation for 2026 Volumes

Synchro 5.0 includes a 'growth factor' that allows for the use of projected future volumes in current Synchro models. A factor of 113 per cent was used for the AM and PM peak hours of the existing and **Concept 2(c)** networks to produce estimates of 2026 levels of performance. The values for various level of performance parameters are included in **Table 3-7**.

Level of performance parameters in **Table 3-7** indicate that the existing street network should be capable of continuing to provide very good to acceptable levels of performance for 2026 volume projections. The intersections within the Cogswell Street Interchange will provide good to excellent levels of performance. Although the Barrington at Cornwallis intersection at the north end of the Study Area will operate with high Intersection Capacity Utilization (ICU) values of 0.99 in the AM and 0.91 in the PM, 'control delay' analysis indicates that the intersection will provide very good to good LOS 'B' or 'C' during the peak hours.

Table 3-6: **Estimated 2026 Volumes for the Study Area**

Intersection Location		PM Peak Hour Volumes (Vehicles per Hour)					
		1996 - Model (without ramp)[1]	1996 - Model (with ramp)[2]	2000 - Manual Counts[3]	2026 - Model (with ramp)[4]	% Change 1996 to 2026[5]	Projected 2026[7]
Barrington (North)	NB	1343	2773	2350	3542	28	2660
	SB	1163	1158	1060	1202	4	1200
	Total	2506	3931	3410	4744	21	3850
Cornwallis	EB	66	190	270	282	48	310
	WB	237	104	200	77	-26	230
	Total	303	294	470	359	22	530
Cogswell	EB	355	352	640	584	66	720
	WB	1823	1318	310	1306	-1	350
	Total	2178	1670	950	1890	13	1070
Barrington (South)	NB	704	1010	640	1192	18	720
	SB	477	472	520	544	15	590
	Total	1181	1482	1160	1736	17	1310
Hollis	SB	460	418	730	406	-3	820
Water	NB	1587	1839	910	1917	4	1030
Summary of all Traffic Entering or Exiting the Study Area[6]							
	Entering	3875	4549	3520	5177	14	4000
	Exiting	4340	5085	4110	5875	16	4600
	Total Two -Way	8215	9634	7630	11052	15	8600

NOTES:

1. Volumes produced by the 1996 QRSII Integrated Servicing Study (ISS) model.
2. Volumes produced by the 1996 model with the addition of the 'new' Barrington Street access ramp to the Macdonald Bridge and the removal of Brunswick Street access to the Bridge.
3. Volumes from 2000 turning movement counts provided by HRM.
4. Volumes produced by the 1996 QRSII Integrated Servicing Study (ISS) model (includes 'new' Barrington Street ramp).
5. This is the percentage change from the 1996 volumes 'with the ramp' to the 2026 volumes.
6. Overall traffic entering and exiting the Study Area is projected to increase by 15 per cent over 30 years, or a 0.5 per cent simple annual growth rate.
7. The 2000 manual count values have been projected to 2026 using a 0.5 per cent simple annual growth rate.
8. Shaded areas indicate locations where 2000 counts differ significantly from 1996 modelled volumes.

Projections to 2026 indicate the **Concept 2(c)** intersection system should provide good to acceptable levels of performance in the future for all major traffic movements. However, 2026 volumes will require an additional southbound lane on Barrington from just north of Cogswell Street to the Barrington Street right turn lane exit to the southern part of Barrington Street at Scotia Square. Although some lower volume movements will experience poor levels of performance, it is expected that the minor movements will not tolerate large delays and will redistribute to other areas by 2026.

***Table 3-7*: Levels of Performance for Projected 2026 Volumes**

Intersection	Level of Performance Measures for Concept 2(c)					
	Highest Approach v/c	Control Delay	Delay LOS	ICU	ICU LOS	System Performance Index
Evaluations of AM Peak Hour for Existing Network for 2026 Volumes						
Barrington @ Cornwallis	0.94	20.6	C	0.99	E	
Barrington SB/Cogswell EB Ramp	-	-	-	0.68	B	
Barrington @ Cogswell/Hollis Ramps	0.61	11.6	B	0.60-	A	
Barrington @ Water/Cogswell Ramps	0.35	4	A	0.31	A	76.3
Evaluations of AM Peak Hour for Concept 2(c) for 2026 Volumes						
Barrington @ Cornwallis	0.94	21.7	C	0.99	E	
Barrington @Cogswell[1]	0.85	10.9	B	0.81	D	
Barrington @ Hollis	0.92	16	B	0.86	D	
Upper Water @ Purdys Wharf	0.18	5.6	A	0.21	A	114.6
Evaluations of PM Peak Hour for Existing Network for 2026 Volumes						
Barrington @ Cornwallis	0.93	17.1	B	0.91	E	
Barrington SB/Cogswell EB Ramp	-	-	-	0.45	A	
Barrington @ Cogswell/Hollis Ramps	0.54	13	B	0.46	A	
Barrington @ Water/Cogswell Ramps	0.48	4.2	A	0.4	A	145.7
Evaluations of PM Peak Hour for Concept 2(c) for 2026 Volumes						
Barrington @ Cornwallis [2]	1.34	18.7	B	1.04	F	
Barrington @Cogswell[1]	0.81	23.7	C	0.84	D	
Barrington @ Hollis	0.92	22.1	C	0.92	E	
Upper Water @ Purdys Wharf	0.25	7	A	0.26	A	165.5

NOTES:

1 This analysis includes an additional southbound lane on Barrington Street from north of Cogswell Street to the right turn lane exit to Barrington Street at the 'crossover intersection. For 2026, Barrington Street will require 3 SB lanes and 3 NB lanes (a left turn lane and 2 through lanes).

2 The 95 vph Barrington Street SB left turning vehicles experience a poor level of service with a 1.34 v/c ratio. However, the 2000+ vph NB and almost 1100 vph SB through movements have low delays and excellent LOS 'A'. It is expected that some of the left turning vehicles will probably redistribute to other intersections during the 2026 PM peak.

4 Preferred Concept

Analysis of redistributed volumes indicates that **Concept 2(c)** can provide good to satisfactory performance as an at-grade replacement for the Cogswell Street interchange. All major movements are expected to experience low 'control delay' per vehicle, resulting in very good to good levels of performance.

4.1 Design and Traffic

Concept 2(c) was developed to allow for the two movements that are key to providing an acceptable level of service:

1. Northbound left turns from Cogswell

2. Southbound traffic to Hollis Street.

HRM will have to specify names for new roadway links when they are developed. For the purpose of this discussion, the two north-south streets are referred to as the Arterial and the Collector. References to Barrington Street here mean the section that will be extended northward from the Central Business District (CBD) to intersect with the new streets. **Appendix D** contains 1:1000 scale plans of the preferred concept.

4.1.1 The Arterial Street

Traffic analysis shows that a strong arterial connection is required from the north to Hollis/Lower Water Street. Concept 2(c) provides a five-lane cross section for the arterial street from Cornwallis Street directly to Lower Water/Hollis. Cogswell Street, and Barrington Street in the CBD respectively intersect the arterial at 3-way and 4-way intersections. Analysis also shows that introducing left turns followed by right turns into this alignment compromises level of service along the route.

Throughout the study process there has been debate over what form or classification of roadway should apply. It has been suggested that the "character" of Barrington Street in the CBD south of the interchange (2-3 lane urban collector) should be extended to achieve the goal of expanding the downtown. However, the street needs to feed traffic to

and from Cogswell Street, Barrington Street as well as Hollis Street/Lower Water Street. The traffic analysis indicates that, to do this effectively, a five-lane section with appropriate turning lanes at intersections is required. Thus from a transportation view, a five-lane section (more in the character of Quinpool Road) is required to provide an acceptable level of service.

The arterial should therefore be a 30 m (Right-Of-Way) urban arterial with a median and turning lanes. Its design speed should be 60 km/hr. This is in keeping with the HRM classification of the route as previously discussed. For the most part, the proposed arterial street has a relatively straight alignment with gentle slopes consistent with the desired function of the roadway.

While a relatively high design speed is recommended for the classification and the projected volumes of traffic to be served (in the range of 35,000 vehicles per day), the posted speed and average running speed of the street is expected to be considerably lower. Speeds in the range of 40 to 50 kmh are likely given the two signalized intersections and new land development. To maintain a good level of service, some access control for this arterial is recommended. Nevertheless, driveway access could be provided at key locations such as opposite the Cogswell Street intersection as the fourth leg of the intersection.

4.1.2 The Collector Street

The collector is a two-lane, two-way street extending from the intersection of the arterial and Cornwallis Street to Upper Water Street in front of the Sheraton. The alignment is relatively straight and flat. **Figure 2-2** shows it aligned to the west of the existing Upper Water Street and raised approximately 1 metre. This will lengthen the driveway to the parking garage, which will allow more vehicles to queue at the garage's ticket kiosk. As well, the area currently occupied by Upper Water Street to the north of the Casino will be freed for development.

However, the alignment of the roadway is flexible, given its function as a collector. The projected daily volume for the road is in the range of 7,000 vehicles per day. For the most part, this represents local traffic from the waterfront developments rather than through traffic. Since through traffic will be accommodated on the Arterial Street, a lower design speed could be considered.

Aligning the road along the existing Upper Water Street and introducing an "S" curve around the Karlson's Wharf Building will reduce the speed and increase the size of the central parcel of land considerably. It will also avoid reconstruction of municipal services, which include a 24" watermain are buried in the Upper Water Street alignment and a drainage outlet to the harbour at the 90° bend just north of the Casino.

The ultimate horizontal and vertical alignment of the Collector may, in any case, vary to suit site development. This will establish the design speed of the street but its function as a two-lane collector street will remain. The proposed width of asphalt shown on **Figure**

2-2, above, is 11 metres. While two core lanes are proposed, the width allows for dedicated turning lanes or on-street parking to be developed on one side of the street to serve developments.

4.1.3 Barrington Street

The low point in the profile of Barrington Street is near the north limit of Barrington Place, where the street begins to climb to the interchange area. The proposed Barrington Street will continue to drop from the existing low point at a grade of 5-6 per cent and curve to intersect the Arterial and the Waterfront collector street at the centre of the Purdys Wharf Court Yard area. The short horizontal curve on Barrington combined with relatively steep grades and the signalized intersection will serve to reduce the speeds.

The proposed alignment has several additional implications. The southerly entrance to the Delta Barrington will slope down to the street. A steep (6-8 per cent) grade on the driveway may be required to accommodate the new street grade. At its intersection with the Collector Street in front of the Purdys Wharf Court Yard, the proposed elevation is approximately 1.0 m higher than the existing condition. While this minimizes the slope on Barrington Street, it will require partial reconstruction of the Court Yard area (**Figure 2-2**, above). Reconstruction could include consolidation of the two existing entrances to the Court Yard; however, it will require acquiescence of the property owner or acquisition of the Court Yard by HRM.

4.1.4 Cogswell Street

The grade of Cogswell Street from Market Street to the Arterial will be approximately 8 per cent. It will end in a T-intersection with the Arterial. The grades and width of the street will be similar to the existing upper portion of Cogswell Street. As discussed in **Section 2.3.1**, terrain precludes the extension of Cogswell Street across the Arterial to the Collector. The resulting steep slopes (11 to 12 per cent) do not meet geometric design criteria.

4.1.5 Possible Future East-West Connector

In addition, **Figure 2-2** shows a potential east-west connector street (dashed alignment immediately east of the Trade Mart) between the Arterial and the Collector to the north of the Casino area. While this connection is not required to handle existing interchange flows, it may eventually be needed to serve land developments, either as a municipal street or a driveway. With the profiles as suggested for the Arterial and the Collector, the connection will have a slope of roughly 10 per cent.

4.1.6 Pedestrian Movements

The design cross section for all proposed streets should include sidewalks on both sides of the street and signalized intersections should include appropriate pedestrian crosswalks and signals. Proposed land uses will influence the direction of pedestrian movements. At this early stage, we have not established the layout of these routes, but we anticipate provision of mid-block crossings or pathways through developed parcels where technically feasible. Municipal plan policies could be considered to ensure desirable

connections. In particular, a crossing at the south end of the Study Area is desirable to link the Granville Street pedestrian area to the waterfront area near the Sheraton.

4.2 Municipal Services

HRM GIS mapping for the interchange indicates the approximate location of storm sewers, sanitary sewers, and watermains within the Study Area (**Figure 4-1**). Some components of these services will have to be altered for **Concept 2(c)**. Required alterations, however, are outlined following.

4.2.1 Storm Sewer

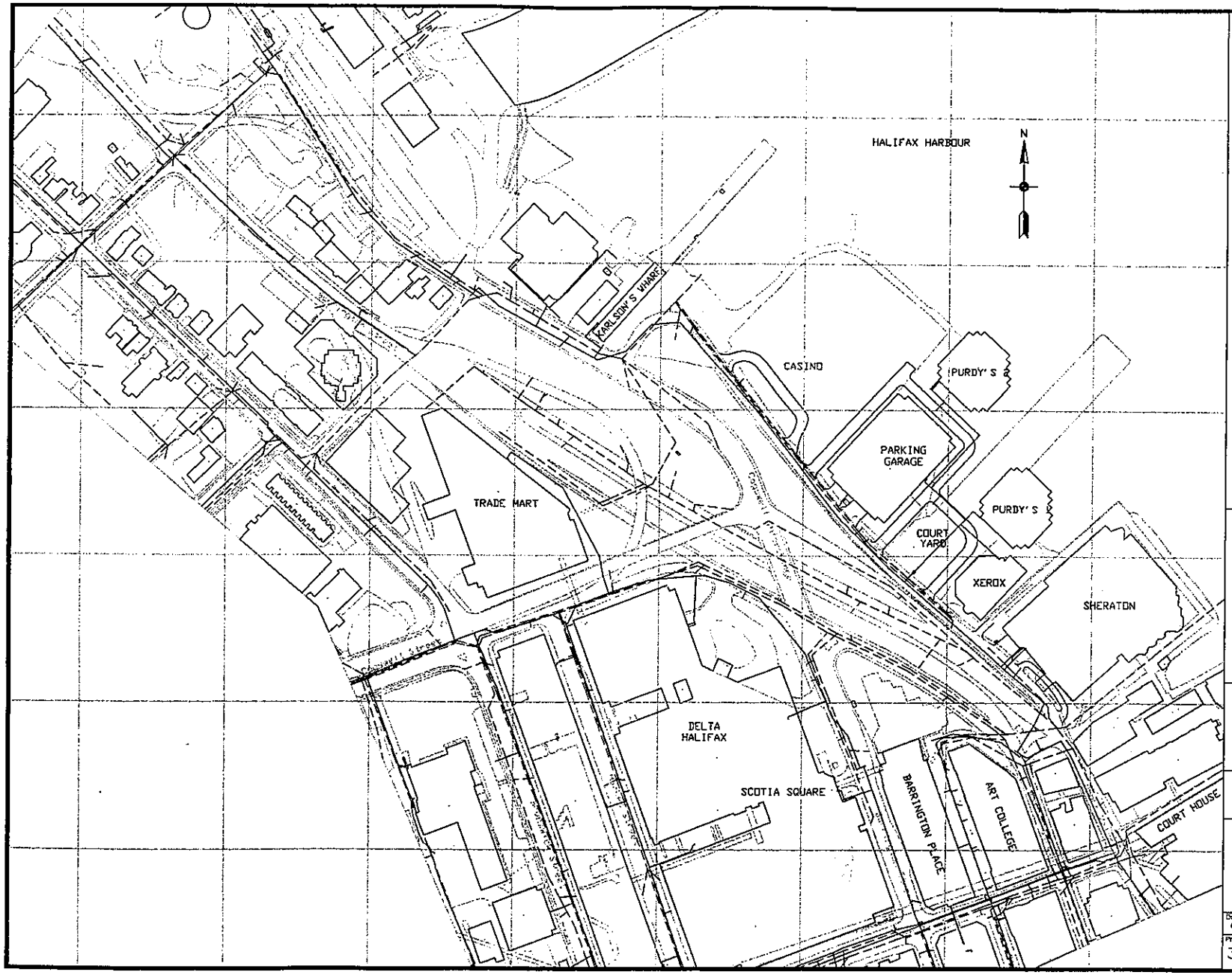
A new storm drainage system is required for the new roadways including piping, manholes, and catchbasins. Existing outlets for the area are located just north of the Casino (at the 90° bend in Upper Water Street) and just south of the Sheraton. A drainage outlet pipe from Brunswick Street along the alignment of the former Proctor Street crosses the site to the south of the proposed sewage treatment plant site and discharges through the outlet north of the Casino. An easement or right-of-way will be required across the new development to maintain this drainage course.

The proposed road network has a high point at the Cogswell Street intersection, which divides the drainage areas between the two noted outlets. The areas of drainage will not change greatly; however, full development of the area will substantially increase runoff. Without on-site storage/detention, over sizing of the drainage outlets to the harbour may be required. These issues should be addressed through a storm water management study undertaken with land use planning for the area.

4.2.2 Sanitary Sewer

Aside from the interchange area itself, which collects only storm water, the other collection system in the area, from Brunswick Street, from Cogswell Street, and along portions of Upper Water Street have both sanitary and storm sewer systems. It appears that the systems are separate with the exception of Brunswick Street and the northern portion of Upper Water Street, which may have combined sewer systems. Reconstruction of the area affords the opportunity to provide new trunk sanitary mains for the collection and transport of sewage to the proposed sewage treatment plant as well as to service new developments.

Changes to horizontal and vertical alignments in the area will require the reconstruction of sanitary and storm services as well as water infrastructure in the northern portion of Upper Water Street, which will be realigned to the east, and along the section of Barrington in front of the Delta Barrington and Scotia Square, where the vertical grade will be lowered.



Legend

- Water System
- Sewer/Storm System
- Sewer/Storm Laterals

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HALIFAX REGIONAL MUNICIPALITY

COGSWELL STREET INTERCHANGE STUDY

EXISTING MUNICIPAL SERVICES

Date	Scale	Drawn	Checked
01/03/22	1:2500	TG	BL

Project No. 3180

FIGURE 4.1

Services along the southerly portion of Upper Water Street from the Casino to the Sheraton can probably be retained. While reconstruction of entrances and roadways is required, grades will remain similar to existing conditions. It seems likely new development areas, at least, can be serviced by a gravity trunk main along the lower collector road to the sewage treatment plant.

4.2.3 Water Services

As noted above, water service in some areas will require reconstruction. As well, new watermains will be installed to service future developments. The mapping shows a 24" diameter trunk water service dated 1968-1969, for the area along Brunswick Street to Cogswell to Market Street to Duke Street to Upper Water Street. Water service planning is required to confirm that adequate domestic and fire flow protection can be provided to the new development areas. Since the northern portion of Upper Water Street will be reconstructed, it seems to extend the 24" trunk to loop into the 12" main on Cornwallis Street. Also, for the purpose of costing new infrastructure, a new 12" trunk main has been assumed for the full length of the main arterial.

4.3 Land Use

Replacement of the interchange is intended to affect abutting land use positively. It should enhance the access to existing land uses. As important, the project is intended to provide the opportunity to develop new, complementary land uses within the Study Area. In total, **Concept 2(c)** will provide roughly 5.8 acres of developable land with minimal impact on property not currently occupied by transportation infrastructure and manageable effects on existing abutting land uses.

4.3.1 Property Requirements

Figures 2-1 through **2-4**, above, show the boundary of HRM owned property. The Consulting Team attempted to develop concepts for the new network within the existing property limits without need for property acquisition. Some minor property acquisitions may however be required for implementation of **Concept 2(c)**, as portrayed in **Figure 2-2**:

- Provision of a 90° intersection at the intersection of Cogswell Street and the Arterial Street, which is desirable for traffic operations, will encroach on the corner of the Trade Mart property.
- The alignment of Barrington Street encroaches on the property at the north side of Barrington Place.
- The alignment of Barrington Street also impacts the Court Yard area at the Purdys complex area. The alignment could be adjusted to align with one or the other entrances and avoid the encroachment on the Court Yard.

The value of these lands has not been included in the cost analysis because they are minor. It may also be possible in practice to modify **Concept 2(c)** to avoid these encroachments.

4.3.2 Impact to Existing Development

The proposed changes to the infrastructure and associated land development will have a significant impact on existing developments. Instead of being on the fringe of a freeway-style interchange, existing establishments will be enveloped into a downtown area. Instead of walls and ramps across the street, the view could include new buildings or green space. As well, access to established developments will generally be improved:

- Access to the Sheraton parking garage or drop-off area will be from the two-way collector street. Traffic approaching from the north and west will be able to get to the Sheraton via the connector road between the Arterial and the Collector. This eliminates the need to circle through the downtown area as is currently the case or to use the connection just north of the Morse Tea building. The connection has very poor sight lines and will be eliminated. Some reconfiguration of the driveways may be required.

- Similarly, access to the Casino, the parking garages, and the Purdy's complex is improved for traffic approaching from the west along Cogswell Street. Access from the north via Cornwallis Street is comparable to the existing service via Upper Water Street.

- Access to and from the Delta Halifax will be similar to the existing configuration since right in, right out access will be provided. The proximity of these entrances to major intersections will preclude the provision for left turns in or out of the entrances. However, traffic exiting from the hotel will have better access to the Casino and waterfront area via the short connector street between the Arterial and the Collector. The southerly entrance of the Delta Halifax will have to be adjusted to accommodate the changed vertical alignment of Barrington Street.

4.3.3 Future Development

Preliminary discussions regarding future land use have included a variety of options. The extent to which the preferred concept will accommodate the vision for the area will need to be evaluated in a land use study. Some preliminary observations follow:

- **Land Parcels Available**: As shown on **Figure 2-2** the total land available for development is approximately 5.8 acres (23,500 square metres). This is divided into 4 parcels of 4.3 acres, 0.9 acres, 0.4 acres and 0.2 acres. The 0.4 acre parcel on the north side of Barrington Place is not owned by HRM. A parking lot currently occupies this site.

  As previously noted, the size and location of the parcels will depend on the final alignment of the Collector Street. As well, the design of streetscapes and provisions for on-street parking may influence the required street allowance. Obviously, the horizontal geometry of the land parcels will influence land development, but the vertical geometry will also present some challenges. There is an 11 metre (36 foot) grade difference between the Arterial and the Collector

Street, which is equivalent to the height of a 3 or 4 storey building. This is similar to most developments on the hillside of downtown Halifax.

- **Land Access**: Given the proposed function of the new streets, it is expected that primary driveway access to the new developments will be from the Collector Street. The Arterial, as well, could accommodate land access, although it should be more limited. A central left turn lane has been suggested along the full length of the street, particularly from Cornwallis to Cogswell in anticipation of driveway access.

- **Sewage Treatment Plant**: As with all concepts, an allowance of 2.6 acres has been made for accommodation of a new sewage treatment plant. The exact land requirements for this facility have not yet been determined.

- **Potential for Transit Transfer Station**: As previously noted, the Downtown Barrington Street Strategy calls for a transit facility in the area. While the transit lay-bys on Barrington Street at Scotia Square are not affected by the design, there is an opportunity to create a transit facility within the land parcels. The smallest parcel of land, close to the Purdys complex may be appropriate for such a facility. The property has ready access to Barrington Street, the Arterial, and the Collector provided sufficient space is available on-site for turning movements.

4.4 Cost

The preceding analysis has determined that all of the concepts will have an impact on areas outside of the Study Area. With the exception of **Concept 2(c)** the alternatives will require either modifications to the layout shown or improvements elsewhere within the HRM peninsula network to accommodate traffic volumes. Modifications to the layouts shown could include the addition of lanes, grade separation of selected movements, or restriction of turning movements. Many improvements might be made elsewhere on the Halifax Peninsula to alleviate capacity constraints within the Study Area. These options can only be evaluated with a region wide study. For these reasons the true capital cost of some of the scenarios cannot be accurately evaluated within this study.

4.4.1 Cost of Preferred Alternative 2(c)

Concept 2(c) "replaces" the existing interchange with no anticipated further improvements. **Table 4-1** provides a detailed breakdown of the major items and associated costs. As the table shows, the estimated construction cost in current (2000) dollars is $9.1 million excluding taxes and financing.

Table 4-1: **Construction Cost Estimate, Concept 2(c), Cogswell Street Interchange**

Description	Estimated Cost
Earthwork and Demolition	$1.9 million
Municipal Services	$2.2 million
Street Construction	$2.5 million
Landscaping	$0.5 million
Intersection Signalization and Lighting	$0.5 million
Contingency	$1.5 million
TOTAL	$9.1 million

Various assumptions regarding the staging of construction have been made to establish the cost estimate:

- Staging of the demolition could allow for roadways to remain operational where possible, but short term roadway closures should be expected.
- Cogswell Street and the south portion of Barrington Street could be disconnected from the network as construction proceeds.
- The "throw away" cost of detour roads and temporary infrastructure has not been evaluated in this analysis. It is assumed these costs will be minimal if closures are permitted. However, it will obviously be important to maintain significant northbound and southbound traffic flow as well as access to existing properties. The parallel arterial system may simplify construction staging by allowing diverted traffic on the alternate route.

Estimated construction costs will be significantly higher if the above approach is not feasible for the Study Area.

4.4.2 The "Do Nothing" Alternative

As noted, the existing Cogswell Street Interchange is more than 25 years old and will probably require rehabilitation to provide continued service. A detailed structural condition assessment and inspection is required to ascertain the condition of the structure and estimate the extent, cost, and timing of required future work. For this study the Consulting Team conducted a cursory visual inspection.

The interchange consists of three bridge structures in addition to associated retaining walls. Descriptions and comments regarding each are as follows:

- **Directional ramp from Cogswell to Barrington**: This structure is a four span continuous voided slab bridge on a horizontal curve. The two outside piers supporting the superstructure have been increased in width on the outside of the horizontal curve. This pier widening may have been the result of concerns with the stability of the superstructure. Water was found on the face of each abutment below the superstructure. This is a sign the expansion joints have failed. The asphalt wearing surface is in good condition.

- **Cogswell Street elevated over the directional ramp and the four-lane arterial**: This structure is a five span wide slab bridge with the two continuous west and three continuous east spans each separated with an expansion joint. A continuous stream of water was observed on the surface of the east retaining wall below the superstructure. Water was also observed at the west abutment and pier support. The water beneath the superstructure at the expansion joints is a sign of expansion joint failure. A 300 mm x 900 mm section of concrete on the surface of the east retaining wall directly below the superstructure is deteriorated with reinforcing steel exposed. The asphalt wearing surface is in good condition.

- **Barrington Street extension over the four-lane Arterial**: This structure is a two span continuous voided slab bridge supported on high retaining walls running along the main arterial and a centre pier in the median of the four-lane arterial. Cracks were observed on the underside of the slab. A longitudinal crack was found on the west side of the south span. This and other random cracks contained moisture at the time of the site visit.

  Water and staining were observed on each retaining wall below the bridge superstructure. These are signs the expansion joints have failed. It was confirmed by observing one of the seals dislodged from the west expansion joint extrusion. The retaining wall in the area under the northeast corner of the bridge is spalled and has numerous cracks caused by water from the bridge superstructure draining on the wall. Shallow potholes were observed throughout the asphalt wearing surface.

Observations were not made of the inside face of the curbs of each structure because snow from plowing operations covered this area during our site visit. Bearings to support the superstructure of each bridge were not inspected.

Restoration work required for these structures will include replacement of expansion joints, resurfacing of the Barrington Street extension, and maintenance of bearings as required. As well, concrete repairs to the deck, and possibly curbs and parapet walls, will be required to repair damage resulting from exposure to deicing chemicals. As well, curbs and drainage structures of approach roadways should be rehabilitated, and pavement

should be resurfaced. Typically, the highest maintenance costs are associated with concrete repairs and, in particular, deck repairs. The extent of these repairs usually cannot be determined by a typical visual inspection. Methods for more detailed assessment include chain drag, hammer sounding, Ground Penetration Radar, and coring to determine the extent of delamination and deterioration. This degree of inspection is beyond the scope of this study. Similarly detailed inspection is required to determine the condition of the expansion joints.

While significant expenditure may be required depending on the maintenance history of the facilities, it can be assumed, for the purpose of this study, that the cost of this work will be relatively small compared with the scale of work required to demolish the existing infrastructure and rebuild a new network. However, the timing of the required repairs should be evaluated in relation to the timing of potential redevelopment to avoid superfluous expenditures.

4.5 Conclusion

All of the concepts explored in this study will transform the Study Area. The objective of the study was to determine whether or not the interchange can be replaced with an at-grade facility operating at an acceptable level of service for the current and horizon year traffic conditions. **Concept 2(c)** achieves this objective. The level of service provided is consistent with what can be expected in an urban environment.

The free-flow conditions of the interchange will be replaced with the stop and go conditions of urban signalized intersections. This will decrease the level of service provided by the interchange. Given this decrease in the level of service, some drivers can be expected to choose alternate routes. Thus, even with the implementation of the preferred alternative, it is recognized that a wider area than addressed in this study will be affected to some degree. We recommend increasing the Study Area to examine the wider implication of potential impacts on the surrounding road network and facilities.

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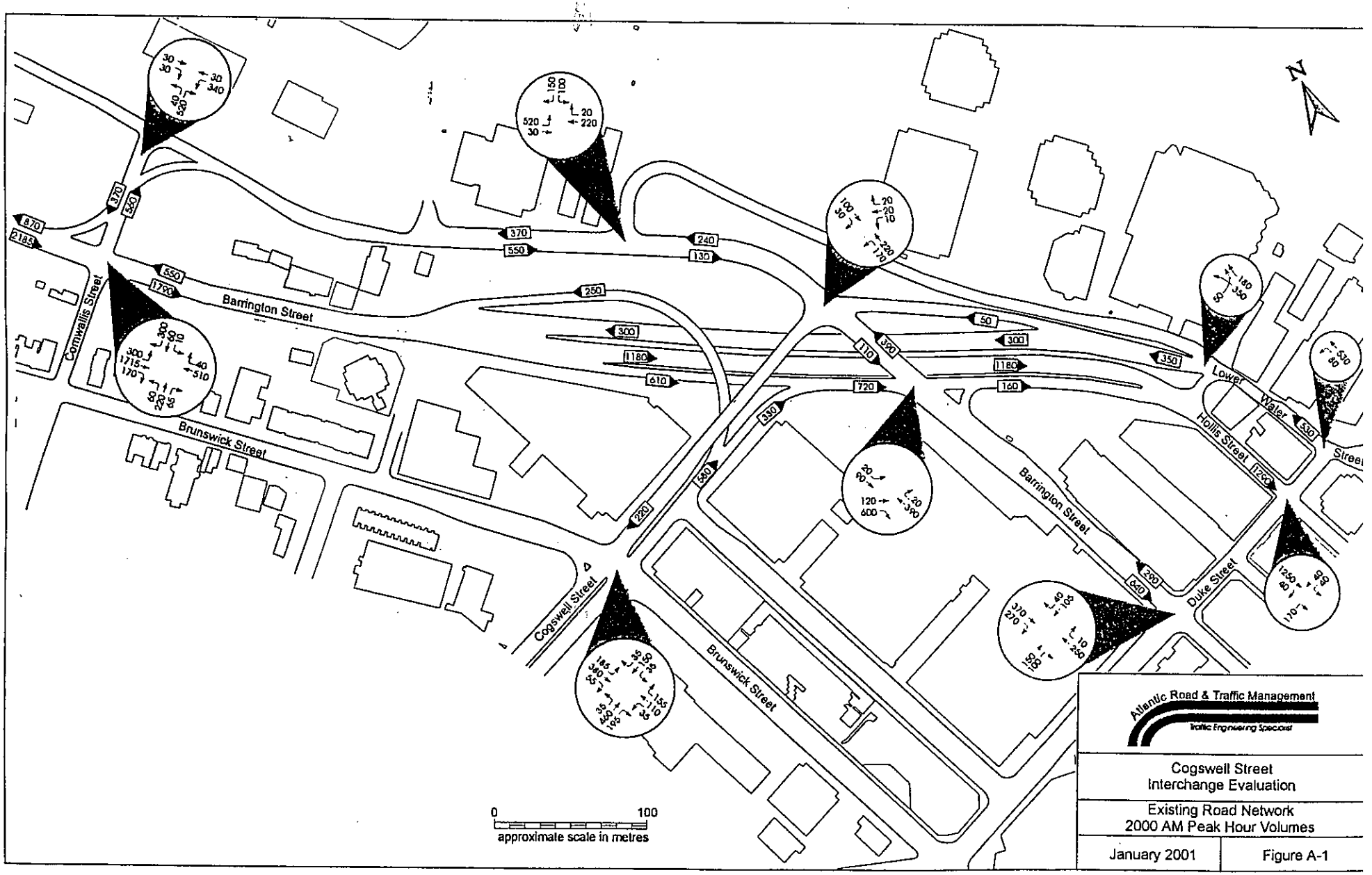
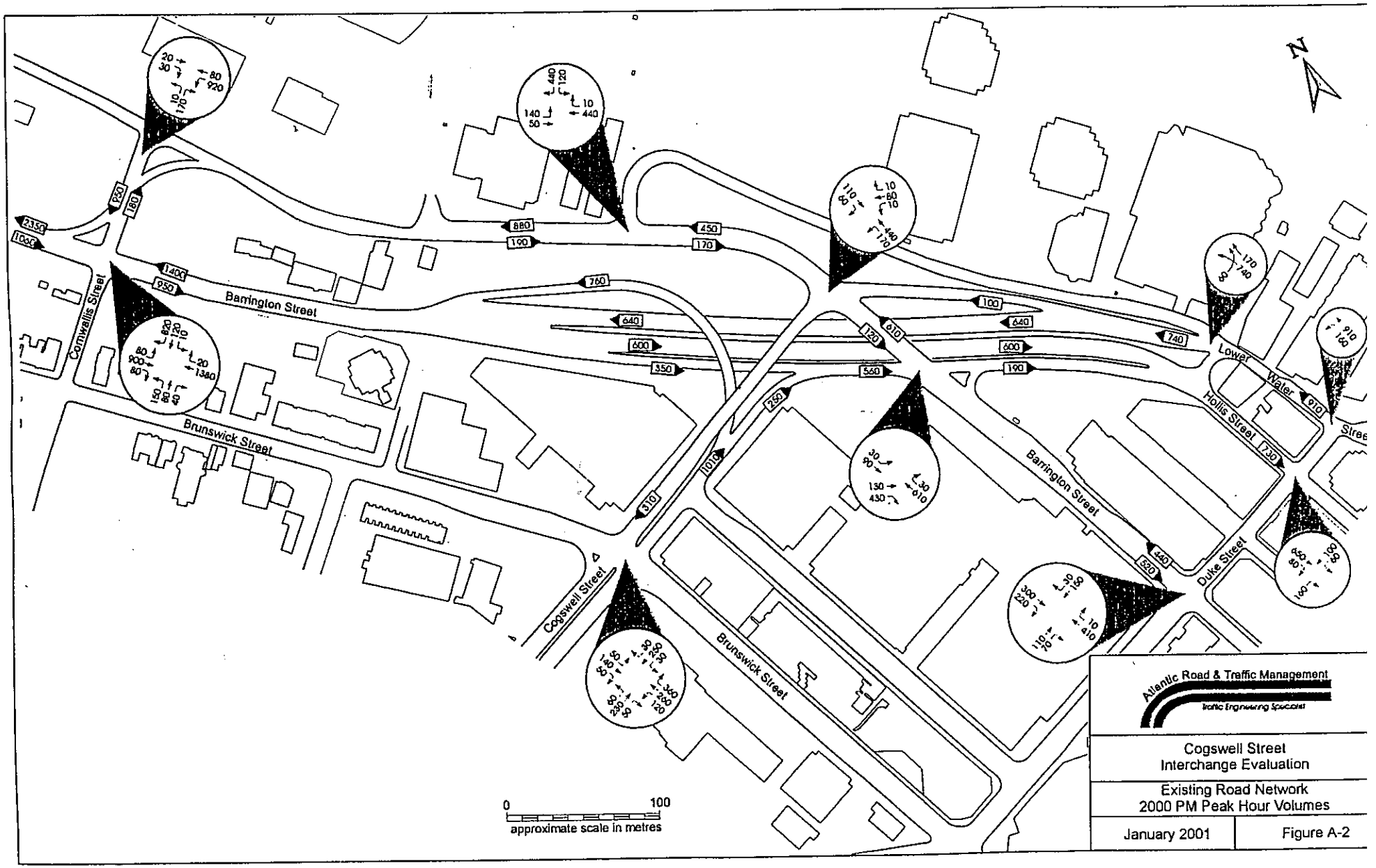
Appendix A - Existing and Redistributed Traffic Volumes


Barrington Street
Cornwallis Street
Brunswick Street
Cogswell Street
Brunswick Street
Barrington Street
Duke Street
Hollis Street
Lower Water Street
N
0
100
approximate scale in metres
Atlantic Road & Traffic Management
Traffic Engineering Specialist
Cogswell Street
Interchange Evaluation
Existing Road Network
2000 AM Peak Hour Volumes
January 2001
Figure A-1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Lower Water
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Duke Street
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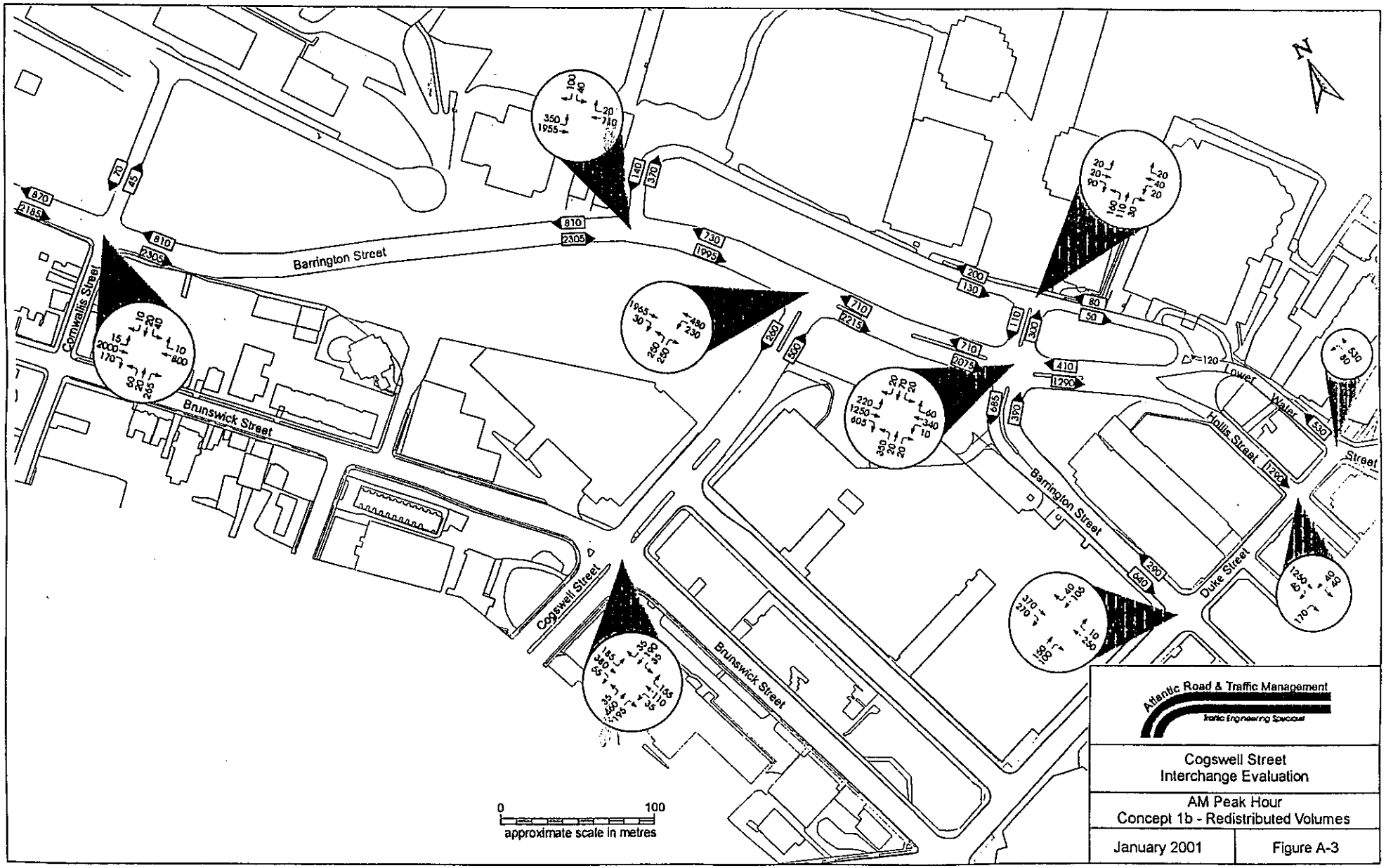
Traffic Engineering Specialist
Cogswell Street
Interchange Evaluation
Existing Road Network
2000 PM Peak Hour Volumes
January 2001
Figure A-2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Brunswick Street
Barrington Street
Duke Street
Hollis Street
Lower Water Street
Cornwallis Street
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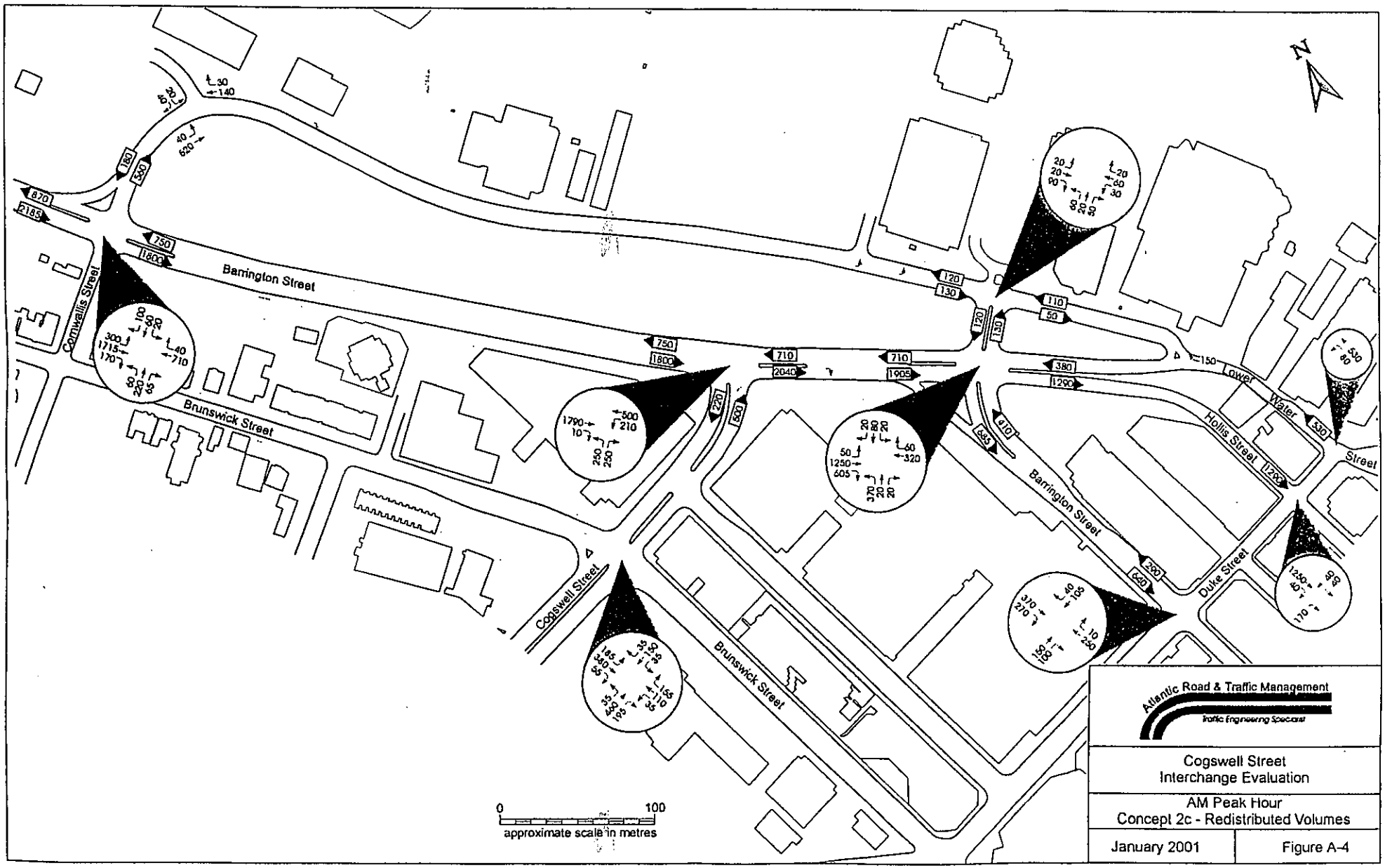
approximate scale in metres
Atlantic Road & Traffic Management
Traffic Engineering Specialists
Cogswell Street
Interchange Evaluation
AM Peak Hour
Concept 1b - Redistributed Volumes
January 2001
Figure A-3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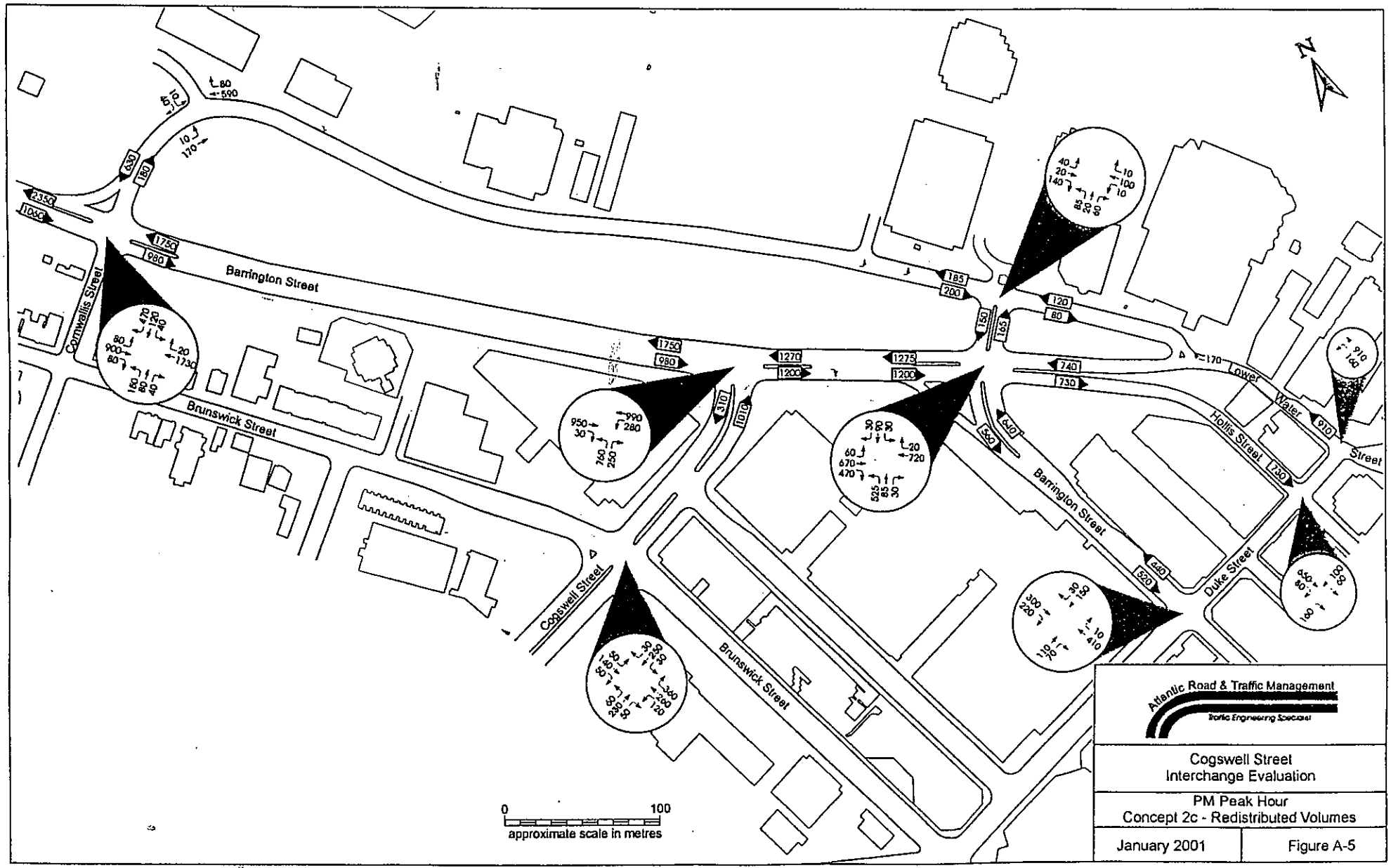
Traffic Engineering Specialist
Cogswell Street
Interchange Evaluation
AM Peak Hour
Concept 2c - Redistributed Volumes
January 2001
Figure A-4


Barrington Street
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Duke Street
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approximate scale in metres
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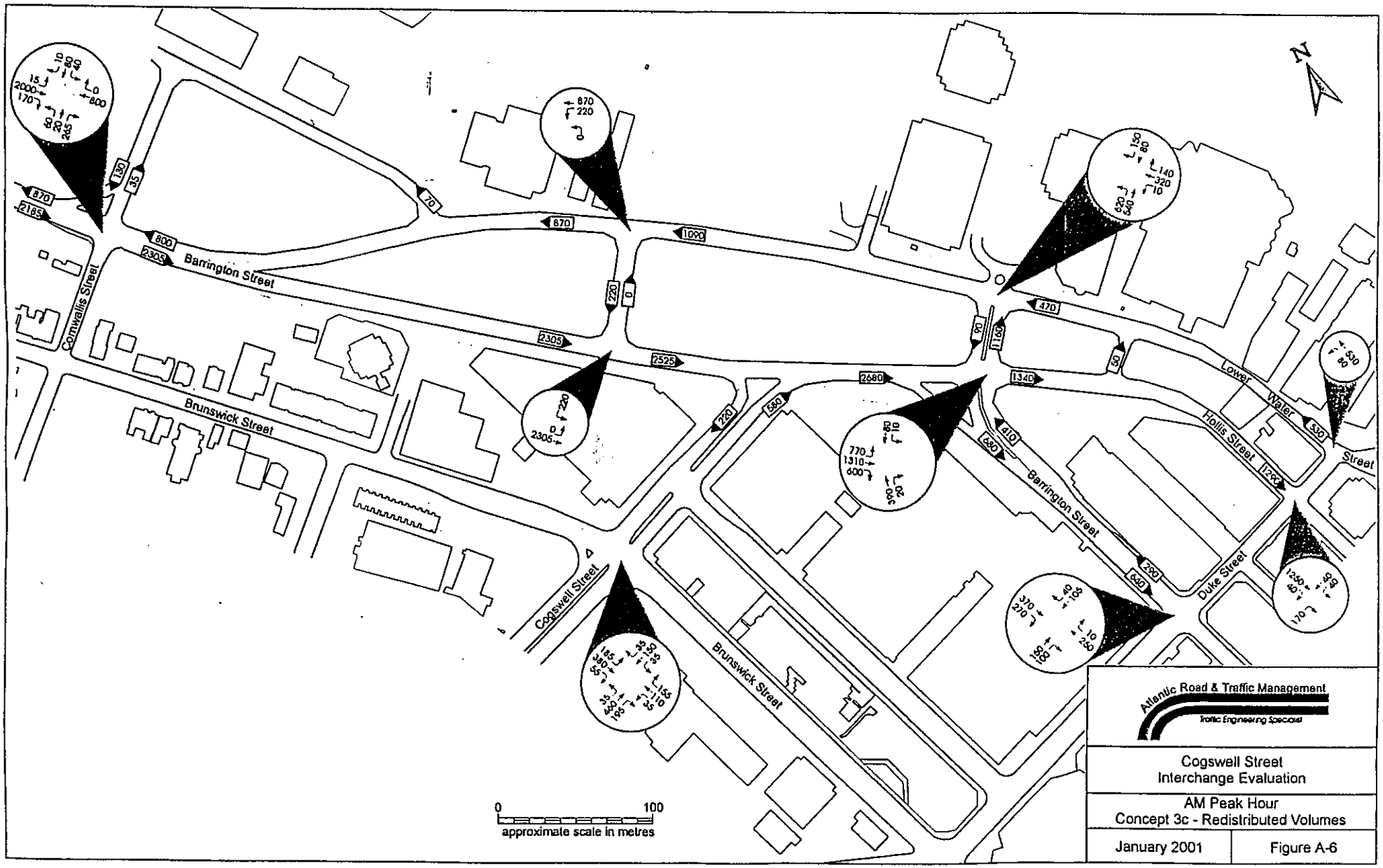
Traffic Engineering Specialist
Cogswell Street
Interchange Evaluation
PM Peak Hour
Concept 2c - Redistributed Volumes
January 2001
Figure A-5



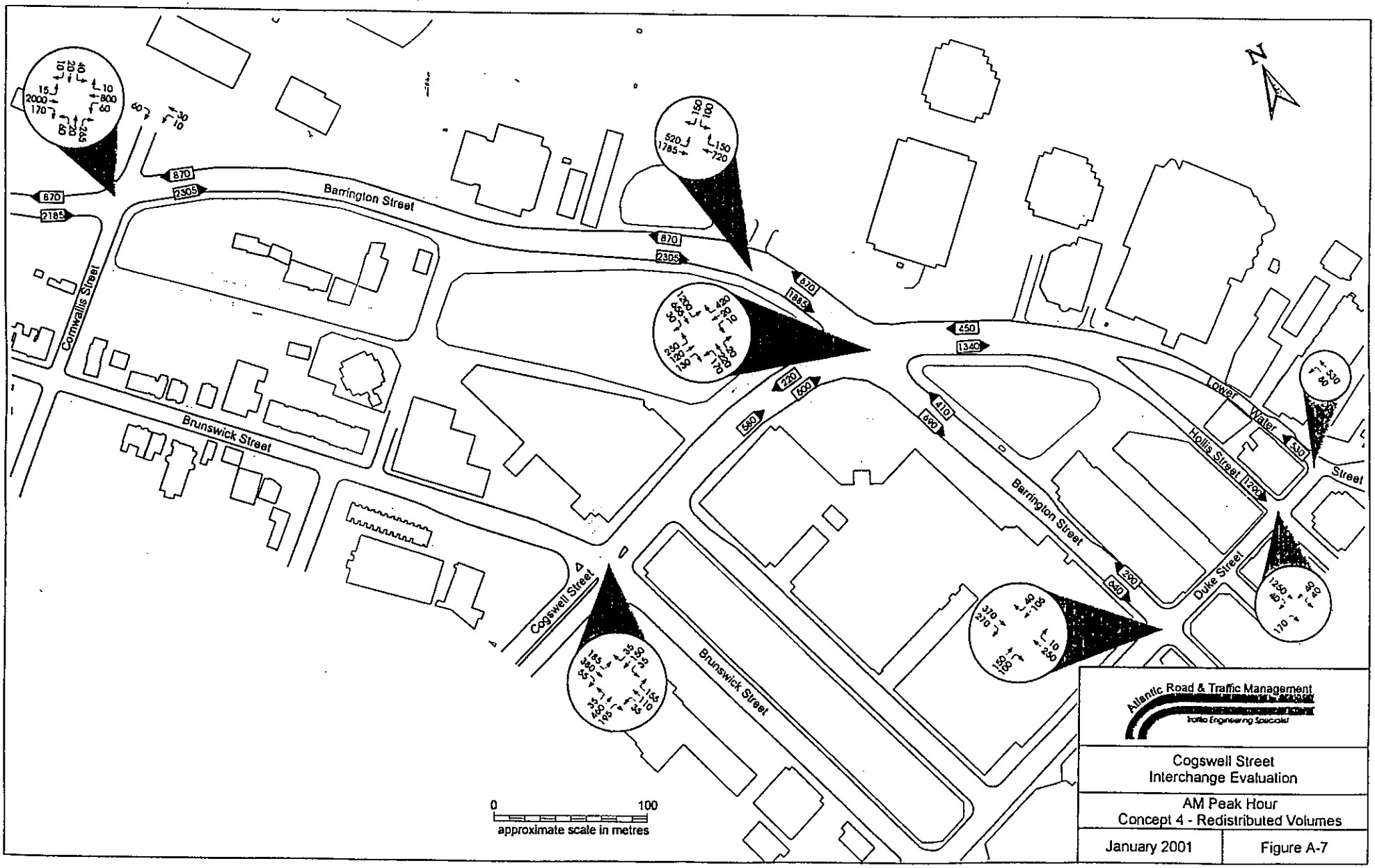
Atlantic Road & Traffic Management
Traffic Engineering Specialist

Cogswell Street
Interchange Evaluation

AM Peak Hour
Concept 3c - Redistributed Volumes

January 2001

Figure A-6


Barrington Street
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Brunswick Street
Cogswell Street
Brunswick Street
Barrington Street
Lower Water Street
Hollis Street
Duke Street
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approximate scale in metres
Atlantic Road & Traffic Management
Traffic Engineering Specialist
Cogswell Street
Interchange Evaluation
AM Peak Hour
Concept 4 - Redistributed Volumes
January 2001
Figure A-7

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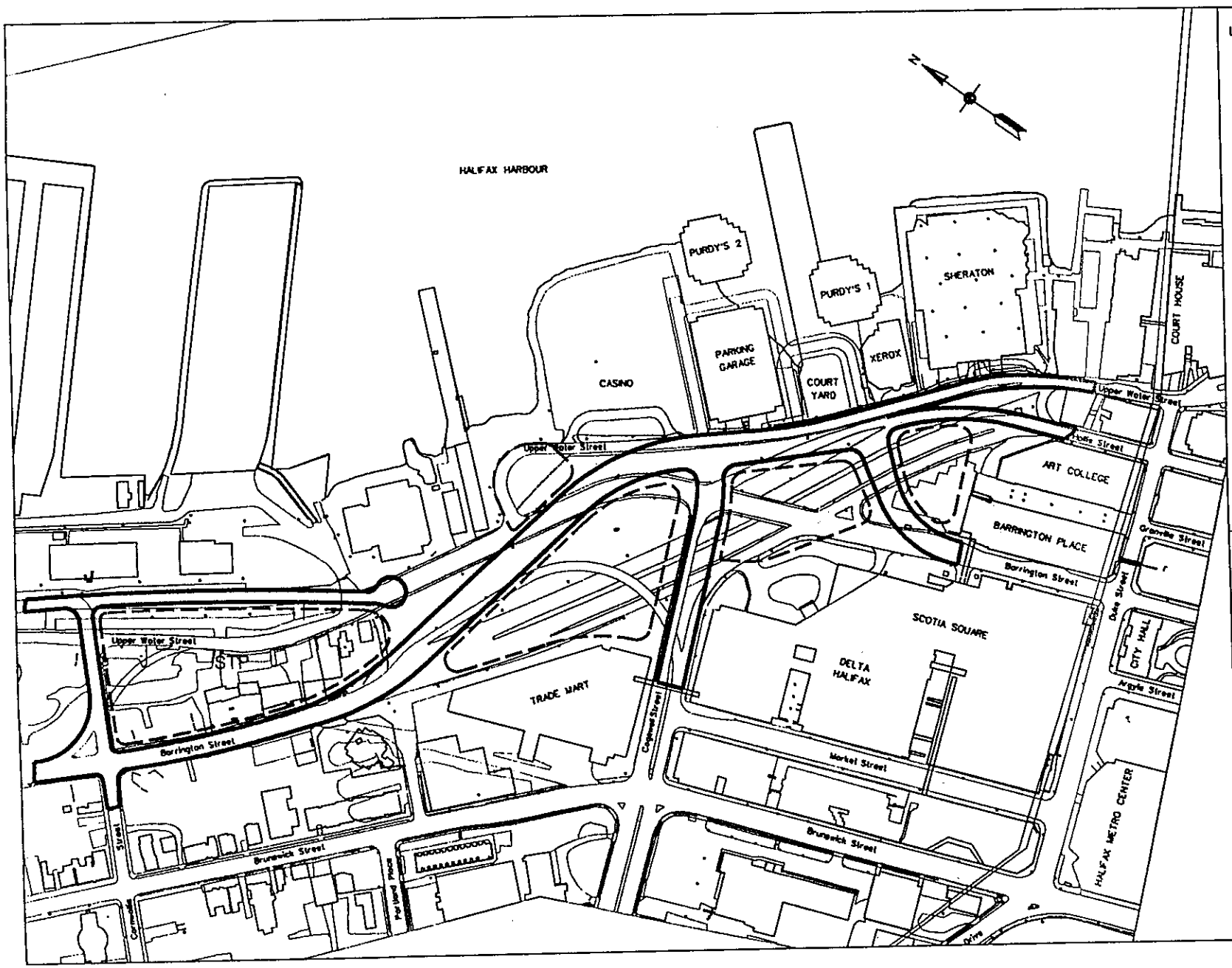
Appendix B - Conceptual Design Alternatives



LEGEND

- Existing roadway
- Proposed Road
- Developable Land
- STP Sewage Treatment Plant

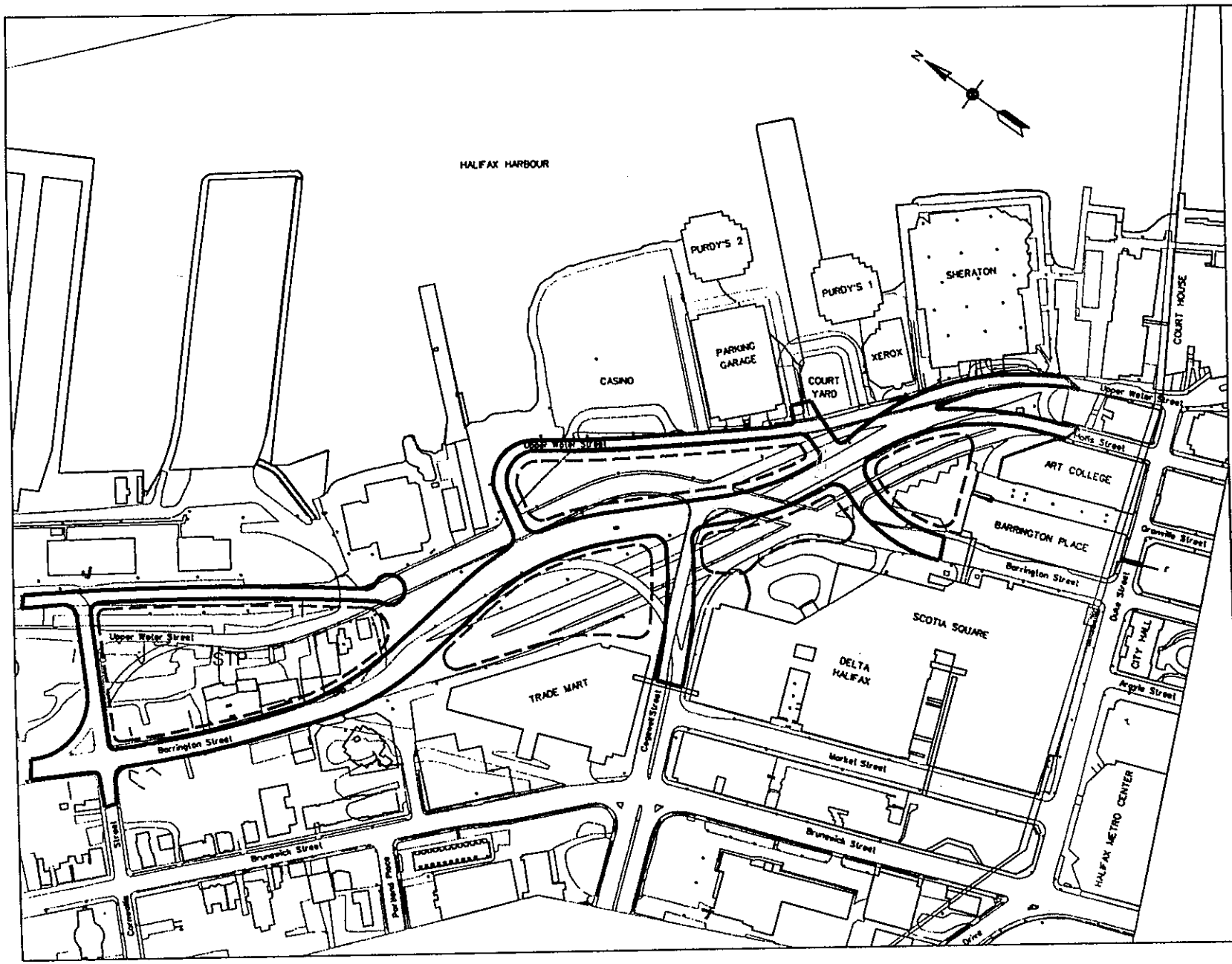
Vaughan Engineering

HALIFAX REGIONAL MUNICIPALITY

COGSWELL STREET INTERCHANGE STUDY

CONCEPT NO. 1(a) SINGLE ARTERIAL

Project No.	Plan No.
3180	0000102



LEGEND

- Existing roadway
- Proposed Road
- Developable Land
- STP Sewage Treatment Plant

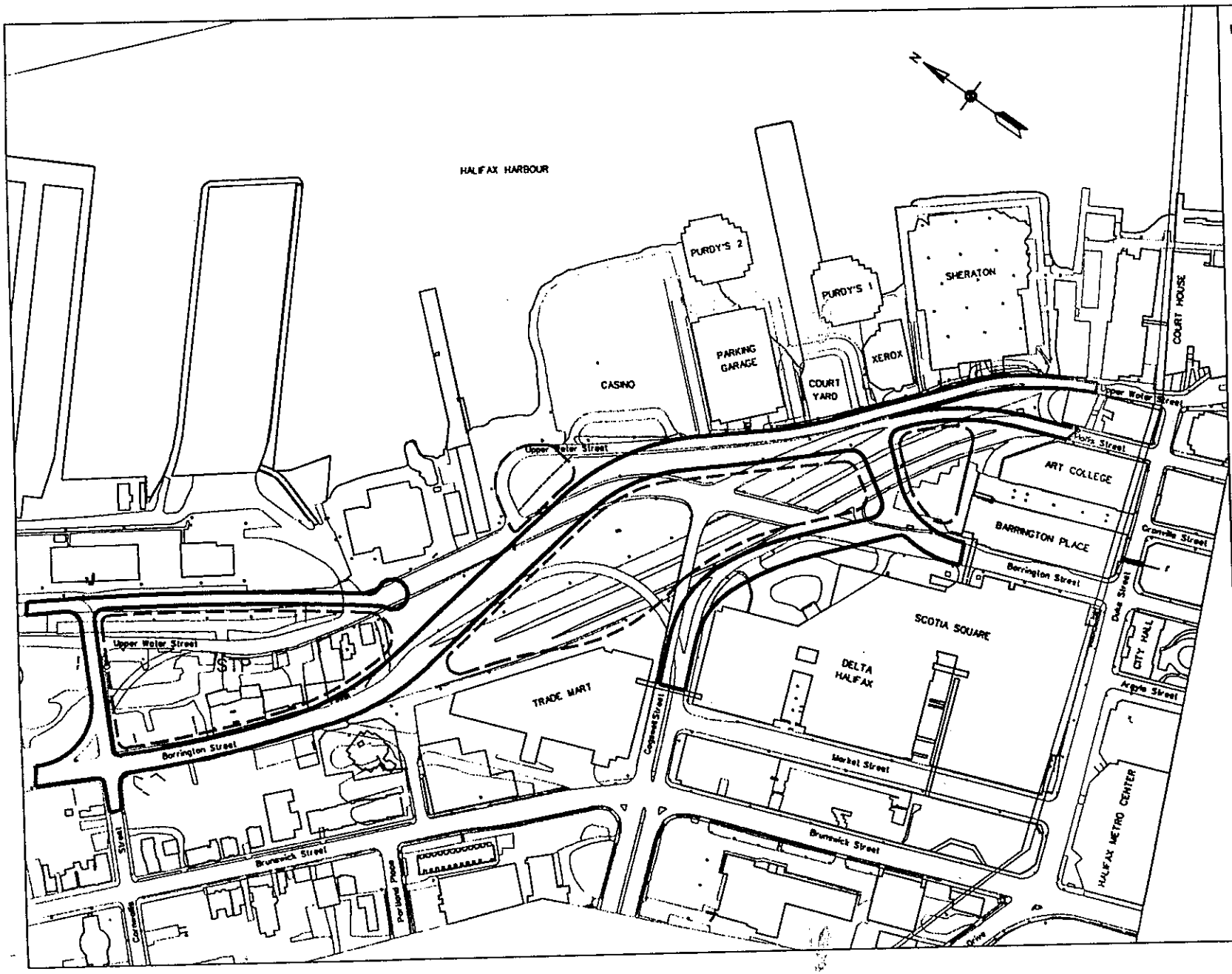
Vaughan Engineering

HALIFAX REGIONAL MUNICIPALITY

COGSWELL STREET INTERCHANGE STUDY

CONCEPT NO. 1(b)
SINGLE ARTERIAL
WITH SERVICE ROAD

Project No.	Plan No.
3180	0000103



LEGEND

- Existing roadway
- Proposed Road
- Developable Land
- STP Sewage Treatment Plant

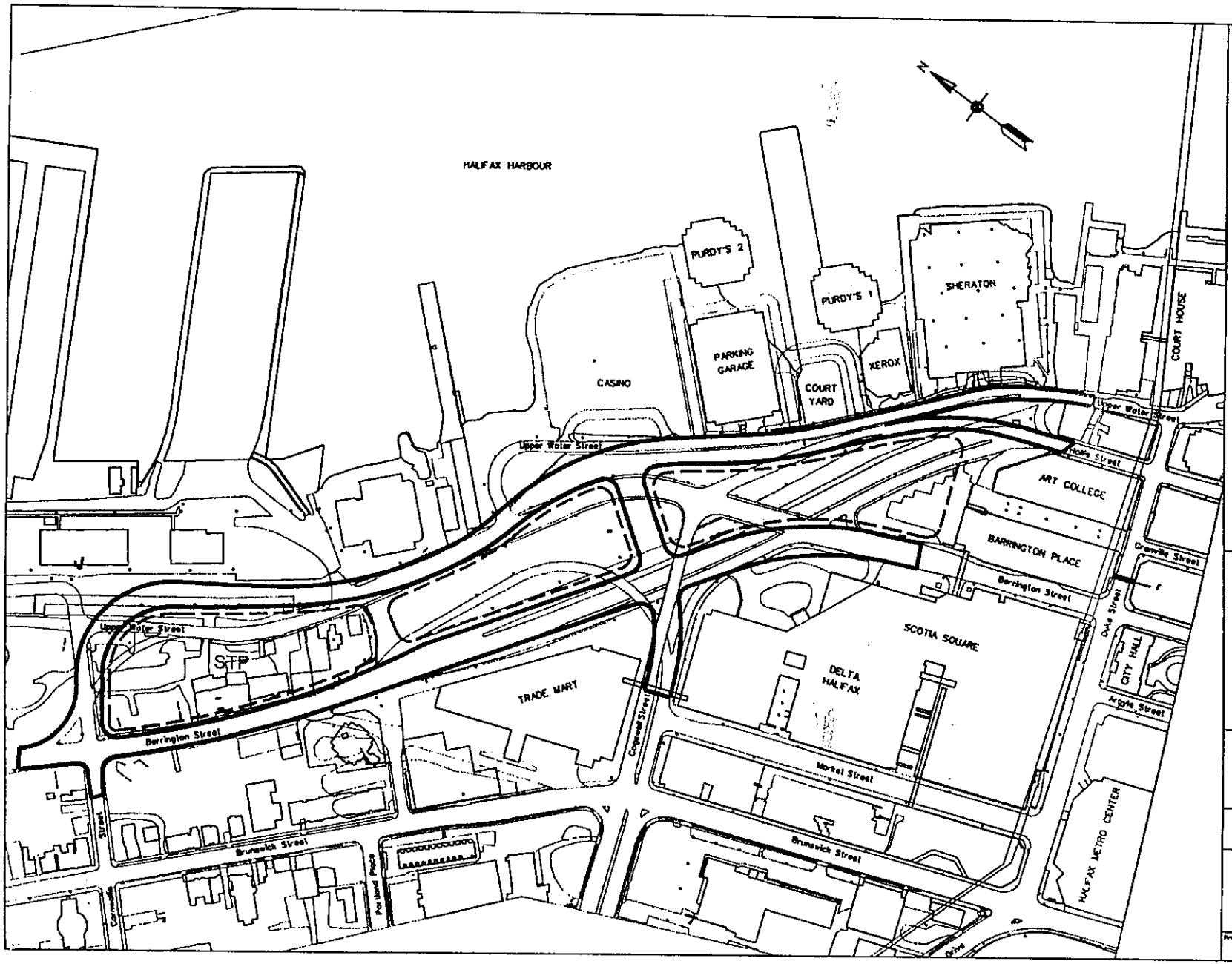
Vaughan Engineering

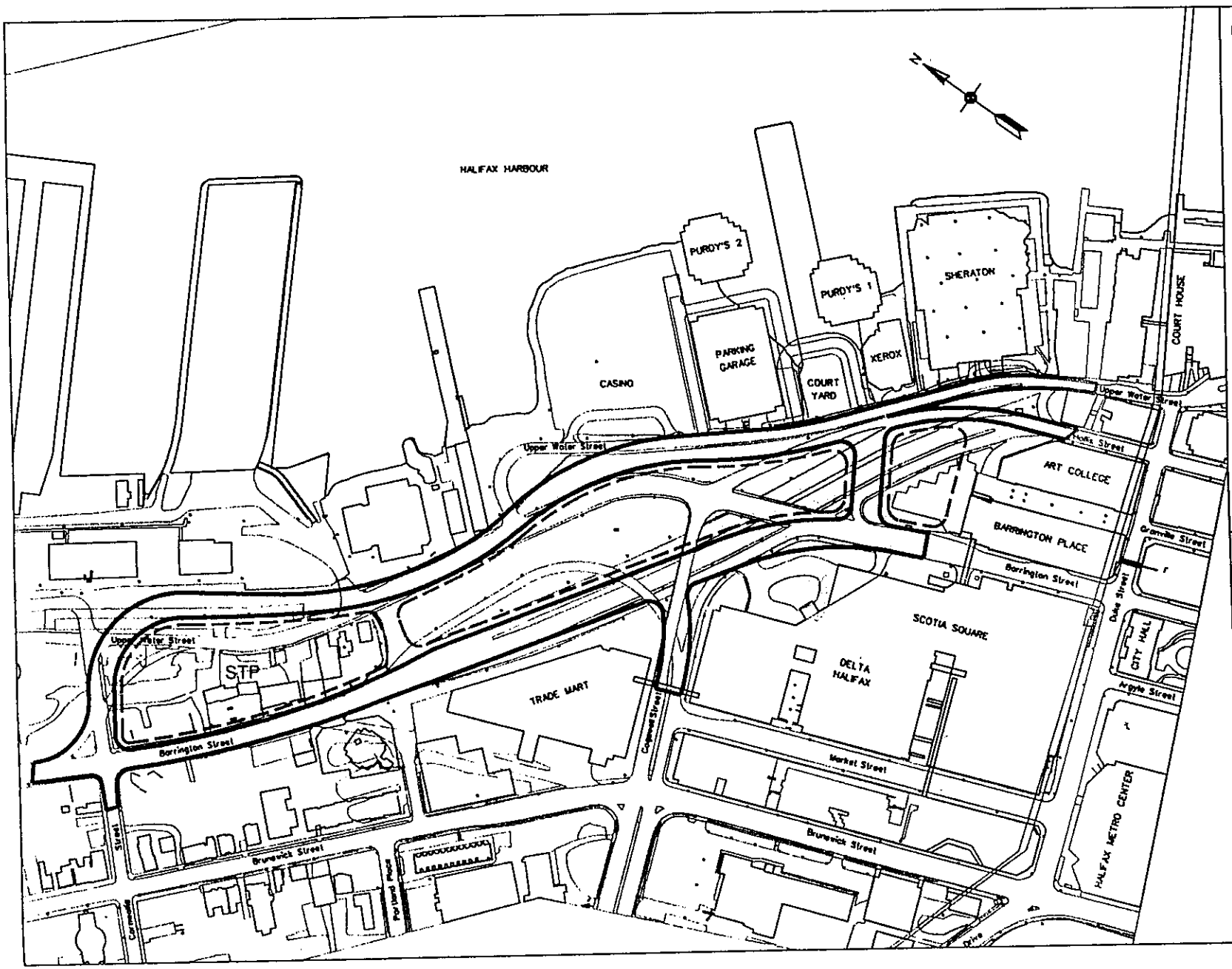
HALIFAX REGIONAL MUNICIPALITY

COGSWELL STREET INTERCHANGE STUDY

CONCEPT NO. 1(c) SINGLE ARTERIAL

Project No.	Plan No.
3180	0000104


HALIFAX HARBOUR
PURDY'S 2
PURDY'S 1
SHERATON
COURT HOUSE
PARKING GARAGE
CASINO
COURT YARD
XEROX
Upper Water Street
Upper Water Street
Upper Water Street
ART COLLEGE
BARRINGTON PLACE
Barrington Street
Granville Street
Duke Street
SCOTIA SQUARE
DELTA HALIFAX
CITY HALL
Argyle Street
STP
TRADE MART
Barrington Street
Cogswell Street
Market Street
Brunswick Street
Brunswick Street
Portland Place
HALIFAX METRO CENTER
LEGEND
Existing roadway
Proposed Road
Developable Land
STP Sewage Treatment Plant
Vaughan Engineering
HALIFAX
REGIONAL MUNICIPALITY
COGSWELL STREET
INTERCHANGE STUDY
CONCEPT NO. 2(a)
PARALLEL STREETS
Project No. 3180
Print No. 0000105



LEGEND

- Existing roadway
- Proposed Road
- Developable Land
- STP Sewage Treatment Plant

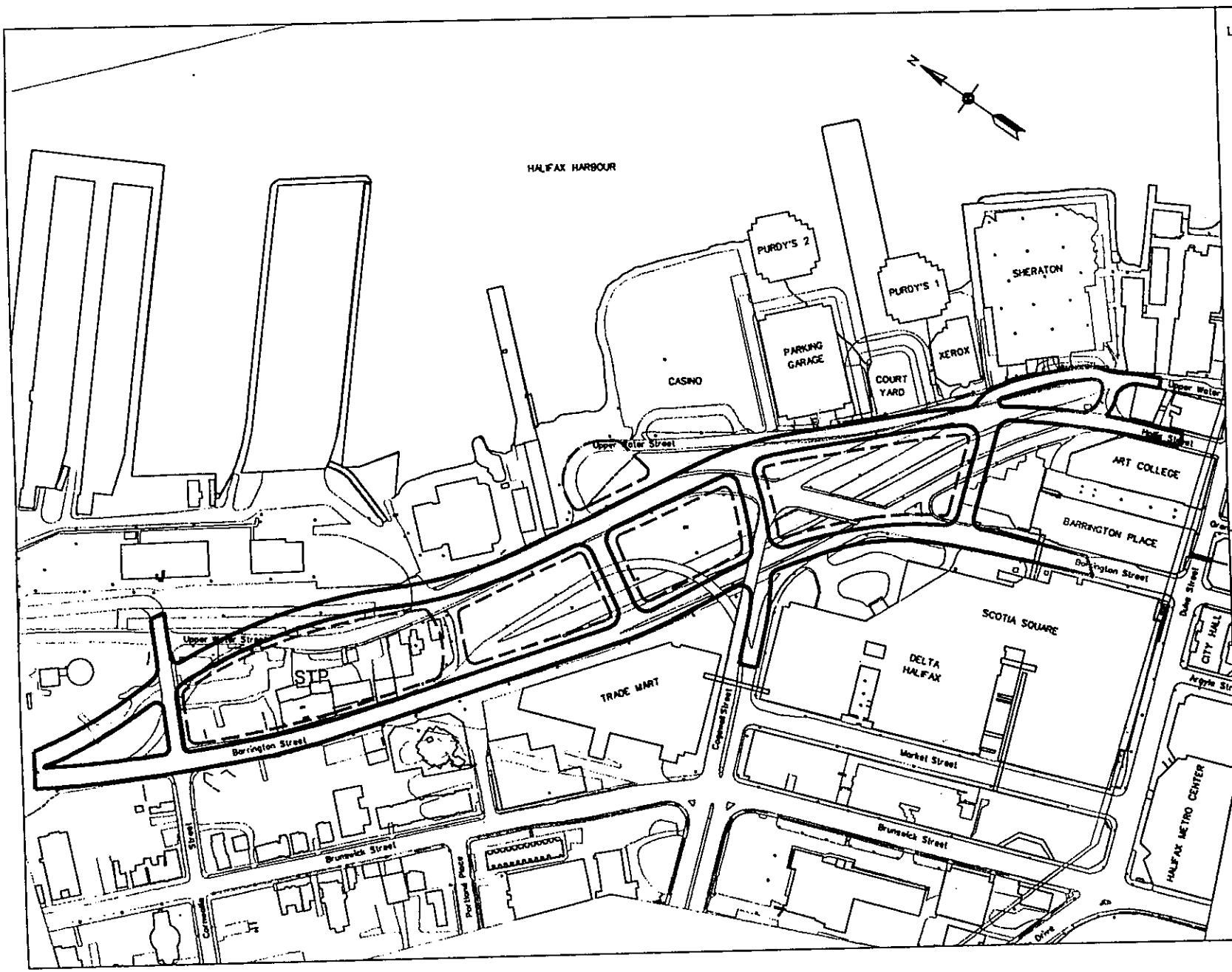
Vaughan Engineering

HALIFAX REGIONAL MUNICIPALITY

COGSWELL STREET INTERCHANGE STUDY

CONCEPT NO. 2(b) PARALLEL STREETS

Project No.	Plan No.
3180	0000106



LEGEND

- Existing roadway
- Proposed Road
- Developable Land
- STP Sewage Treatment Plant

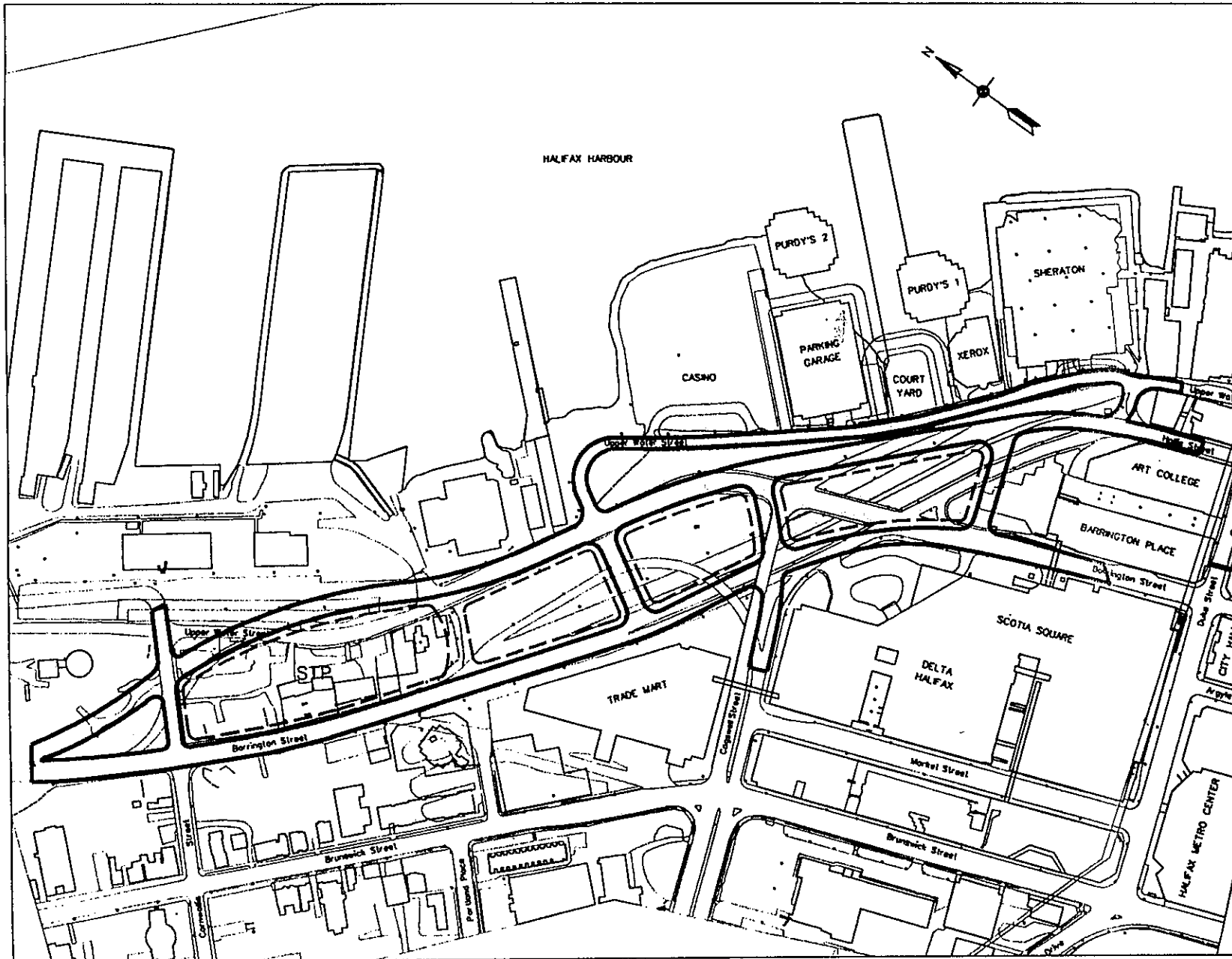
Vaughan Engineering

HALIFAX
REGIONAL MUNICIPALITY

COGSWELL STREET
INTERCHANGE STUDY

CONCEPT NO. 3(a)
ONE-WAY STREETS

Project No.	Print No.
3180	0000107



LEGEND

Existing roadway

Proposed Road

Developable Land

STP Sewage Treatment Plant

Vaughan Engineering

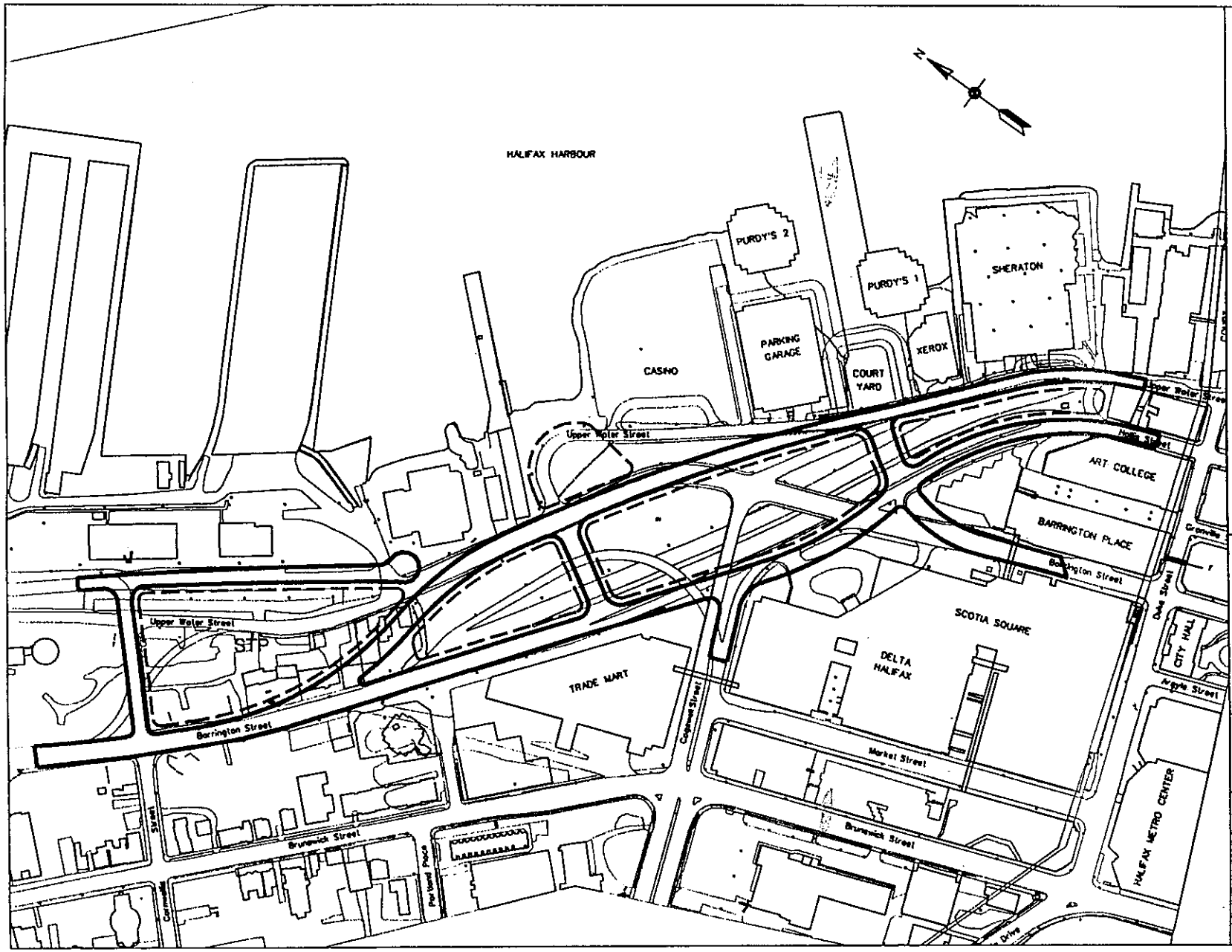
HALIFAX
REGIONAL MUNICIPALITY

COGSWELL STREET
INTERCHANGE STUDY

CONCEPT NO. 3(b)
ONE-WAY STREETS
WITH SERVICE ROAD

Project No. 3180

Plan No. 0000108



LEGEND

- Existing roadway
- Proposed Road
- Developable Land
- STP Sewage Treatment Plant

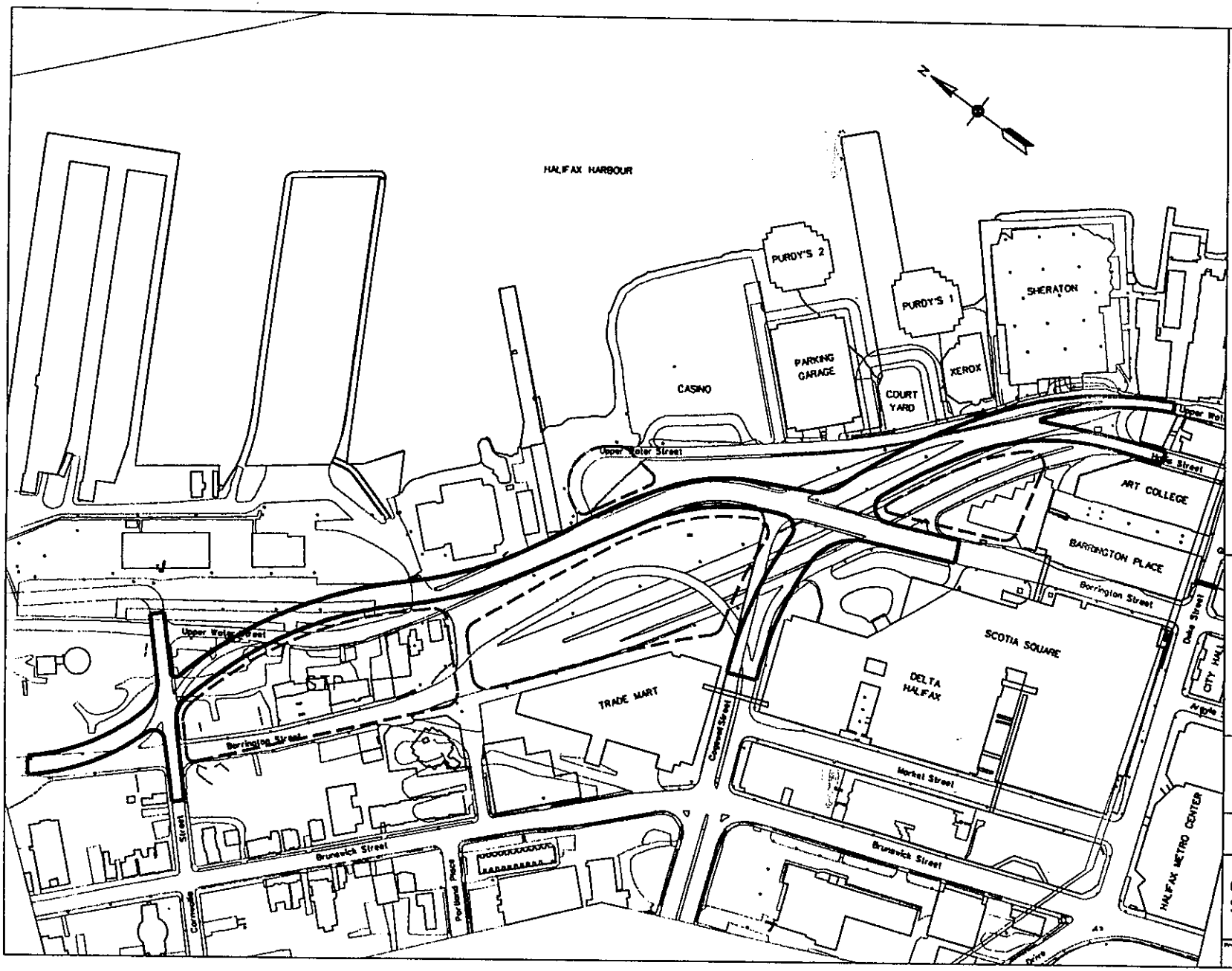
Vaughan Engineering

HALIFAX REGIONAL MUNICIPALITY

COGSWELL STREET INTERCHANGE STUDY

CONCEPT NO. 3(c)
ONE-WAY STREETS

Project No.	Plan No.
3180	0000109



LEGEND

- Existing roadway
- Proposed Road
- Developable Land
- STP Sewage Treatment Plant

Vaughan Engineering

HALIFAX REGIONAL MUNICIPALITY

COGSWELL STREET INTERCHANGE STUDY

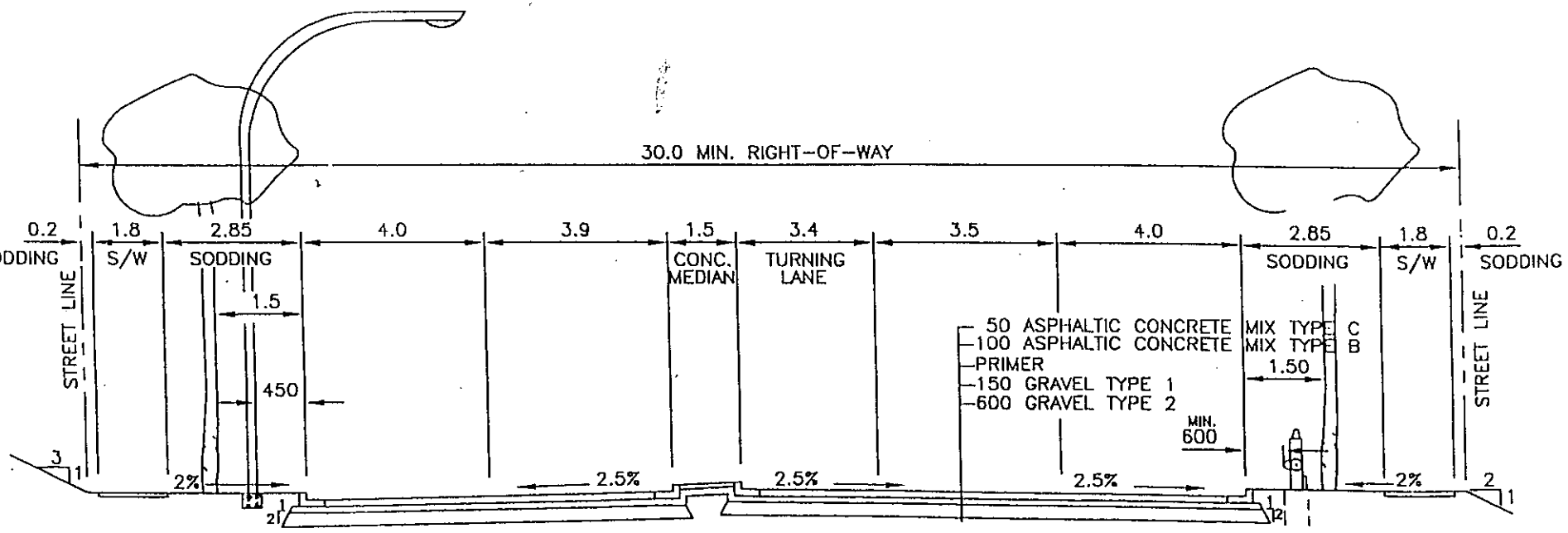
CONCEPT NO. 4
SINGLE INTERSECTION

Project No. 3180

Plan No. 0000110

Vaughan Engineering

Appendix C - Cross Sections



CROSS SECTION

NOTES:

1 ADDITIONAL ROADBED AND SLOPE STABILIZATION AS REQUIRED BY GEOTECHNICAL REPORT.

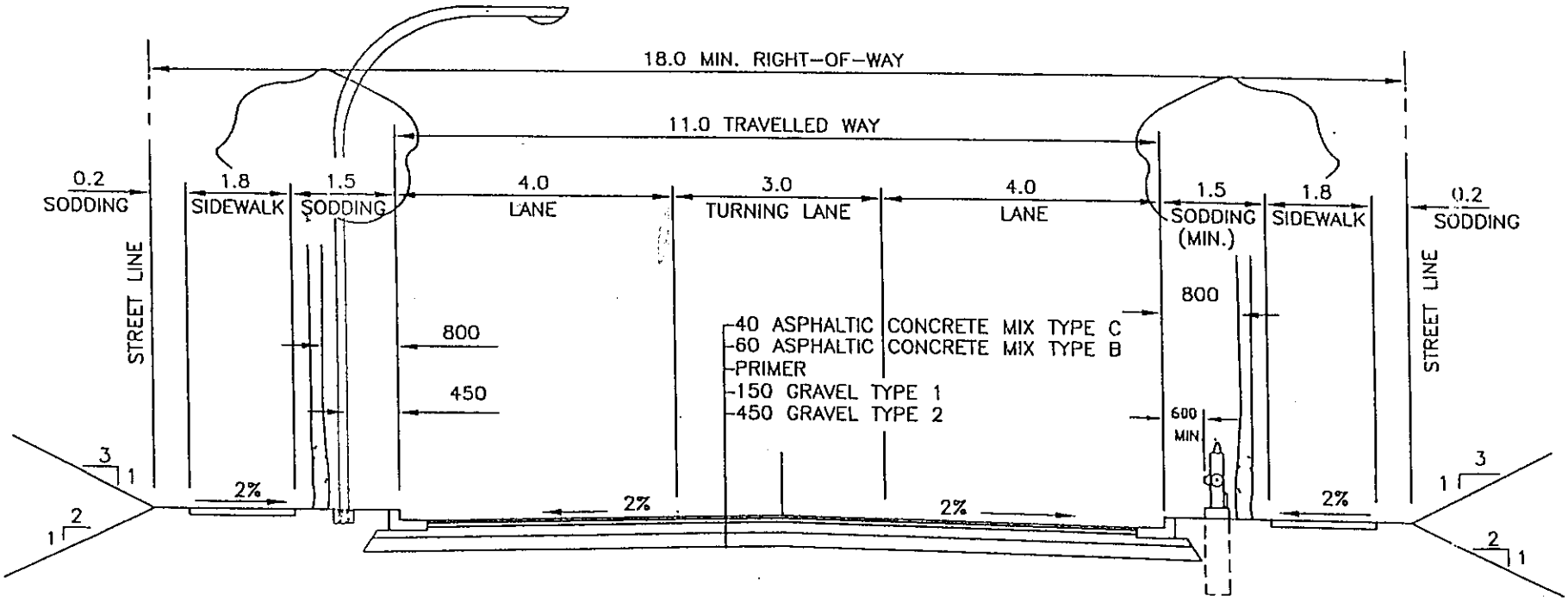
2 SLOPE GUTTER PLATE OF MEDIAN CURB AND GUTTER TO MATCH CROSS SLOPE OF PAVEMENT.

HALIFAX
REGIONAL MUNICIPALITY
PUBLIC WORKS AND TRANSPORTATION

STANDARD DETAIL

30.0 m URBAN ARTERIAL WITH TURNING LANE

DATE: 00/01/24	REFERENCE	APPROVED
SCALE: NTS		FIG. NO. 7.02600.14



CROSS SECTION

NOTE:

ADDITIONAL ROADBED AND SLOPE STABILIZATION AS REQUIRED BY GEOTECHNICAL REPORT.

HALIFAX
REGIONAL MUNICIPALITY
PUBLIC WORKS AND TRANSPORTATION

STANDARD DETAIL

18.0 m URBAN MINOR COLLECTOR WITH TURNING LANE

DATE: 00/01/24	REFERENCE	APPROVED
SCALE: NTS		FIG. NO. 7.02600.10