Corporation of the
City of Windsor

ENVIRONMENTAL STUDY REPORT

CLASS ENVIRONMENTAL ASSESSMENT

TWIN OAKS BUSINESS PARK
CITY OF WINDSOR

MARCH 1997

CONSULTING ENGINEERS

LAFONTAINE, COWIE, BURATTO
& ASSOCIATES LIMITED
WINDSOR - LONDON

EXECUTIVE SUMMARY

The City of Windsor has identified a requirement for additional serviced industrial property to meet existing and future growth demands. The City proposes developing the property known as Twin Oaks Business Park located at the southeast corner of E. C. Row Expressway and Lauzon Parkway.

Planning for this project is being undertaken in accordance with the requirements of the Environmental Assessment Act. Watermains, sanitary sewers and storm sewers have been identified as Schedule 'B' works. With completion of the Phase 1/2 Environmental Study Report (ESR) in October, 1996, the City is in a position to proceed with the planning, design and construction of these works. Roads, a bridge across Little River and stormwater management works have been identified as Schedule 'C' activities. Final design and construction of these works can proceed 30 days after the Phase 3 ESR is adopted by Council and Notification of Completion of the ESR has been published in the newspaper provided any concerns have been addressed and there is no request for a 'bump up' to an individual environmental assessment.

Two open house drop-in centres were held during the planning process; one during Phase 2 of the process on August 29th, 1996 and one during Phase 3 on January 9th, 1997. Comments were received and have been addressed in this study.

The primary concern indicated at the open house meetings was traffic access to the site. Accordingly, a Traffic Impact Study was prepared to address the concern. The report determined the increase in traffic due to development of the park could not be safely accommodated on the existing road system.

The report reviews 14 different options to alleviate these problems and recommends the following staged approach.

A. Up to development of approximately 24 hectares (60 acres)

1. Construct a 90 metre left turn bay in the Lauzon Parkway median north of the South Service Road intersection.

2. Signalize the South Service Road intersection including warning lights south of the South Service Road.

B. Up to development of 75 hectares (185 acres)

3. Realign and signalize the ramp from E. C. Row eastbound to Lauzon Road southbound.

4. Extend the left turn bay in the Lauzon Parkway median north of the South Service Road intersection to 175 metres.

5. Realign and signalize the southbound Lauzon Parkway to eastbound E. C. Row Expressway ramp.

C. For development greater than 75 hectares (185 acres)

6. Construct a new ramp into Twin Oaks east of Lauzon Parkway from the eastbound lanes.

7. Install traffic signals at the intersection of Lauzon Parkway northbound at the ramp to E. C. Row Expressway westbound if traffic volumes warrant.

8. Install traffic signals at the intersection of Lauzon Parkway northbound at the ramp to E. C. Row Expressway eastbound if traffic volumes warrant. ?

D. Future when warranted.

Construction of E. C. Row/Banwell Road interchange.

Another issue addressed is stormwater management. Planning and design of stormwater management facilities has been carried out in accordance with the requirements of the MOEE and ERCA to address both water quality and quantity issues. A unique feature in this case is that the Twin Oaks development is directly under the flight path into the Windsor Airport. Stormwater Management options are restricted to those that will not attract waterfowl such as geese. This eliminated options such as wet ponds or constructed wetlands. Due to the predominance of native clay materials, options which involved percolation of stormwater into the ground were also eliminated. It was ultimately determined the best option was to widen the existing Little River channel to provide the required storage capacity and to improve the river cross-section with flatter slopes for stabilization of the banks and to provide an area for a walkway/bikeway along the side of the channel. The study found the recommended design will not increase downstream flows or water levels due to development of Twin Oaks.

A new bridge is required across Little River as part of the new road construction. Measures will be taken during construction of the bridge to control erosion and sedimentation in the river channel. The existing Lauzon Road bridge will eventually be removed.

Through the 30 day review period, public concerns and comments regarding development of the Twin Oaks Business Park will continue to be received and addressed.

CORPORATION OF THE CITY OF WINDSOR

TWIN OAKS INDUSTRIAL PARK

CLASS ENVIRONMENTAL ASSESSMENT

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PHASE 1: PROBLEM IDENTIFICATION AND PLANNING PROCESS

1.0 INTRODUCTION

1.1 DESCRIPTION OF UNDERTAKING

The City of Windsor (City) has identified a need for additional serviced industrial property to meet existing and future growth demands. To meet this need, the City intends to provide municipal services for a proposed industrial park in the south east area of the City. This area, known as the Twin Oaks Business Park is comprised of approximately 200 acres of land and is bounded on the north by the E. C. Row Expressway, on the south by the Canadian Pacific Railway, on the west by Lauzon Parkway and on the east by the City of Windsor/Township of Sandwich South boundary (see Appendix - Study Area).

The purpose of this report is to document the planning process followed for the project in leading up to the recommended solution and design concept while considering the impacts on the natural and socio-economic environments and the corresponding mitigating measures. Planning for this project is being undertaken in compliance with requirements of the Environmental Assessment Act following the procedures set out in the Class Environmental Assessment documents for Municipal Road Projects and for Municipal Water and Wastewater Projects.

It should be noted that Twin Oaks is officially designated as a Business Park. Any references to an Industrial Park refer to the Twin Oaks Business Park.

1.2 BACKGROUND

A report was prepared for the City in 1987[1] and an updated report issued in 1990[2], setting out estimated costs to provide internal services for a proposed industrial park in the area referenced above. The report included an overall study area of approximately 420 acres of land. Initially 100 acres of this area was in the City and the remainder in the Township of Sandwich South. Negotiations between the two municipalities resulted in a servicing agreement and boundary adjustment such that 200 acres are now in the City and 220 acres in the Township. Details of the Annexation Agreement are contained in the Appendix.

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1 Servicing Study - Lauzon Parkway - Banwell Road Proposed Industrial Park - 1987 - LaFontaine, Cowie, Buratto & Associates Limited

2 Servicing Study - Lauzon Parkway - Banwell Road Proposed Industrial Park - 1990 - LaFontaine, Cowie, Buratto & Associates Limited

1.3 PROBLEM IDENTIFICATION

A need for serviced industrial land to meet existing and future growth demands has been identified by the City. The City is interested in exploring the feasibility of developing an industrial park as a municipal undertaking. LaFontaine, Cowie, Buratto & Associates Limited (LCBA) have been retained by the City to prepare the Class Environmental Assessment (EA) document and to provide engineering services for the proposed development.

The issues to be resolved involve the provision of all internal servicing for the subject land and include new roads, bridge(s) over watercourses, water distribution and wastewater collection systems, stormwater management facilities and utility servicing (electricity, telephone, gas, etc.) and appropriate parks and recreational requirements. This undertaking is being carried out in accordance with the planning procedures approved under the Environmental Assessment (EA) Act.

2.0 ENVIRONMENTAL ASSESSMENT PROCESS

2.1 GENERAL

In recent years, the need to more directly involve the public in the decision making process for public projects was recognized and in some cases demanded by the public. The Environmental Assessment Act (EA Act) was passed in 1975 by the Provincial government to provide a mechanism for public participation in public projects.

The EA Act provides a means for the public or interest groups to receive the needed assurances that the environment is being protected from adverse effects of any significant public project. If there are adverse impacts on the environment, there must be assurances that all essential measures are taken to minimize these impacts. The proponent for the project must evaluate a number of possible alternatives to achieve the desired objective and to select the best alternative based on a thorough examination.

The EA Act recognized that certain municipal undertakings occur frequently, are relatively small in scale, have a generally predictable range of effects or have relatively minor environmental significance. To ensure that a degree of standardization in the planning process is followed throughout the Province and to avoid costly individual environmental assessments, the EA Act contemplated the use of the Class EA procedure for projects which require approval under the Act but which are not considered to be major environmental works.

This document follows the planning procedures approved under the EA Act as provided in the documents titled "Class Environmental Assessment for Municipal Road Projects - June 1993" and "Class Environmental Assessment for Municipal Water and Wastewater Projects - June 1993" as prepared by the Municipal Engineers Association (MEA).

The Class EA document also serves as a statement for public use in the decision making process under the EA Act. Municipal staff and their consultants can use the Class EA in the planning, design and construction of projects to ensure that the requirements of the EA Act are met. As part of Class EA procedure, the proponent is required to state how the project is to proceed to gain approval under the EA Act. There are three approval mechanisms available to a proponent under the Class EA. These are Schedule A, project approved; Schedule B, project approved subject to screening, and finally, projects which require the preparation of an Environmental Study Report (ESR) which are referred to as Schedule C.

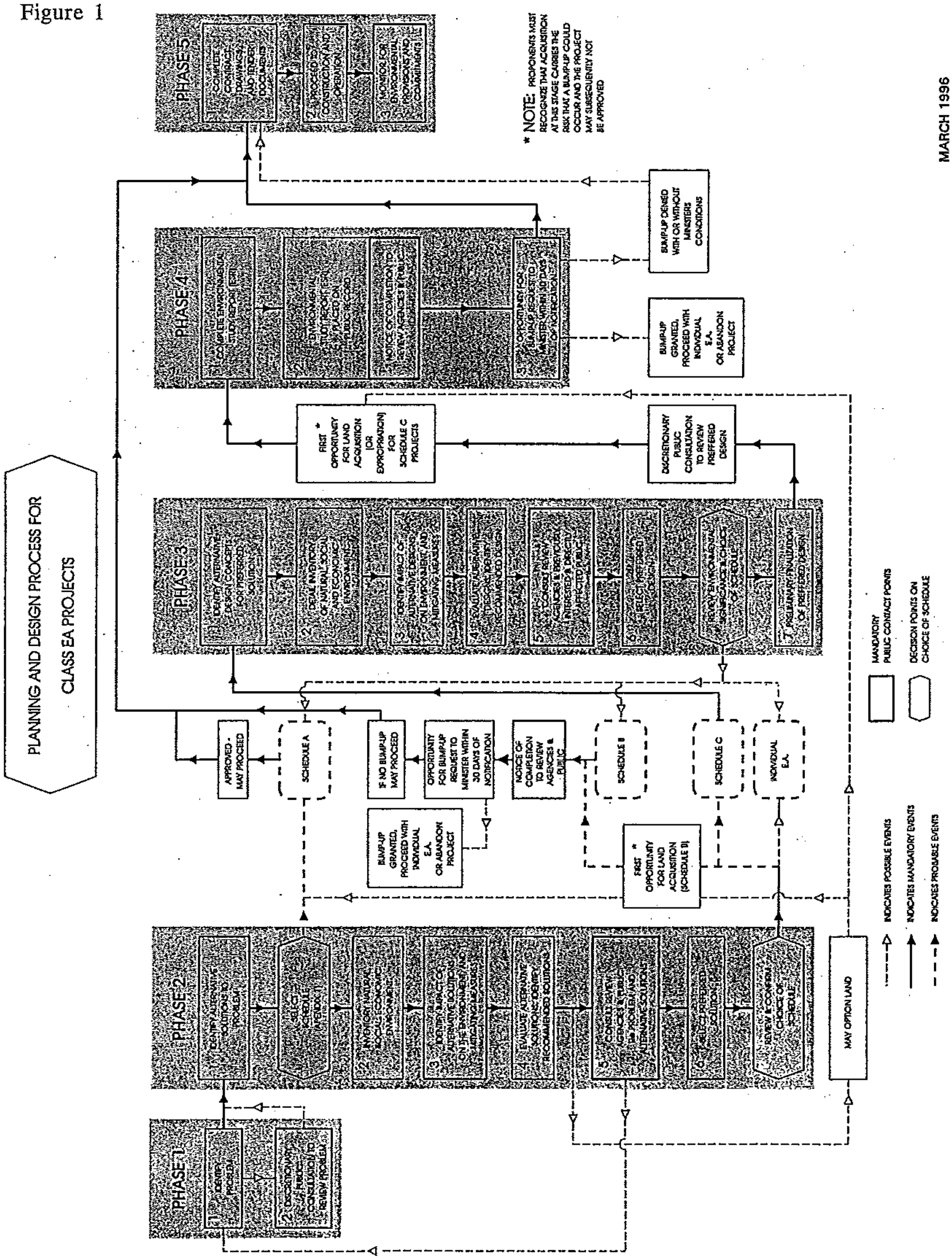
From a review of internal servicing cost estimates and the criteria contained in the Class EA documents, it appears the proposed undertaking is a Schedule C activity because the proposed works include **construction of new roads not shown on an approved development plan and in excess of $1.5 million** (including a new bridge). However, other servicing components such as watermains, stormwater management and sanitary sewage collection qualify as Schedule B activities. Phases 1 & 2 of this report satisfy all the requirements for Schedule B activities and part of the requirements for Schedule C activities. Phase 3 of this report satisfies the remaining requirements for the Schedule C work and includes stormwater management water quality/quantity issues and other works related to Little River.

2.2 PROJECT STAGES AND ORGANIZATION

The Class EA document provides a flow diagram outlining in general terms the process to be followed through the five phases of the process required for a Schedule C activity. The diagram is shown on Page 4 and the phases are summarized as follows:

Phase 1	-	Identification of problem
Phase 2	-	Identification of alternative solutions to the problem, selection of the preferred alternative and identification of the project as a Schedule A, B or C activity.
Phase 3	-	Identification of alternative design concepts (technical alternatives) to achieve the preferred alternative weighing these against one another to select the preferred technical design. The ESR is to outline and summarize the options considered and provide possible methods of mitigating any adverse impacts the project might have on the environment.
Phase 4	-	Review and acceptance by the public and government agencies of the ESR which establishes the overall design concept which is to be used in final design.
Phase 5	-	Final design, construction and commissioning of the selected technical alternative.

Figure 1


PLANNING AND DESIGN PROCESS FOR
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MARCH 1996

2.3 PROJECT TEAM

The Proponent for the project is:

The Corporation of the City of Windsor
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350 City Hall Square West
Windsor, Ontario
N9A 6S1

Att. Mr. G. T. Harding, P. Eng.
Commissioner of Works

The Consulting Engineers are:

LaFontaine, Cowie, Buratto
& Associates Limited
3260 Devon Drive
Windsor, Ontario
N8X 4L4

Att. Mr. Harold Horneck, P. Eng.
Project Manager

2.4 PUBLIC AND REVIEW AGENCY PARTICIPATION

In accordance with the requirements of the Class Environmental Assessment process, the public and various review agencies must be advised of certain milestones in the planning process in order to provide the opportunity for their involvement. There are two points of mandatory contact where the review agencies and public are consulted. The first occurs near the end of Phase 2 of the planning process and the second occurs near the end of Phase 3. The following sections provide a summary of comments received during the two consultation points.

2.4.1 Phase 2 Consultation

The Phase 2 consultation included publication of a notice in the Windsor Star advising the public of the project and inviting comments with respect to the problem definition and recommended alternative solution. In addition, a public open house was held to review the alternative solutions and to receive comments related to various design alternatives for consideration and incorporation into the final design.

In addition, the Phase 2 consultation included advising various review agencies of the project. A copy of the notice published in the Windsor Star along with a copy of the Draft Phase 1 & 2 Report were forwarded to the various review agencies with a letter advising of the proposed development and soliciting comments or concerns. The Appendix contains all comments received from both the public and review agencies. Also included in the Appendix is a copy of the Notice of Project Advertisement, Notice of Public Open House and information provided at the Open House.

Following is a summary of the comments received and the related issues resulting from the Phase 2 consultation.

1. Traffic

   - Concern with possible traffic signal at Lauzon Parkway and Industrial Park entrance.

   - Concern with sight distance at proposed intersection.

- Concern with potential lane crossing required for vehicles leaving the Park to get onto E. C. Row.

To address these concerns, a Traffic Impact Study was prepared. The impact study includes review of existing traffic on roads adjacent to the site and provides future traffic projections based on the proposed development of the Industrial Park. It deals with potential access problems to Lauzon Parkway and possible signalization. The study also predicts the impact of phasing the construction and outlines at what level of development specific improvements will be required. Details of the traffic impact are provided in Section 5.2.

2. Stormwater Management

- Concern with potential for aggravating reported flooding problems north of E. C. Row and south of the site.

- Concern with creation of wetland/wet pond in the Windsor Airport flight path due to problems associated with the attraction of waterfowl.

- Preference for dry ponds or in-channel storage along Little River to accommodate the increased stormwater runoff from the Industrial Park.

Details regarding Stormwater Management including the selection of the preferred option for controlling stormwater quantity and quality are provided in Section 5.1.

3. Recreation

- Preference for a walkway/bikeway along the Little River corridor through the park.

Recreation issues will be addressed during final design in consultation with the City of Windsor Parks and Recreation Department.

4. Zoning

- Concerns about allowable building height, especially as it concerns the Windsor Airport. There were also concerns expressed regarding the height of traffic lights at the intersection of Lauzon Parkway and the entrance to the Industrial Park.

Details regarding height restrictions and the impact on the Windsor Airport are discussed in Section 6.2

2.4.2 Phase 3 Consultation

The Phase 3 consultation included publication of a notice in the Windsor Star indicating preferred design concepts had been developed for the Schedule C Activities which include new roads and stormwater management facilities. The notice also invited members of the public to attend an open house to review and discuss these servicing issues.

All comments received as a result of the Open House provided support for the project particularly with respect to the proposed stormwater management alternative (including the greenway/walkway) and the proposed road alignment. Comments received included correspondence form the Little River Enhancement Group, the Essex County Field Naturalists' Club, Mr. S. R. Fulford, the Essex Region Conservation Authority and the Windsor Airport. Copies of these comments are included in the Appendix as well as all Phase 3 Consultation information .

PHASE 2: INVENTORY OF EXISTING NATURAL, SOCIAL AND ECONOMIC ENVIRONMENTS AND EVALUATION OF ALTERNATIVE SOLUTIONS

3.0 EXISTING CONDITIONS

3.1 GENERAL

Alternative ways to address the identified problem must be evaluated on the basis of the potential impact on the existing natural, social and economic environments. The following sections provide a general description of the existing conditions.

3.2 NATURAL ENVIRONMENT

3.2.1 Climate

The climate in Essex County is classified as modified humid continental which has hot and humid summers with mild winters and adequate precipitation. In comparison with the other areas in the Province, Essex County's southerly latitude and proximity to the lower Great Lakes provides for warmer summer and winter temperatures with a longer growing season. Because the area is also on one of the major continental storm tracks, it experiences wide variations in day to day weather including severe summer thunderstorms. The normal minimum and maximum temperatures are -9°C and +28°C respectively and the mean daily temperature is above 6°C which tends to increase temperatures in surface waters.

3.2.2 Geology and Physiography

Most of the bedrock under the region is sedimentary limestone of the Devonian age which has a high calcium and magnesium content. The bedrock in the majority of Essex County is covered by glacial drift. The parent soil material is a heavy ground moraine and lacustrine deposition containing a considerable amount of limestone, appreciable amounts of shale and some igneous rock.

3.2.3 Soils

Soils within the study area were formed from heavy ground moraine which has been altered by glacial lake wave action and lacustrine deposition. The majority of the area is part of a smooth clay plain and the predominant soil types are Perth and Brookston clays and their associated clay loams. Developed from dolomitic limestone intermixed with shale, the imperfectly drained member is the Perth clays and the poorly drained member is the Brookston clays.

3.2.4 Watercourses

A 1992 study[3] of Little River indicated that one of the main beneficial uses of the river is that it serves as a stormwater conveyance channel for flood plain management. The River exists as a natural channel within the study area and flows from south to north across the west side of the site. The topography of the area is such that there is a very gentle slope of the land from south to north. There are three municipal drains crossing portions of the site and outletting to the Little River.

A dam placed on the Little River upstream of the E. C. Row Expressway was formerly used to provide irrigation water to the Twin Oaks Golf Club. This dam is no longer in use. The portion of the stream within the study area has been altered by dredging and is characterized by deposition of silt during low flow conditions and scouring during extreme wet weather events. Improvements to the drain banks will be required during development of the site to allow for maintenance access and reduction of bank erosion.

3.2.5 Terrestrial and Aquatic Animal Life

The land in the study area supports generally small animals including rabbits, raccoons, skunks, fox, muskrat, etc. The terrestrial life indigenous to this area are not considered endangered species.

The Ministry of Natural Resources conducted an aquatic habitat survey and concluded that the Little River does not support an active recreational sport fishery due to the limited species and density of fish present.

3.2.6 Natural Vegetation

We have had discussions with the City of Windsor Parks and Recreation Department regarding the natural vegetation on the site. There has not been a detailed review of the vegetation on the site. During earlier work on this site, Parks and Recreation moved many of the better trees. There are still a number of larger trees in good condition. Those trees not on road right-of-ways will not be disturbed at the time of municipal site servicing. Lot purchasers and developers should be encouraged to keep as many of the trees as possible. We will review the remaining trees with Parks and Recreation again prior to construction to determine if there are any other trees which can be moved.

3.3 SOCIAL AND ECONOMIC ENVIRONMENT

The study area is located in the south east portion of the City of Windsor. It is bounded to the north by the E. C. Row Expressway, to the south by the Canadian Pacific Railway, to the west

[3] Little River Comprehensive Stream Study - 1992 - LaFontaine, Cowie, Buratto & Associates Ltd., CH2M Hill Engineering Ltd. and The Great Lakes Institute.

by Lauzon Parkway and to the east by the City of Windsor boundary at the property limit between Farm Lots 138 and 139. Planning and design of services will take into consideration possible future expansion of the serviced area to include lands in the Township of Sandwich South extending east to Banwell Road.

The lands in the study area are zoned for industrial development. The western portion of the study area includes the former Twin Oaks Golf Course (130 acres). Since the closing of this facility several years ago, this parcel of land has been left dormant and is covered with heavy grass growth. The remaining land in the study area is used for cash crop farming.

4.0 ALTERNATIVE SOLUTIONS

4.1 GENERAL

Section 1 described and demonstrated the problem. This Chapter evaluates various alternatives based on impacts on the natural, social and economic environments.

4.2 ENVIRONMENTAL EVALUATION CRITERIA

The evaluation of alternatives includes the following categories to compare the impacts of each alternative.

(1) **Aesthetics** The proposed works may have aesthetically undesirable effects or may obstruct existing views.

(2) **Economic/Social Effects** The economic effects of a given project are not the costs associated with construction, maintenance and operation of the development. Rather, they are the benefits or detriments to the study area that derive from the implementation of the project. For example, employment opportunities, increased growth or development in the community and in general, improved quality of life are all beneficial examples of these types of effects.

(3) **Conflicting Land Use** The siting and construction of facilities may not be compatible with surrounding land use. This may apply to active use or passive use such as existing natural areas including wetlands and woodlots.

(4) **Aquatic Environment** Siting, design, construction and operation of proposed works should attempt to eliminate or minimize any adverse disruption or other adverse environmental effects on nearby lakes, rivers or other wetland ecosystems.

(5) **Terrestrial Environment** Siting, design, construction and operation of proposed works should attempt to eliminate or minimize any environmental disruption or other adverse environmental effects on soils and vegetation. Attempts should be made to eliminate or reduce soil erosion, soil loss, loss of mature or significant vegetation and to control noise levels.

4.3 ENVIRONMENTAL EFFECTS AND MITIGATING MEASURES

4.3.1 Do Nothing

This alternative maintains the status quo, i.e. no new development in the study area. Clearly, the Do Nothing alternative does not address the identified problem in this case.

4.3.2 Develop a New Industrial Park

This has been the proposed use for the subject lands with planning by the City dating back to the early 1980's. Some of the action taken by the City in this regard include:

- Commissioned a study in 1981[4] and 1987[5] of the Little River Trunk Sanitary Sewer and determined that there was excess capacity available to serve the study area.
- Prepared budget costs to service the study area documented in a 1987[1] report with revisions in 1990[2].
- In 1990 a municipal boundary adjustment between the City and the Township of Sandwich South was finalized (see Appendix).
- Performed a geotechnical investigation of the study area in 1990[6], followed by a Level 1 Environmental Assessment in 1991[7] and a Level II Environmental Site Assessment in 1996.[8] Copies of these reports are available for review at the Consultant's office and at City of Windsor Public Works.
- Completed a Storm Water Management Plan in 1993[9] that addressed the quantity control measures required for this proposed development.

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4 Little River Comprehensive Stream Study - 1992 - LaFontaine, Cowie, Buratto & Associates Ltd.

5 Servicing Feasibility Study for Proposed Industrial Park, Little River Trunk Sanitary Sewer Drainage Area - 1987 - LaFontaine, Cowie, Buratto & Associates Limited

6 Geotechnical Investigation, Twin Oaks Industrial Park, City of Windsor - 1990 -Golder Associates Ltd.

7 Level 1 Environmental Assessment, Twin Oaks Industrial Park, City of Windsor -1991 - Golder Associates Ltd.

8 Level II Environmental Site Assessment, Twin Oaks Industrial Park, Windsor, Ontario, August 1996 - Golder Associates Ltd.

9 Report on the Storm Water Management Plan for the Banwell Road/Twin Oaks Industrial Park - 1993 - J. A. McCorquodale, P. Eng.

The specific nature and extent of environmental effects will depend on the design details of the park. Some general environmental considerations can be identified.

(1) **Aesthetics** The proposed industrial park will definitely change the existing landscape. A development of this type will require the construction of access roads, bridge(s), stormwater management facilities, street lighting, clearing and grading of land, etc. Underground services such as watermains, storm and sanitary sewers, hydro, bell, etc. will generally be hidden from view.

Once developed, the construction of buildings to house the various industries can be expected. While it is quite apparent that a proposed development will change the "look" of the study area, it should be noted that (i) most of the land west of Lauzon Parkway and bordering both sides of the E. C. Row Expressway are already used for industrial development, and (ii) appropriate site selection and landscaping can be employed to mask or minimize any visual intrusion by the development.

(2) **Economic/Social Effects** It is anticipated this development will stimulate economic growth and create permanent jobs within the City by attracting new industries to Windsor. The proposed development will generate temporary employment opportunities during construction of the park and building facilities.

(3) **Conflicting Land Use** Conflicting land use is not anticipated because the study area has been zoned for industrial land use. The study area is isolated from adjacent lands by the E. C. Row Expressway to the north, Lauzon Parkway to the west and the Canadian Pacific Railway to the south thus minimizing conflict with adjacent land uses.

(4) **Aquatic Environment** Site clearing activities can result in increased sediment loads on adjacent watercourses and disruption to the aquatic ecosystem. These impacts will be mitigated by employing properly controlled and/or staged construction activities to the satisfaction of the Ministry of Environment and Energy (MOEE), Essex Region Conservation Authority (ERCA) and the City. Detailed identification of the applicable construction control measures is addressed in Phase 3 of this report.

(5) **Terrestrial Environment** Construction methods will be selected to eliminate or minimize effects on soils and vegetation. Attempts will be made to reduce soil erosion, soil loss, topsoil mixing and loss of mature or significant vegetation. Due to the isolated nature of the study area, it is unlikely that noise abatement measures will be implemented to control noise levels during construction. Detailed identification of the applicable construction control measures is addressed in Phase 3 of this report.

4.3.3 Mitigating Measures

The following table provides a summary of anticipated environmental impacts and proposed mitigating measures. In addition to the mitigating measures described in the table, development of the design concept and plans presented in Phase 3 of this report were undertaken in consultation with various regulatory agencies to ensure appropriate mitigating measures were incorporated in this project.

OPERATION	EFFECT	MITIGATING MEASURES
1. Construction of new roads, bridge(s) over watercourses, water distribution and wastewater collection systems, stormwater management facilities and utility servicing	Sedimentation and turbidity of adjacent water bodies and drainage ditches	Use silt fences Collect contaminated runoff Restore vegetation growth quickly
2. Construction within the Little River channel including stormwater management facilities, watermain and sewer crossings under Little River and a new bridge over Little River.	Loss of vegetation and topsoil and mixing topsoil and subsoil	Restore site by replacing topsoil and reinstate vegetation to prevent erosion
	Removal and/or disturbance of trees and ground flora	Avoid treed areas Employ tree protection measures Avoid areas with significant vegetation
	Loss of productive farmland	Site is zoned for Industrial Development Locate facilities to minimize land requirements Use existing rights-of-way as much as possible
	Disruption of tile and surface drainage systems	Provide for temporary drainage systems until final restoration is accomplished Avoid disturbing drainage systems during critical periods Restore drainage systems
	Temporary disruption of pedestrian and vehicle traffic	Provide and maintain detours Provide for safe alternate routes Select alternate routes to minimize inconvenience
	Temporary disruption and inconvenience during construction to adjacent properties, buildings and inhabitants	Notify public agencies and neighbouring owners of construction activities Prepare program for reporting and resolving problems Schedule construction to minimize period of disruption Ensure access is provided for emergency vehicles and personnel Apply noise and vibration control measures Apply dust control measures Control emissions from construction equipment and vehicles Use silencers to reduce noise Require compliance with municipal noise by-laws
Use of construction equipment	Contamination of surface waters, drains and public roadways	Use containment facilities Inspect equipment regularly for fuel and oil leaks Clean equipment before it travels off site.

4.4 SELECTION OF RECOMMENDED SOLUTION

It is evident that the recommended solution to develop a new industrial park will address the City's need for additional serviced industrial land. With respect to the natural environment, it is anticipated the recommended solution will not have any significant effect on wildlife, vegetation or the habitat characteristics of any particular species. Further, the recommended solution is not considered to have any serious impact on the socio-economic environment except to the extent that it will permit the ongoing implementation of development and other activities that have positive impacts on the environment.

PHASE 3: EVALUATION AND SELECTION OF PREFERRED DESIGN

5.0 SERVICING CONSIDERATIONS

Development of a new subdivision, whether residential or industrial, involves the construction of various municipal services including roads, watermains, storm and sanitary sewers and stormwater management facilities. The following sections provide details regarding the alternative design concepts for the stormwater management facilities and the road system including the access roadways into the industrial park and the internal road system. Other various servicing conditions are included in the following sections as well as the environmental impacts and the proposed mitigating measures resulting from the development and construction of the services for the Twin Oaks Business Park.

5.1 STORMWATER MANAGEMENT

The MOEE has established policies to control the amount of stormwater that is discharged from a site proposed for development. Generally, this policy requires that the rate of runoff from the site after it is fully developed not exceed the rate of runoff from the site in its pre-developed condition. Presently, the entire 420 acre site is a grassed field and during storm events, surface runoff occurs at "natural" rates overland to large drainage works or ditches which eventually discharge to the Detroit River via Little River. These large drainage works include the LaChance Drain, the Gouin Drain and the McGill Drain and Figure 2 illustrates the existing drainage works system within the study area. Development of the Twin Oaks Business Park will include the construction of building, roadways and parking lots, all of which will increase the rate of surface runoff. Accordingly, stormwater management facilities must be incorporated into the development of the Industrial Park to control surface runoff during storm events. In general, stormwater management practices include the following:

1. Stormwater lot level controls
2. Stormwater conveyance controls
3. End-of-pipe stormwater management facilities

It is important to note the foregoing stormwater management practices not only incorporate measures to control the quantity of surface runoff but also include quality control measures.

Because limits for the maximum concentration of contaminants in stormwater effluent do not exist, the level of quality control was established through discussions with ERCA.

The following table summarizes various alternatives available for each of the three stormwater management practices listed previously and includes the advantages and disadvantages for each. The advantages and disadvantages for the various stormwater lot level control alternatives are generally common for each alternative. Accordingly, the table only provides one set of advantages and disadvantages for all of the stormwater lot level control alternatives.(ie. for alternatives 1(a) to 1(c)).

Alternative Stormwater Management Practice	Advantages	Disadvantages
1. **Stormwater Lot Level Controls** - involves measures to treat stormwater and restrict the quantity of stormwater discharging to the conveyance system (a) **Rooftop Detention of Stormwater** - implemented by restricting the number of roof drains. (b) **Detain Stormwater on Parking Lots** - implemented by restricting flow from catch basins. (c) **Stormwater Storage in Conveyance System** - implemented by oversizing storm sewers and installing orifices. (d) **Rear Yard Storage of Stormwater** - implemented by restricting flow from rear yard catch basins combined with directing roof leaders to rear yard. (e) **Increase Stormwater Ponding and Natural Infiltration** - implemented by reducing lot grades.	• reduce storage requirements at end-of-pipe stormwater management facilities • provides quality control at the source	• inconvenient to public due to ponding of water in parking lots and yards • infiltration systems require sandy soils which are not common in the study area
2. **Stormwater Conveyance Controls** - implemented as part of the conveyance system for quantity and quality control.		
(a) **Pervious Pipe Systems** - include a perforated pipe installed inside clear stone that is wrapped in a blanket of filter fabric	• lower construction cost compared to conventional storm sewers • improved quality of stormwater runoff	• does not meet City of Windsor standards • still an experimental control system • unreliable in terms of long term performance due to clogging • requires pretreatment of road run-off • requires soils with good infiltration which are not typically common to the study area

Alternative Stormwater Management Practice	Advantages	Disadvantages
(b) **Previous Catch Basins** - include a normal catch basin with a larger sump that is connected to an exfiltration storage media comprised of clear stone and sand which acts as a filter.	• reduces quantity of stormwater discharging to conveyance system • improved quality of stormwater that is discharged through storage media into soils • comparatively low capital cost	• does not meet City of Windsor standards • still an experimental control system • unreliable in terms of long term performance due to clogging • requires soils with good infiltration which are not typically common to the study area
(c) **Grassed Swales** - includes shallow roadside ditches and rear yard swales	• filter and detain stormwater runoff thus increasing quality and reducing quantity • relatively inexpensive • low land requirements • low maintenance costs	• not well suited to urban road cross-sections (i.e. curb and gutter) that is proposed for the Twin Oaks Business Park • limited storage capacity • maintenance problems • access concerns for swales in rear yards • marketability (perception of rural development)
3. **End-of-Pipe Stormwater Management Facilities** - include facilities located at the end of the conveyance system to control the quantity and quality of the collected stormwater prior to discharge to receiving waters		
(a) **Wet Ponds** - as the name implies, the pond permanently stores a portion of the collected stormwater by strategically locating the inlet and outlet pipes	• most reliable end-of-pipe method for pollutant removal • will satisfy storage requirements • permanent wet pond prevents re-suspension of sediment and provides extended settling • aesthetically pleasing and can be integrated into passive park setting • minimal maintenance requirements	• unacceptable to Transport Canada officials due to attraction of waterfowl and the proximity of Windsor Airport • safety concerns regarding permanent pool of water • large land requirements • may increase temperature of receiving water bodies • requires circulation of water to avoid problems related to stagnation (odours, insects, etc.) • requires occasional cleaning of sediment

Alternative Stormwater Management Practice	Advantages	Disadvantages
(b) **Constructed Wetlands** - similar to wet pond except it is shallower	• good stormwater quality control • can be integrated into passive park setting • will satisfy storage requirements • comparatively safe since it is typically shallower with flatter slopes	• unacceptable to Transport Canada officials due to attraction of waterflow and the proximity of Windsor Airport • largest land requirements • safety concerns due to permanent standing water • requires circulation of water to avoid problems related to stagnation (odours, insects, etc.)
(c) **Dry Pond** - as the name implies, this pond empties after the storm event	• will satisfy storage requirements • eliminates safety concerns related to a permanent pond of water • minimal potential to attract waterfowl • can be integrated with park and recreational functions (playing fields) • easy to maintain	• limited quality control • resuspension and transport of sediments during storm events • medium land requirements • inlet and outlet pipes will be exposed which increases potential of closing • vegetation must be able to tolerate occasional inundation
(d) **In-Channel Storage** - require widening of Little River to provide for storage of stormwater within the channel	• low land requirements • incorporate 15 metre setback required by ERCA into stormwater management scheme • potential for greenway development (walking and biking trails) • re-established natural floodway which has been altered over the years • will not encourage nesting of water fowl (Transport Canada concern) due to steeper banks at the bottom of the channel and greater fluctuation of water levels • will satisfy storage requirements	• low quality control • may require additional quality control measures prior to discharging to Little River • will disturb/destroy existing habitat during construction

Alternative Stormwater Management Practice	Advantages	Disadvantages
(e) In-Ground Storage - includes construction of covered storage facilities and oversizing of conveyance system	• minimal land requirements since storage can be constructed under roads, parking lots, park land, etc. • minimal safety concerns • can satisfy storage requirements • will not destroy existing habitat • will not attract waterfowl	• most expensive option • minimal quality control • limited access for maintenance • will not enhance habitat
(f) Oil/Grit Separators	• good quality control of pollutants and sediments from small areas for small storms • no aesthetic concerns (underground)	• relatively expensive for larger applications • does not satisfy storage requirements • frequent inspection and maintenance (cleaning) requirements

In addition to the alternatives listed previously, options that require infiltration or percolation of water into the ground, such as infiltration basins or trenches and sand filters, were reviewed. These methods, which are generally appropriate for small scale applications, require soils that are condusive to infiltration (ie. percolation rates of 15 mm/hour or greater). Because the native soils in the study area are typically silty clays with poor infiltration capabilities and considering the large scale nature of the proposed Industrial Park, these options were not given any further consideration.

The various stormwater management alternatives were discussed with the City, ERCA and Transport Canada. Based on these discussions and a review of the previous advantages and disadvantages of the alternatives, it was agreed the preferred stormwater management alternative would include a conventional gravity storm sewer collection system discharging to Little River where in-channel storage would be provided to control the quantity of stormwater being discharged from the site. Further, it was agreed that the lot level controls would include parking lot and roof top storage of stormwater, grass swales and flatter lot grades.

A preliminary design of the stormwater management facility for the proposed Twin Oaks Business Park was completed for the preferred stormwater management alternative utilizing computer modelling. The conventional storm sewer system was designed to accommodate the 5 year storm within the City owned portion of the Industrial Park only and to convey it to the end-of-pipe stormwater management facility (ie. Little River). Storage requirements were designed to accommodate stormwater from the 100 year storm within the City owned portion of the Industrial Park. Improvements and alterations to the existing drainage works (i.e. Little River, McGill Drain, LaChance Drain and Gouin Drain) were designed to accommodate the runoff from the property within each drainage area in its present condition plus the increased runoff from the City owned portion of the Industrial Park after it is fully developed. Design and storage requirements for the storm water management facilities required to drain the Sandwich South owned portion of the Industrial Park will be the responsibility of the Township at the time development occurs.

Improvements and modifications to the various waterways within the Industrial Park that are required as part of the preferred stormwater management alternative include the following:

- It is proposed to widen and deepen the Little River channel. The new cross-section will have a bottom width of 10.8 metres and a 0.5 metre deep meandering low flow channel.

- It is proposed to realign approximately 400 m of the McGill Drain along the railway right-of-way and to relocate approximately 420 m of the LaChance Drain to the north limit of the railway right-of-way.

Details regarding the proposed stormwater management facilities are included in a Stormwater Management Report dated February 1997, a copy of which is included in the Appendix. The report details the design criteria and design method, the selected stormwater management plan and includes information on phasing, planting strategies and erosion and sediment controls during construction. Also, figures are included in the Stormwater Management Report in the Appendix that include a site plan illustrating the existing drainage facilities and proposed works (Figure 1), the proposed stormwater management plan for Little River including a plan and profile (Figure 2) and channel cross-sections (Figure 3) illustrating the proposed modifications to Little River.

5.2 ROAD SYSTEM

Discussions with the City identified several features that were incorporated into the final road pattern. These include:

- A main access point to the internal road system from Lauzon Parkway at the west side of the site (opposite the South Service Road west of Lauzon Parkway).

- A road pattern to maximize the use of available land area.

- A minimal use of cul-de-sacs to permit easier truck movement.

- A main east-west arterial road from Lauzon Parkway to the east limit of the study area.

- Provision for future access from the east limit of the study area to Banwell Road through Township of Sandwich South property.

- Use of the South Service Road as a local collector road giving property with frontage exposure on the E. C. Row Expressway.

- The need for signalization at the access point to Lauzon Parkway.

In addition to the foregoing, a traffic impact study was undertaken as part of the road system evaluation in order to establish roadway improvements required to permit the development of the Twin Oaks Business Park. The traffic impact study, a copy of which is in the Appendix, indicates the existing roadways can not accommodate the future peak hour morning traffic destined to the Twin Oaks development. Accordingly, various alternatives to remedy this problem were evaluated in the traffic impact study. The traffic impact study made the following recommendations and Figure 3 in the Appendix illustrates the preferred conceptual road layout as well as the traffic impact study recommendations.

- Operational improvements to the existing roads are required in order to accommodate most of the future traffic projections. For instance, traffic in the morning peak hour destined for the Twin Oaks Business Park from E. C. Row Expressway is too great to be accommodated by the existing road configuration. The prime problem is insufficient distance between the eastbound E. C. Row/southbound Lauzon Parkway off-ramp (Ramp W-S) and the new Twin Oaks collector road to accommodate weaving of future traffic volumes across Lauzon Parkway to the Twin Oaks collector.

- The first stage of construction should involve extending that part of Ramp W-S parallelling E. C. Row Expressway straight through to a signalized intersection at Lauzon Parkway. This will provide motorists on the ramp with sufficient green time to prevent the need to turn right on the red signal. In fact, the 'right turn on red' movement must be expressly prohibited. This is essential since the entire purpose of reconstructing this ramp is to provide a traffic signal that will break the north-south traffic flow making it unnecessary for weaving manoeuvres to take place along the Parkway. The main benefit is interrupting the weaving traffic into two separate traffic flows improves motorists' safety.

  It has been estimated that with this concept, road safety can be maintained for up to 74 hectares of development (about 183 acres).

- Further improvements will be required to accommodate the ultimate traffic projection to be generated by the entire 170-hectare (420 acres) Twin Oaks development. For this second stage, a new ramp from the E. C. Row Expressway is required, east of Lauzon Parkway, to accommodate traffic from the west destined for Twin Oaks. A 'buttonhook' design is recommended.

The traffic impact study included recommendations for roadway improvements and the timing for construction of these improvements. It is important to note that timing for construction work on Lauzon parkway and the new ramp was based on assumptions inherent in any traffic analysis and as such it is somewhat arbitrary. The timing will depend on assumptions concerning trip generation rates, trip distribution patterns and traffic assignment characteristics. In addition, the timing also depends on more abstract factors such as the effects of future marketing strategies of the City, the extent to which development will be less labour-intensive than in the past (flowing recent trends), future densities, whether the future economic atmosphere will be one in which businesses will expand and intensify development within Twin Oaks and whether or not the Lauzon Parkway is to be extended to Highway 401.

As illustrated on Figure 3, the preferred road pattern involves at least one crossing of Little River. A new bridge is proposed where the east-west collector road crosses Little River. Past discussion with the City called for the removal of an existing bridge over Little River on Lauzon Road while continuing to maintain the Lauzon Road right-of-way as a servicing corridor. Further to this discussion, a report prepared in 1996[10] identified several structural deficiencies and concluded that the existing bridge would be incapable of supporting construction related traffic.

It is important to note the Phase 1 & 2 Report indicated the Lauzon Road right-of-way would be maintained in the selected road system. However, during the evaluation of the various road systems, the Canadian Pacific Railway indicted they will be exercising an option to close Lauzon Road across the railway right-of-way. Accordingly, Lauzon Road will not provide an access to Twin Oaks and no bridges or culverts will be required over the sections of the McGill Drain at Lauzon Road.

5.3 *SANITARY SEWERS*

5.3.1 External Service

The Little River Trunk Sanitary Sewer was designed to serve approximately 2,600 acres of land in the southeast section of the City of Windsor. The original drainage area was bounded on the west by Jefferson Avenue, on the east by Banwell Road, on the south by the E. C. Row Expressway and on the north by an irregular line extending north from Tecumseh Road to the Little River Pollution Control Plant.

Studies undertaken in 1981[3] and 1987[4] concluded there is sufficient capacity in the Little River Trunk Sewer to serve the study area. The 1987 report further indicated the most cost effective sanitary servicing outlet to the trunk sewer is along Lauzon Road to Forest Glade Drive. From this point, a portion of the sewage flow can be directed west along Forest Glade Drive to the trunk sewer on Lauzon Parkway. Flows in excess of the capacity of the Forest Glade Drive - Lauzon Parkway sewer can be carried north along Lauzon Road to the trunk sewer at Hawthorne Drive.

This servicing approach offers the advantage of staged construction. The Forest Glade Drive - Lauzon Parkway sewer will be used to accommodate flows from initial development and the sewer on Lauzon Road north of Forest Glade Drive can be built later as growth takes place and flows increase from the study area.

Following recommendations in the 1987 report, the following sewer sections were constructed:

- A 600 mm diameter sewer on Lauzon Road from Forest Glade Drive south to a 525 mm diameter sewer crossing under the E. C. Row Expressway.
- A 525 mm diameter sewer on Forest Glade Drive from Lauzon Road to the trunk sewer on Lauzon Parkway.
- A 525 mm diameter sewer on Lauzon Road from just south of Lilac Lane to Hawthorne Drive.

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10 Report on Inspection of a Bridge over Little River at Twin Oaks Site in the City of Windsor - 1996 - LaFontaine, Cowie, Buratto & Associates Ltd.

The sewers were oversized at the City's request with the City contributing to the cost of oversizing these sewers for eventual servicing of the study area.

5.3.2 Internal Service

A sanitary sewage collection system will be designed to meet the requirements of the City and the MOEE. The system will be designed to outlet through the existing 525 mm diameter sanitary sewer crossing under the E. C. Row Expressway at Lauzon Road.

The minimum depth of cover required for sanitary sewers has been discussed with City personnel. Sanitary sewers will be designed with a minimum cover of 2.0 metres which will be sufficient to provide gravity ground floor service to development in the industrial park. It has been agreed gravity basement level servicing will not be required.

The existing 525 mm diameter sewer under the E.C. Row Expressway is at a higher elevation than the bottom of Little River. Therefore, the area west of Little River cannot drain by gravity directly to this outlet. A sanitary sewage pumping station will therefore be required to serve the area west of Little River. It will also be convenient to use this pumping station to serve an area east of Little River at the south side of the site.

The sewage collection system within the study area will be designed to allow for future servicing of land east of the City boundary up to Banwell Road. A second pumping station will be required to serve the eastern portion of the expanded service area.

5.4 WATER SUPPLY

A water supply servicing proposal for the study area has been developed in discussions with the Windsor Utilities Commission. This proposal consists of providing water for initial stages of development by extending an existing 300 mm diameter watermain on the South Service Road west of Lauzon Parkway into the study area. A second feed point will be provided from a 200 mm diameter watermain crossing under the E. C. Row Expressway at Lauzon Parkway. This 200 mm main is fed from a 300 mm diameter watermain along Lauzon Road south of Forest Glade Drive. Providing two feed sources into the study area allows for a more reliable looped system. The Windsor Utilities Commission has plans for future construction of a new reservoir and pumping station to be located at the south west corner of Banwell Road and the E.C. Row Expressway. This reservoir is not required for development of this site but is being considered for future expansion of the water system. Trunk watermains will be sized to service the entire industrial park including the portion in the Township of Sandwich South.

Design of the internal water supply system is dependent largely on the selected road pattern and will conform to the requirements of the Windsor Utilities Commission, the City and the MOEE.

5.5 ELECTRICAL SERVICE

Discussion with the Windsor Utilities Commission indicates that above ground electrical servicing to lots within the study area will be provided at no cost to the City. The City would be responsible for additional costs related to underground servicing.

5.6 NATURAL GAS SERVICE

Union Gas has a 400 mm diameter high pressure gas line along the south side of the Canadian pacific Railway which feeds a 250 mm diameter high pressure gas line on the west side of Lauzon Road. There is also a 100 mm diameter intermediate pressure gas line on the west side of Lauzon Road and it is from this line that development in the proposed industrial park will be fed.

Union Gas has advised that provision of gas service to the lots in the proposed industrial park will be at no cost to the owner as long as provision of the service is economically feasible for Union Gas. This policy has applied in previous industrial developments.

5.7 TELEPHONE SERVICE

Bell Canada has existing overhead cables running southerly on Banwell Road from Tecumseh Road and then along the South Service Road westerly to Lauzon Road. The overhead cable changes to buried cable on Lauzon Road and extends southerly along Lauzon Road.

The existing bell cable on the South Service Road does not have sufficient capacity to serve the proposed industrial development. A new buried cable will be required in the right-of-way of Banwell Road from the main feeder on Tecumseh Road to the South Service Road and then to the Industrial Park. Bell Canada will therefore require access on Banwell Road and the South Service Road to install their buried plant including conduit and manholes. There will be no cost to the City for provision of telephone service to the site.

5.8 RECREATION

This development presents a unique opportunity to integrate stormwater management facilities and recreational lands/park lands. In consultation with City of Windsor parks and Recreation Department and the Essex Region Conservation Authority, a greenway/walkway/bikeway and/or passive park/playing fields was considered in the overall design of the stormwater management facility.

6.0 DESIGN AND CONSTRUCTION CONSIDERATIONS

6.1 ZONING

The site is currently zoned Manufacturing District 2.15 (M2.15). A meeting was held to review the current zoning of the site and to discuss whether the objectives of this development can be met with the current zoning. A copy of the City of Windsor By-Law defining the current zoning is included in the appendix as well as the minutes of the referenced meeting.

6.2 AIRPORT OBSTACLE LIMITATIONS

The proposed development lies in the final approach path to the Windsor Airport. Government regulations restrict the height of structures in the vicinity of airports according to distance from the airport. Building heights and the height of traffic lights and street lights will have to be controlled such that they conform to the applicable regulations and/or codes.

City of Windsor By-Law No. 10221 currently in place for this property allows maximum building heights of 22 metres (72 feet). The west limit of the site at Lauzon Parkway is approximately 1,900 metres from the end of the nearest airport runway.

Lauzon Parkway adjacent to the site is approximately 9 metres higher than the existing ground surface in the park. If traffic signals are installed at this point, their height would be restricted to the 22 metre maximum. This is adequate height to install proper lighting and traffic signals.

These heights correspond to the "Obstacle Limitation Surfaces" defined in the "Land Use in the Vicinity of Airports, Transport Canada, Air Navigation System Directorate, Amendment No. 2, 1992".

6.3 RAILWAY CONSIDERATIONS

Generally, there are no significant concerns with industrial development adjacent to a railway. Canadian Pacific Railway officials indicate their only requirements are to include a 1.8 metre chain link fence along the property line and no alterations to the rail right-of-way. A safety berm is not required. Noise attenuation, if any, will be the responsibility of builders who must meet MOEE noise level requirements.

It may be desirable to consider provision of a rail spur within the study area connecting to the Canadian Pacific Railway located at the south limit of the study area. This feature may provide a required transportation link for certain prospective industries. The design, construction and funding of a rail spur should be a matter to be negotiated between the railway company and the purchaser of the lands requiring the rail service. This will achieve the most cost effective layout conforming to accepted design standards.

6.4 ENVIRONMENTAL IMPACTS AND MITIGATING MEASURES

Section 4.3.3 provided effects the proposed alternative solutions would have on the natural and socio-economic environments including the mitigating measures. Generally, these environmental effects and mitigating measures apply to the design concepts discussed throughout Section 5.0.

The most significant impacts on the natural environment will occur during construction of the various services within the Little River channel. These services include widening the channel of Little River to provide storage capacity for stormwater, installation of watermain and sewer crossings under Little River and construction of a new bridge over Little River. It is proposed to implement a single erosion control plan to mitigate the potential environmental impacts that may result from construction of these services. The erosion control plan includes installation of silt fences and temporary sedimentation basins to filter and settle the stormwater prior to discharge from the site. Further, the erosion control plan will restrict construction activities within Little River to the summer months when the channel is relatively dry. Restricting construction activities within Little River to this time frame will avoid construction during the fish spawning season and it will minimize environmental impacts related to sedimentation and turbidity in the waterway.

7.0 PUBLIC REVIEW AND COMMENT

A number of comments were received during the review process. This report documents comments received up to and including March 7th, 1997.

Generally, the following issues were mentioned.

1. Traffic

   - Concern with possible traffic signal at Lauzon Parkway and Industrial Park entrance.
   - Concern with sight distance at proposed intersection.
   - Concern with potential lane crossing required for vehicles leaving the Park to get onto E. C. Row.

   To address these concerns, a Traffic Impact Study has been completed.

   The study reviews existing traffic on roads adjacent to the site and provides future traffic projections based on the proposed development of the Industrial Park. It deals with potential access problems to Lauzon Parkway and possible signalization. It also predicts the impact of phasing the construction and outlines at what level of development specific improvements will be required.

2. Stormwater Management

   - Concern with potential for aggravating reported flooding problems north of E. C. Row and south of the site.
   - Concern with creation of wetland/wet pond in the Windsor Airport flight path. These facilities may attract birds.
   - Preference for on-line storage of increased stormwater runoff in Little River corridor. Also, preference for dry ponds.

   A Stormwater Management Report has been prepared outlining in detail the selection of the preferred option for controlling stormwater quantity and quality.

3. Recreation

- Preference for a walkway/bikeway along the Little River corridor through the park.

Recreation issues will be addressed in the final design with City of Windsor Parks and Recreation Department and other interested parties.

4. Zoning

- Concerns about allowable building height, especially as it concerns the Windsor Airport. There were also concerns expressed regarding the height of traffic lights, etc. at a possible Lauzon Parkway intersection.

City of Windsor By-Law No. 10221 currently in place for this property allows maximum building heights of 22 metres (72 feet). The west limit of the site at Lauzon Parkway is approximately 1,900 metres from the end of the nearest airport runway.

Lauzon Parkway adjacent to the site is approximately 9 metres higher than the existing ground surface in the park. If traffic signals are installed at this point, their height would be restricted to the 22 metre maximum. This is adequate height to install proper lighting and traffic signals.

These heights correspond to the "Obstacle Limitation Surfaces" defined in the "Land Use in the Vicinity of Airports, Transport Canada, Air Navigation System Directorate, Amendment No. 2, 1992".

8.0 CONCLUSION

Certain works proposed for the Industrial Park have been identified as Schedule "B" works. These include sanitary sewers, storm sewers and watermains. The Phase 1/2 ESR was adopted by Council on October 21, 1996 and notice of the 30 day period for public comment was published in the Windsor Star on October 24, 1996. Subject to receipt of necessary approvals, the City may proceed with the planning, design and construction of these works.

Those works identified as Schedule "C" works include roadwork, construction of a bridge over Little River and stormwater management. This report has outlined the preferred design solution, identified alternative design concepts to achieve this solution, evaluated the alternative designs and identified the recommended design. Review agencies and interested and affected parties have been notified for their input.

The primary concern noted during the course of the study was traffic access to the site. The following problems were noted.

- There is insufficient weaving distance between the ramp from E. C. Row eastbound to Lauzon Parkway southbound and the left turn bay into Twin Oaks.

- The increase in traffic volumes at the proposed South Service Road intersection will be too high for an unsignalized intersection.

- The South Service Road intersection is hidden from view for traffic approaching from the south on Lauzon Parkway because of the crest over the railway.

- Future traffic volumes leaving Twin Oaks to go westbound on E. C. Row Expressway will be too high for an unsignalized intersection.

The report reviews 14 different options to alleviate these problems and recommends the following staged approach. (see following figures)

A. Up to development of approximately 24 hectares (60 acres)

1. Construct a 90 metre left turn bay in the Lauzon Parkway median north of the South Service Road intersection.

2. Signalize the South Service Road intersection including warning lights south of the South Service Road.

B. Up to development of 75 hectares (185 acres)

3. Realign and signalize the ramp from E. C. Row eastbound to Lauzon Road southbound.

4. Extend the left turn bay in the Lauzon Parkway median north of the South Service Road intersection to 175 metres.

5. Realign and signalize the southbound Lauzon Parkway to eastbound E. C. Row Expressway ramp.

C. For development greater than 75 hectares (185 acres)

6. Construct a new ramp into Twin Oaks east of Lauzon Parkway from the eastbound lanes.

7. Install traffic signals at the intersection of Lauzon Parkway northbound at the ramp to E. C. Row Expressway westbound if traffic volumes warrant.

8. Install traffic signals at the intersection of Lauzon Parkway northbound at the ramp to E. C. Row Expressway eastbound if traffic volumes warrant.

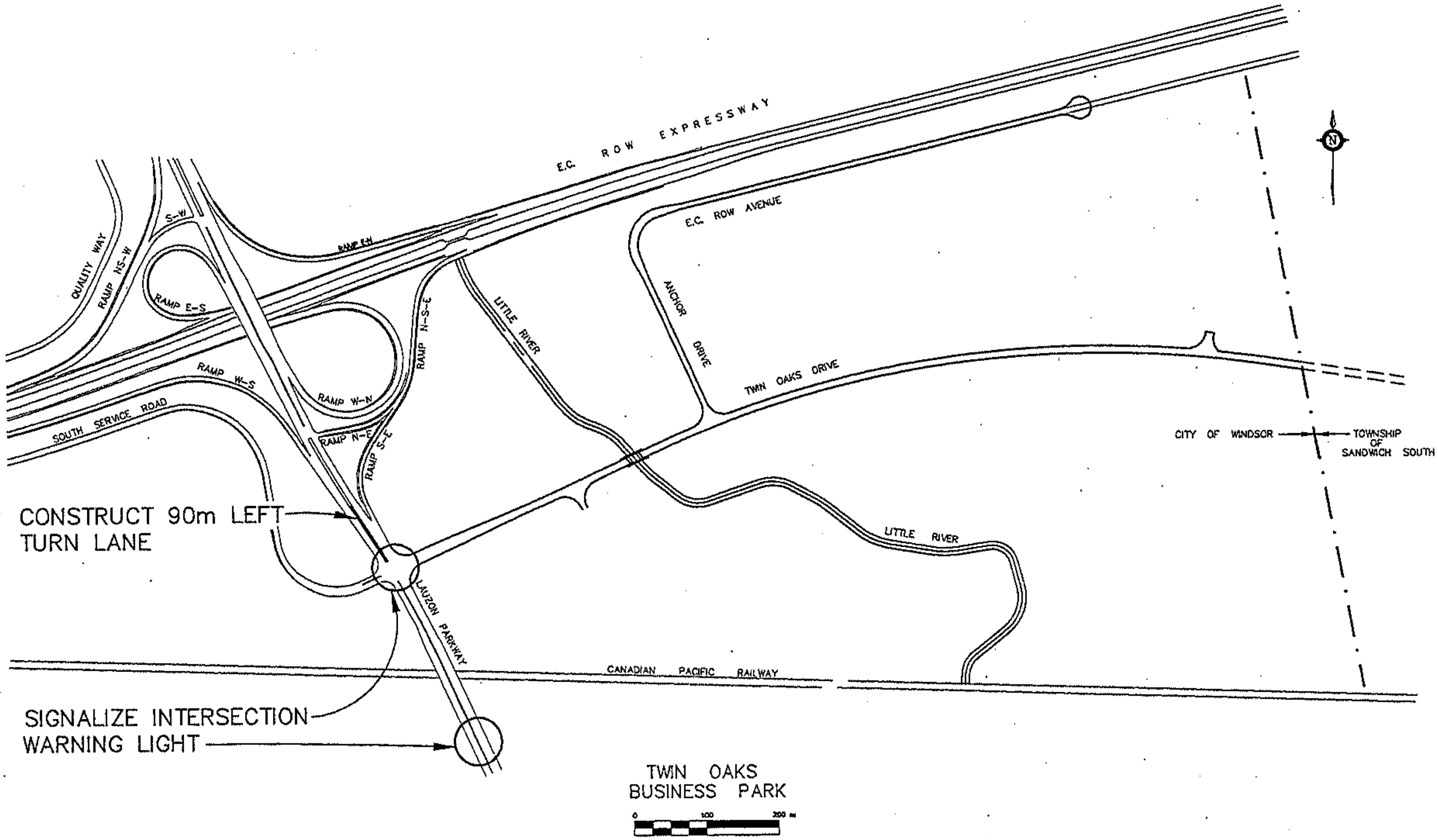
D. Future when warranted

Ultimately, there will be an interchange constructed at E. C. Row and Banwell Road. This report does not discount these works. The interchange will be constructed as E. C. Row traffic dictates.

Another issue to be addressed is stormwater management. Planning and design of stormwater management facilities has been carried out in accordance with the requirements of the MOEE and ERCA to address both water quality and quantity issues. A unique feature in this case is that the Twin Oaks development is directly under the flight path into the Windsor Airport. Stormwater Management options are restricted to those that will not attract waterfowl such as geese. This eliminated options such as wet ponds or constructed wetlands. Due to the predominance of native clay materials, options which involved percolation of stormwater into the ground were also eliminated. It was ultimately determined the best option was to widen the existing Little River channel to provide the required storage capacity and to improve the river cross-section with flatter slopes for stabilization of the banks and to provide an area for a walkway/bikeway along the side of the channel (see following Figure 8.04). The study found the recommended design will not increase downstream flows or water levels due to development of Twin Oaks.

A new bridge will be required across Little River as part of the new road construction. Measures will be taken during construction of the bridge to control erosion and sedimentation in the river channel. The existing Lauzon Road bridge will eventually be removed.

Through the 30 day review period, public concerns and comments regarding development of the Twin Oaks Business Park will continue to be received and addressed.



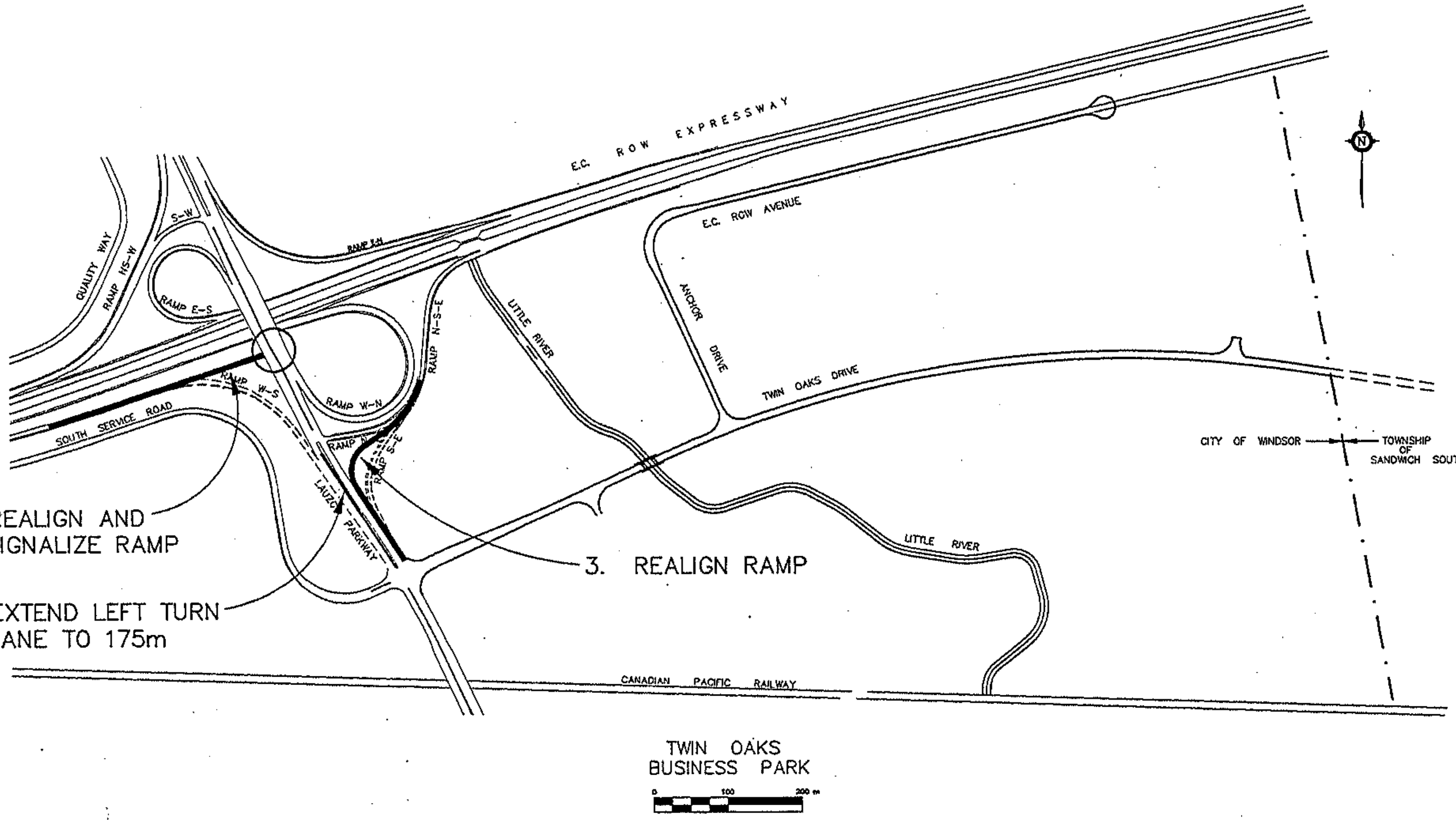
1. CONSTRUCT 90m LEFT TURN LANE

2. SIGNALIZE INTERSECTION WARNING LIGHT

ACCESS ROAD CONSTRUCTION OPTIONS

A – CONSTUCT IMMEDIATELY

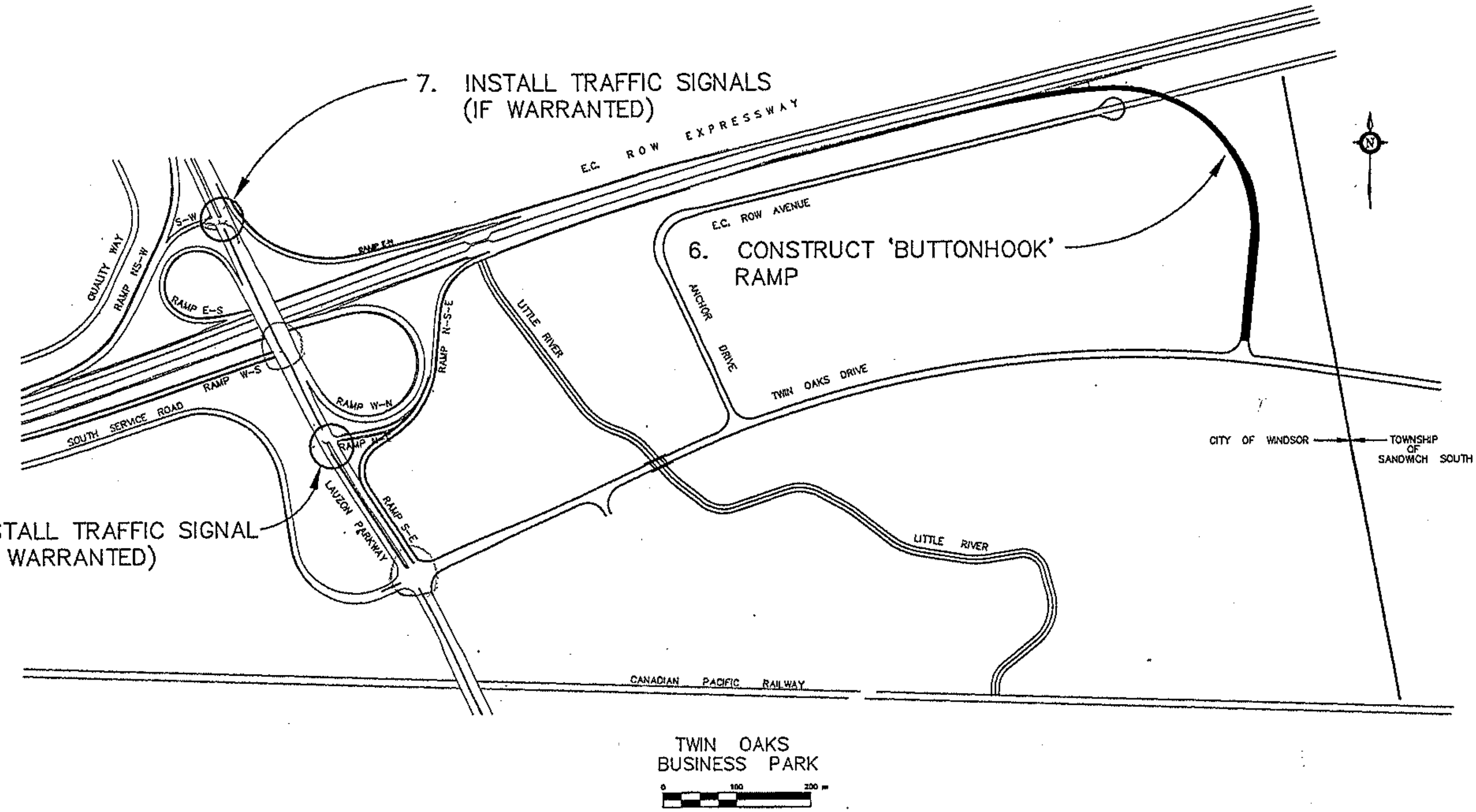
WILL SUPPORT UP TO 24 ha (60 ACRES) OF DEVELOPMENT



ACCESS ROAD CONSTRUCTION OPTIONS

B – CONSTUCT AFTER 24 ha (60 ACRES) OF DEVELOPMENT

WILL SUPPORT UP TO 75 ha (185 ACRES) OF DEVELOPMENT



ACCESS ROAD CONSTRUCTION OPTIONS

C – CONSTUCT AFTER 24 ha (185 ACRES) ARE DEVELOPED

75

APPENDIX

CORPORATION OF THE CITY OF WINDSOR

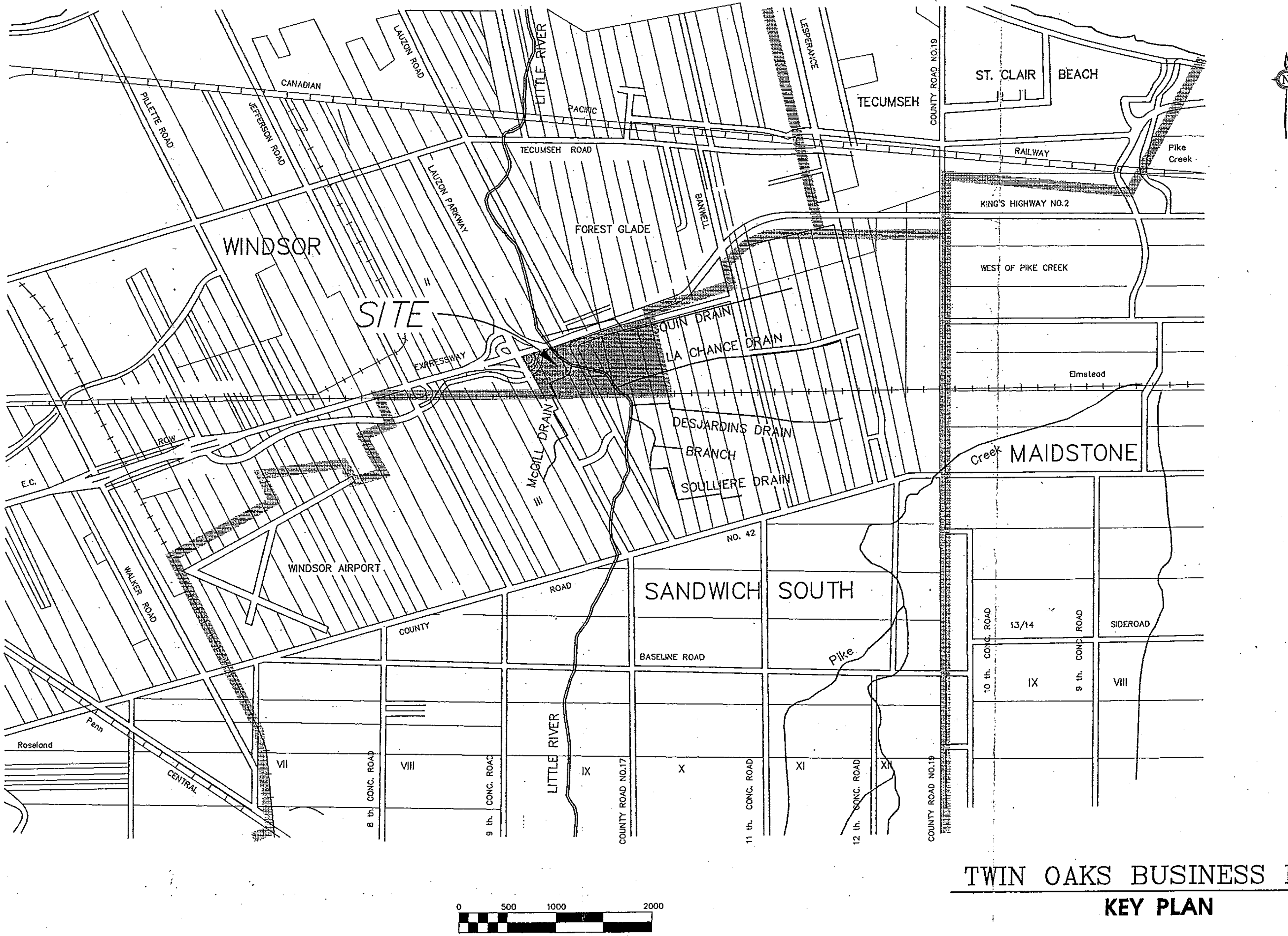
TWIN OAKS INDUSTRIAL PARK

CLASS ENVIRONMENTAL ASSESSMENT

APPENDIX CONTENTS

STUDY AREA

- Figures 1 and 2



LCBA CONSULTING ENGINEERS

TWIN OAKS BUSINESS PARK

KEY PLAN

FIGURE 1

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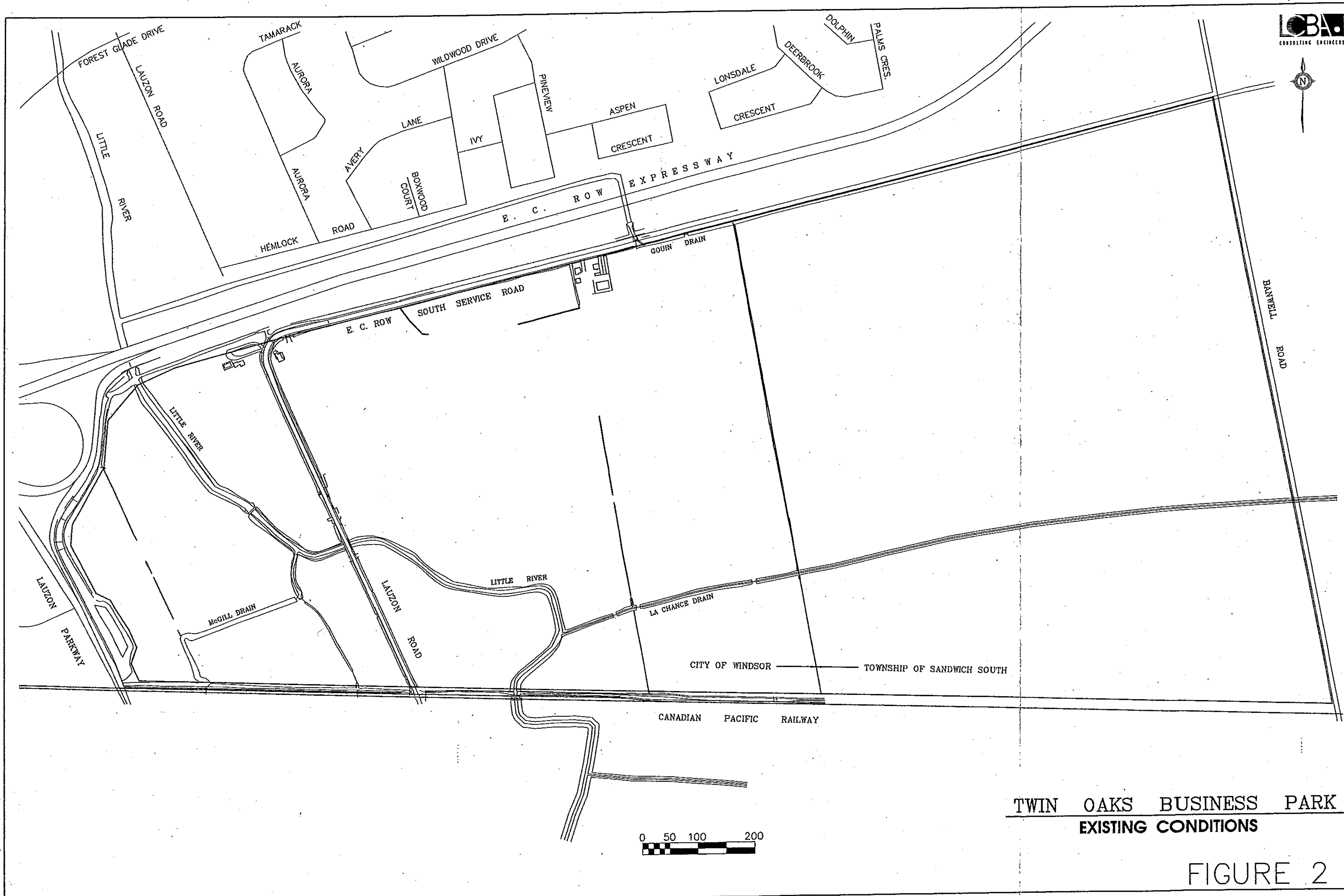


TWIN OAKS BUSINESS PARK

EXISTING CONDITIONS

FIGURE 2

ANNEXATION AGREEMENT

B I L L
No. 111
1 9 9 0 (AS AMENDED)

B Y - L A W   N U M B E R 10167

A BY-LAW TO AUTHORIZE THE ENTERING INTO OF AN AGREEMENT WITH THE CORPORATION OF THE TOWNSHIP OF SANDWICH SOUTH RESPECTING ADJUSTMENT OF MUNICIPAL BOUNDARIES

Passed the 9th day of March, 1990.

WHEREAS it is deemed expedient to enter into an Agreement with The Corporation of the Township of Sandwich South for the purpose of adjusting municipal boundaries;

THEREFORE the Council of The Corporation of the City of Windsor enacts as follows:

1. That The Corporation of the City of Windsor enter into an Agreement with The Corporation of the Township of Sandwich South to provide for the adjustment of their municipal boundaries and that such Agreement be in the form hereto annexed and marked Schedule "A" to this by-law.

2. That the Mayor and the City Clerk are hereby authorized and directed on behalf of the Corporation to execute the said Agreement and affix thereto the corporate seal of the Corporation and cause to be prepared and executed any documents, reports, forms and correspondence as may be required in order to give effect to this Agreement and the application therein referred to.

3. This by-law shall come into force and take effect on the day of the final passing thereof.

David S. Cassivi

ACTING MAYOR

CLERK

First Reading - March 9, 1990
Second Reading - March 9, 1990
Third Reading - March 9, 1990

THIS AGREEMENT made in quadruplicate this 9th day of March, 1990.

B E T W E E N:

THE CORPORATION OF THE CITY OF WINDSOR

hereinafter called the "City"

of the First Part

- and -

THE CORPORATION OF THE TOWNSHIP OF SANDWICH SOUTH

hereinafter called the "Township"

of the Second Part

WHEREAS the Council of The Corporation of the City of Windsor and the Council of The Corporation of the Township of Sandwich South agree that it would be mutually advantageous to adjust the municipal boundary between the City and the Township;

AND WHEREAS the City and the Township have come to an agreement respecting the resolution of the inter-municipal boundary issue;

AND WHEREAS it is expedient to have this Agreement in written form so that the parties may request that the Minister of Municipal Affairs recommend to the Lieutenant Governor in Council that an Order giving effect to this Agreement be made pursuant to the Municipal Boundary Negotiations Act, 1981, S.O. 1981, c.70;

NOW THEREFORE WITNESSETH that in consideration of the premises and the mutual terms and conditions hereinafter contained, the parties hereto agree as follows:

1. <u>AREA TO BE ANNEXED BY THE CITY</u>

On April 1, 1990, or such earlier date as is provided for in the Order of Lieutenant Governor in Council (hereinafter called the "annexation day"), the portion of the Township described in Schedule "A" to this Agreement (hereinafter referred to as "the area to be annexed by the City") shall be annexed to the City and shall form part of Ward 5 of the City.

2. ASSETS AND LIABILITIES

A. All real property of the Township located in the area to be annexed by the City shall vest in and become the property of the City on annexation day.

B. All assets and liabilities, excluding all real property of the Township attributable to the area to be annexed by the City, shall remain the assets and liabilities of the Township.

C. For the purpose of this paragraph, real property shall be deemed to also include any highway, street fixture, waterline, easement and restrictive covenant running with the land.

3. REAL PROPERTY TAXES

A. All real property taxes levied under any general or special Act and uncollected in the area to be annexed by the City which are due and unpaid on the day prior to the annexation day shall, on annexation day, become a debt owed to the City and may be collected by the City.

B. The Clerk of the Township shall forthwith prepare and furnish to the Clerk of the City a special collector's roll showing all real property taxes or special rates assessed against the lands in the area to be annexed by the City up to the annexation day and the persons assessed therefor.

C. The City shall pay to the Township on annexation day or within 3 months thereafter, an amount equal to the amount due and unpaid in subparagraph A.

4. BUSINESS TAXES

All business taxes levied and uncollected in the area to be annexed by the City which are due and unpaid on the day prior to annexation day shall continue after that date to be taxes due and payable to the Township and may be collected by the Township.

5. BY-LAWS IN AREA TO BE ANNEXED BY THE CITY

A. The by-laws of the City in force on annexation day shall as of that date extend to the area to be annexed by the City and any Township by-law then in force in the area to be annexed by the City shall as of that date cease to apply to the area, save and except:

(a) Township by-laws that were passed under sections 17, 22, 34 or 41 of the Planning Act, 1983, or a predecessor of those sections;

(b) Township by-laws that are kept in force by subsection 13 (3) of the Municipal Amendment Act, 1941;

(c) Township by-laws that are passed under the Drainage Act or similar legislation that places specific obligations on individual properties within the area to be annexed by the City;

(d) Township by-laws governing highways, traffic and encroachments; and

(e) Township by-laws conferring rights, privileges, franchises, immunities or exemptions that could not have been lawfully repealed by the Township Council.

6. ASSESSMENTS

The Assessment Commissioner shall be requested to prepare the assessment roll for the purposes of taxation on and after the annexation day and subsequent years for the area to be annexed by the City on the same basis that the assessment roll for the City is prepared in order to provide the area to be annexed by the City with an assessment that is equitable to the assessment of real property in the City.

7. CONTRIBUTION FOR HIGHWAY IMPROVEMENT

A. In this paragraph, "up-grading" shall mean

(i) a 34-foot wide industrial pavement complete with curb and gutter, roadside drainage, load transfer devices and street lighting for that part of the E.C. Row Avenue (South Service Road) lying between Lauzon Road and Banwell Road and that part of Banwell Road lying between the E. C. Row Avenue (South Service Road) and the right-of-way of the Canadian Pacific Railway.

(ii) the acquisition of properties necessary to widen the right-of-way to a minimun width of 66 feet; the construction of a minimum 24-foot wide industrial-type pavement (comparable to the City of Windsor's current standards) with 2 foot wide paved and 5 foot wide granular shoulders; seeded drainage swales (to suitable outlets) with perforated subdrains; complete with pavement markings, lighting and traffic signs; for that part of Banwell Road lying between the Canadian Pacific Railway right-of- way and County Road No. 42.

B. Should the up-grading referred to in paragraph A be pursued, the parties agree to share the cost remaining after any supplementary subsidy allotment provided by the Ministry of Transportation, in the proportion of two-thirds to be paid by the City and one-third to be paid by the Township.

C. The payment by each municipality to the other of its respective share of the cost of the said highway up-grading referred to in sub-paragraph B shall be made forthwith upon the completion of the up-grading or part thereof and upon the delivery of a written statement of the cost thereof certified by the respective Municipal Treasurer.

D. The terms and conditions of this paragraph shall terminate and be at an end on the 1st day of January, 1999, save and except for the contribution by one party to the other on account of works completed prior to such date.

8. SANITARY SEWER SERVICES

A. In this paragraph,

(i) "net acre" means all land area exclusive of road rights-of-way and other lands dedicated for public use.

(ii) "oversizing costs" means the additional costs resulting from the construction of a sanitary sewer having a larger size and installed at a greater depth in order to service the lands described in Schedule "B" hereto.

B. The City agrees to provide the Township on its westerly boundary with the City, namely, that part of the easterly limit of Farm Lot 138, Concession III, or its northerly projection lying north of the right-of-way of the Canadian Pacific Railway at a point or location as may be determined by the City, with a sanitary sewer outlet to service those lands in the Township described in Schedule "B" hereto within one year following the issuance of a building permit on the lands described in Schedule "A" hereto.

C. It is anticipated that the said sanitary sewer referred to in subpargraph B will be constructed pursuant to subdivison agreement with the City respecting the lands described in Schedule "A" hereto and the lands described in Schedule "C" hereto. If for any reason a contribution is made by the City toward the construction of the said sanitary sewer by way of a payment of oversizing costs, such oversizing costs shall be shared equally by the parties hereto and in the event of a dispute the Ontario Municipal Board shall hear and determine the dispute.

D. The Township, upon the issuance of a building permit for the erection of a building or structure on the lands described in said Schedule "B", agrees to pay to the City forthwith the following sums or amounts of money as impost charges, namely:

(i) $1,489 per net acre for cost sharing of the Little River Trunk Sanitary Sewer;

(ii) $2,616 per net acre for cost sharing for trunk sanitary services;

(iii) $13,275 per net acre toward the cost of the Little River Pollution Control Plant or such other amount as may be agreed upon by the parties and in the event of a dispute, the Ontario Muncipal Board shall hear and determine the dispute. In the first instance, the said sum of $13,275 shall be paid to the City and shall be held by the City, if necessary, pending a determination of the sum or amount of money to be paid pursuant to this clause; and

(iv) an amount per net acre yet to be determined in accordance with subparagraph 8C towards the Township's share of the oversizing costs referred to in 8C above.

E. The City and Township further agree that commencing on the date that the City has completed the construction of the sanitary sewer outlet referred to in subparagraph B of this paragraph, interest charges will be added to the said impost charges set out in subparagraph D of this paragraph that will consist of the addition of an annual simple interest charge based on the average annual rate of debentures issued by the City in each one-year period prior to the payment of the impost charges and the Township agrees to pay such interest charges.

F. If at some future date the Township determines that it does not wish to use any of the sanitary sewerage facilities provided for under paragraph 8 including the sanitary sewer yet to be constructed on Lauzon Road north of E.C. Row Expressway, the Township shall notify the City forthwith and compensate the City for any expenditures attributable to the provision of sanitary service to the lands in Schedule "B". Any such expenditure by the City shall have been incurred after February 3, 1990.

9. <u>SANITARY SEWAGE TREATMENT</u>

The City agrees to treat at its Little River Pollution Control Plant the sanitary sewage originating from that part of the Township described in said Schedule "B" in accordance with such terms and conditions and the payment by the Township to the City of such charges including administrative costs as may be agreed upon by the parties and in the event of a dispute, the Ontario Municipal Board shall hear and determine all such disputes.

10. LIMITATION

A. The Province of Ontario supports and encourages the resolution of inter-municipal boundary and boundary-related issues by the party municipalities pursuant to the **Municipal Boundary Negotiations Act, 1981**.

B. The parties recognize that this Agreement does not in any way bind the Province of Ontario and that,

(a) this Agreement does not imply or anticipate an alteration in the policies or programs of the Province of Ontario, its agencies, boards or commissions; and

(b) the implementation by Order-in-Council of this Agreement does not imply any right to preferred treatment under any program of the Province of Ontario, its agencies, boards or commissions.

C. Where any provision of this Agreement is declared invalid by any court or other tribunal, the balance of this Agreement shall remain in force and be binding upon the parties.

11. This Agreement shall be binding upon the successors and assigns to the parties hereto.

IN WITNESS WHEREOF this Agreement has been executed by the parties hereto under their respective corporate seal.

THE CORPORATION OF THE CITY OF WINDSOR

Approved As To Form: FSS City Solicitor

David S. Cassivi

Mayor

Clerk

THE CORPORATION OF THE TOWNSHIP OF SANDWICH SOUTH

Reeve

C. S.

Clerk

SCHEDULE "A"

Area to be annexed from the Township of Sandwich South to the City of Windsor:

Beginning at the intersection of the westerly limit of Lot 136 in Concession III (McNiff's Survey) in the Township of Sandwich South and the northerly limit of the right-of-way of the Canadian Pacific Railways;

Thence easterly following the northerly limit of the right-of-way of the Canadian Pacific Railways to the easterly limit of Lot 138 in the said Concession III;

Thence northerly along the easterly limit of Lot 138 and the northerly prolongation thereof to the southerly boundary of the City of Windsor;

Thence westerly and southerly following the boundaries of the said City to the place of beginning.

SCHEDULE "B"

Area of the Township of Sandwich South to be provided with a Sanitary Sewer Outlet by the City of Windsor:

Beginning at the intersection of the easterly limit of Lot 138 in Concesssion III (McNiff's Survey) in the Township of Sandwich South and the northerly limit of the right-of-way of the Canadian Pacific Railways;

Thence easterly following the northerly limit of the right-of-way of the Canadian Pacific Railways to the easterly limit of Lot 143 in the said Concesssion III:

Thence northerly along the easterly limit of Lot 143 and the northerly prolongation thereof to the southerly boundary of the City of Windsor;

Thence westerly and southerly following the boundaries of the said City to the place of beginning.

SCHEDULE "C"

Area within the City of Windsor;

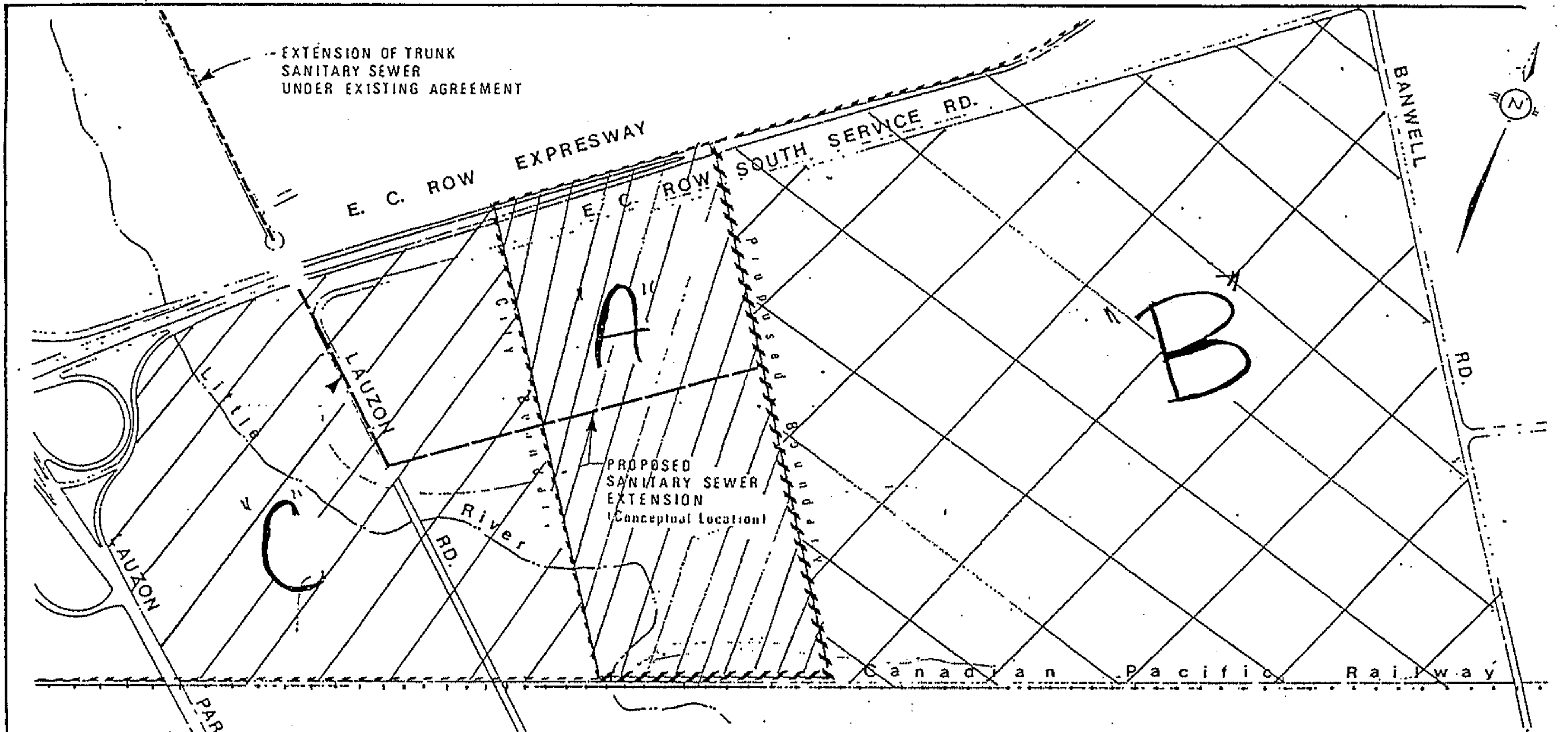
Beginning at the intersection of the westerly limit of the Lauzon Parkway and the northerly limit of the right-of-way of the Canadian Pacific Railways;

Thence easterly following the northerly limit of the said right-of-way to the westerly limit of Lot 136 in Concession III (McNiff's Survey) in the Township of Sandwich South;

Thence northerly along the westerly limit of Lot 136 and the northerly prolongation thereof to the southerly boundary of the City of Windsor and the E. C. Row Expressway;

Thence westerly following the southerly limit of the E. C. Row Expressway to the westerly limit of the Lauzon Parkway;

Thence southerly along the westerly limit of the Lauzon Parkway to the place of beginning.



THE CORPORATION OF THE CITY OF WINDSOR-DEPARTMENT OF PUBLIC WORKS			
TOWNSHIP OF SANDWICH SOUTH - JANTREE DEVELOPMENT - ANNEXATIAN AGREEMENT - TRUNK SANITARY SEWER			
Commissioner Of Works	SCALE N. T. S.	DATE JAN./90	DWG NO C-1690
	DWN BY M. H	CHECKED L C	

PHASE 2 CONSULTATION

- Notice of Project published in the July 6, 1996 edition of the Windsor Star
- Comments Received
- Notice of Public Information Centre published in the August 17th, 1996 edition of the Windsor Star
- Sample Copy of Open House Questionnaire and Information Package
- Copy of Sign In Sheet
- Comments Received
- Mandatory Contact List
- City of Windsor Council Resolution of October 21, 1996 adopting Phase 1 and 2 ESR
- Notice of Completion of Phase 1 and 2 ESR published in the October 24th, 1996 edition of the Windsor Star

CITY OF WINDSOR

CLASS ENVIRONMENTAL ASSESSMENT

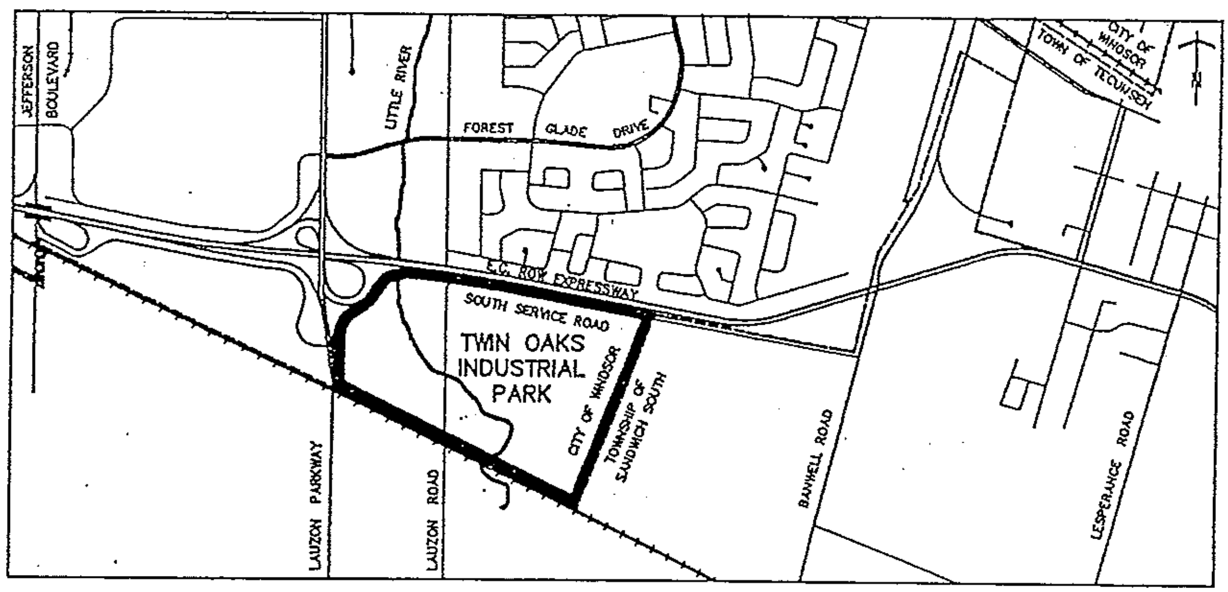
TWIN OAKS INDUSTRIAL PARK

PUBLIC COMMENT INVITED

The City of Windsor has identified the need for additional serviced industrial land to allow industrial development to proceed in an orderly manner. To address this need, the City, using good environmental planning, will conduct a study focused on the installation of road, sewer, water and power services in the area known as the Twin Oaks Industrial Park which has been owned by the City since 1989.

The study will follow the requirements of the Class Environmental Assessment for Municipal Road, Water and Wastewater Projects (June 1993) and will include a problem definition and evaluation of alternative solutions. The background information and evaluation of solutions will be made available for review by the potentially affected and/or interested public and agencies.

The purpose of this announcement is to inform of the start of Phases 1 and 2 of the Class Environmental Assessment process and to invite the public and agencies to comment and provide early input. Comments should be forwarded to the individuals identified below.



Mr. Mario Sonego, P.Eng.

City of Windsor
350 City Hall Square West
Windsor, Ontario
N9A 6S1

Telephone: (519) 255-6356
Fax: (519) 255-9847

Mr. Harold Horneck, P.Eng.

LaFontaine, Cowie, Buratto
& Associates Limited
3260 Devon Drive
Windsor, Ontario
N8X 4L4

Telephone: (519) 966-2250
Fax: (519) 966-5523

WD-1182-1B

THE CITY OF WINDSOR

OFFICE OF THE COMMISSIONER OF WORKS

G. T. HARDING, B.S.C.E., P.ENG.
COMMISSIONER OF WORKS

July 8, 1996

RECEIVED
JUL 15 1996
LAFONTAINE, COWIE, BURATTO & ASSOCIATES
Consulting Engineers

Wilson, Walker, Hochberg, Slopen
443 Ouellette Avenue
P.O. Box 1390
Windsor, Ontario
N9A 6R4

Attention: Mr. Jeffrey Slopen

Dear Sir:

RE: TWIN OAKS INDUSTRIAL PARK - PROPERTIES IN SANDWICH SOUTH

This will confirm our previous telephone conversation regarding clients you represent with land holdings in Sandwich South located on South Service Road west of Banwell Road..

Attached is By-Law 10167 which was the Boundary Adjustment Agreement in 1990 which respected Twin Oaks Industrial Park. This schedule described the terms for servicing of the area both within Sandwich South and the City of Windsor.

I believe the agreement speaks for itself and I trust the above is the information you require.

Should you have any further questions, please contact myself at 255-6356.

Yours truly,

Mario Sonego, P. Eng.
Development and Corporate Projects Engineer

MSonego:ht
Attach.

cc: Commissioner of Works
Lafontaine, Cowie, Buratto & Associates Ltd.

Corporation of the Township of Sandwich South

Rick Wellwood, P.Eng.
Deputy Clerk
Planning Co-ordinator

July 11, 1996

RECEIVED
JUL 15 1996
LAFONTAINE, COWIE, BURATTO & ASSOCIATES
Consulting Engineers

LaFontaine, Cowie, Buratto & Associates Ltd.
3260 Devon Drive,
Windsor, Ontario
N8X 4L4

Attention: Mr. Harold Horneck, P.Eng.

Dear Harold,

Re: Class Environmental Assessment
Twin Oaks Industrial Park

The Township is in receipt of your letter of July 03/1996 re. the above. Council has requested that I make you aware of the annexation agreement between the City of Windsor (copy attached) and the Township of Sandwich South dated February 12th, 1990. This agreement details the terms between the parties that resulted in certain lands within the Township being annexed by the City. In consideration of the annexation the City agreed to provide services to the abutting Township lands (zoning map attached). These services included, roads, sanitary sewers and water. We are concerned that you are aware of the agreement between the parties in order that your terms of reference for the Class EA addresses the total/combined servicing requirements within the study area resulting from the requirements contained in the agreement regarding the servicing of the abutting lands within Sandwich South.

Yours Truly,
THE TOWNSHIP OF SANDWICH SOUTH

R. Wellwood

Rick Wellwood CBCO, P.Eng
Deputy Clerk / Planning and Development Co-ordinator

cc: Mr. M. Sonego, P.Eng.

LA FONTAINE, COWIE, BURATTO
& ASSOCIATES LIMITED
CONSULTING ENGINEERS
3260 Devon Drive, Windsor, Ontario N8X 4L4
Tel: (519) 966-2250 Fax: (519) 966-5523

1996 07 26
Our Ref. No. WD1002-1B

Township of Sandwich South
3455 North Talbot Road
OLDCASTLE, Ontario
N0R 1L0

Attention: Mr. Rick Wellwood
Dep. Clerk/Planner

Re: Class Environmental Assessment
Twin Oaks Industrial Park

Dear Sir:

This will acknowledge receipt of your letter dated July 11, 1996 together with a copy of the annexation agreement dated February 12, 1990 between the City of Windsor and Sandwich South Township.

The servicing requirements contained in the annexation agreement will be taken into consideration in design of the roads, sanitary sewers and water distribution facilities required to service the proposed industrial park.

We are in the process of preparing the Phase 1 & 2 Class Environmental Assessment Report and will provide you with further information as it becomes available.

Yours very truly,

LaFONTAINE, COWIE, BURATTO
& ASSOCIATES LIMITED

per: [signature]

H. S. Horneck, P. Eng.

HSH:vt
cc: Mr. M. Sonego, P. Eng.

Certified Professional Engineers Ontario

CITY OF WINDSOR

CLASS ENVIRONMENTAL ASSESSMENT

TWIN OAKS INDUSTRIAL PARK

NOTICE OF PUBLIC MEETING

The City of Windsor has identified a need for additional serviced industrial land to meet existing and future growth demands. The City of Windsor has retained LaFontaine, Cowie, Buratto & Associates Limited to proceed with the planning and design of services in the area known as the Twin Oaks Industrial Park located in the south east portion of the City and bounded to the north by the E.C. Row Expressway, to the south by the Canadian Pacific Railway, to the west by Lauzon Parkway and on the east by the Township of Sandwich South. Servicing requirements for the proposed development include new roads, bridge(s) over watercourses, water distribution and wastewater collection systems, stormwater management facilities and areas for parks/recreational use.

The project is being planned in accordance with the procedures contained in the Class Environmental Assessment for Municipal Road, Water and Wastewater Projects (June 1993).

The study has progressed such that design alternatives have been developed for review and public comment. All interested parties are invited to attend a public meeting to review and discuss the work which has been completed to date. Representatives from the City of Windsor and LaFontaine, Cowie, Buratto & Associates Limited will be present to answer questions and to obtain feedback prior to finalizing the project. The public meeting will be held on:

Thursday, August 29th, 1996
2 p.m. to 4 p.m. & 6 p.m. to 8 p.m.
Forest Glade Community Centre
3215 Forest Glade Drive
Windsor, Ontario

For additional information, please contact:

Mr. Mario Sonego, P. Eng.
City of Windsor
350 City Hall Square West
WINDSOR, Ontario, N9A 6S1

Tel: (519) 255-6356
Fax: (519) 255-9847

Mr. Harold Horneck, P. Eng.
LaFontaine, Cowie, Buratto
& Associates Limited
3260 Devon Drive
WINDSOR, Ontario, N8X 4L4

Tel: (519) 966-2250
Fax: (519) 966-5523

Comments are invited for incorporation into the planning and design of this project and will be received until September 20th, 1996.

NOTE: Any person has the right to request the Minister of the Environment and Energy "bump up" the project to an individual environmental assessment if concerns regarding this project cannot be resolved through discussions with the City of Windsor. A request to the Minister must be made in writing to the address set out below and a copy must be sent to the City of Windsor's address set out above.

Minister's Address:
Minister of the Environment and Energy
135 St. Clair Avenue West, 15th Floor
TORONTO, Ontario M4V 1P5

This notice issued August 17th, 1996.

CITY OF WINDSOR

TWIN OAKS INDUSTRIAL PARK
CLASS ENVIRONMENTAL ASSESSMENT

OPEN HOUSE

THURSDAY, AUGUST 29TH, 1996
2:00-4:00 pm
6:00-8:00 pm

QUESTIONNAIRE

PLANNING AND DESIGN PROCESS FOR THE PROPOSED TWIN OAKS INDUSTRIAL PARK IN THE CITY OF WINDSOR

You are invited to comment or express concerns regarding the proposed Twin Oaks Industrial Park. The preliminary Phase 1&2 Report identifies the problem and it also reviews a number of alternative solutions, identifies advantages and disadvantages of each including impacts on the natural, social and economic environments.

Please leave your completed questionnaire at the Open House or send your reply to:

LaFontaine, Cowie, Buratto & Associates Limited
3260 Devon Drive
WINDSOR, Ontario
N8X 4L4

on or before September 20, 1996.

COMMENTS OR CONCERNS:

____

____

____

____

____

____

____

(Attach additional sheets if necessary)

NAME:______________________________

ADDRESS:______________________________

TELEPHONE NO.:______________________________

FAX NO.:______________________________

AFFILIATION OR GROUP:______________________________

DATE:________________ SIGNATURE:____________________

MEMO TO FILE

RE: TWIN OAKS INDUSTRIAL PARK
PHASE 1/2 CLASS EA REPORT

Call from Faye Langmaid, City of Windsor, Parks and Recreation, on August 27, 1996.

Faye made the following comments regarding the above report.

Section 3.2.6 - Natural Vegetation

- Fay noted there is significant vegetation remaining on the site.
- Parks and Rec has taken out trees which can be moved.
- There are still a number of nice trees remaining.
- There has not been an inventory carried out.

Re: Airport concerns regarding a west pond.

- Faye noted that there is a pond/wetland adjacent to the airport in Saskatoon, Saskatchewan which was constructed by Ducks Unlimited. She suggested we call Cal Sexsmith [(306) 975-2762] to discuss if there are problems with this pond.

Ontario

Ministry of Municipal Affairs and Housing
Ministère des Affaires municipales et du Logement

495 Richmond Street
7th Floor
London ON N6A 5A9
519/673-1611
Fax: 519/661-1677
Toll Free:
1-800-265-4736

495, rue Richmond
7e étage
London ON N6A 5A9
519/673-1611
Télécopieur: 519/661-1677
Ligne sans frais:
1-800-265-4736

Regional Operations Branch
Direction des opérations régionales

RECEIVED
SEP - 3 1996
LAFONTAINE, COWIE, BURATTO & ASSOCIATES
Consulting Engineers

August 29, 1996

Mr. Don Joudrey, P. Eng.
LaFontaine, Cowie, Buratto
& Associates Limited
3260 Devon Drive
Windsor, Ontario
N8X 4L4

Dear Mr. Joudrey:

Re: Twin Oaks Industrial Park
City of Windsor

We have completed our review of the Phase 1 and 2 Environmental Assessment Report and have no comment on the proposal.

Please remove this Ministry from the Mandatory Contact list for this project.

Sincerely,

Tim Ryall

Tim Ryall
Municipal Advisor

WD 1002-7B

BELL CANADA

A.N. FACITITIES

FACSIMILE COVER LETTER

DELIVER TO: Don Joudrey **DATE:** 96 09 03

FAX #: 966-5523 **REGARDING:** Twin Oaks Industrial Park

ATTENTION:

NUMBER OF PAGES INCLUDING THIS COVER LETTER: 1

We are transmitting the following information. Please contact sender if all pages are not received.

With regard to Draft Phase 1 & 2 Report for Twin Oaks p 21. Telephone Service. A possible alternative to placing new buried cable along Banwell and the South Service Road would be a Fibre Fed Bell building in the area of Lauzon and the South Service Road. At this stage - F.Y.I as a possibility.

FROM: J.L. MAILLOUX (JEANINE)
F1, 1149 GOYEAU STREET
WINDSOR, ONTARIO
N9A 1H9
TELEPHONE: 519-973-6790
FAX: 519-258-4543

Thanks,
Jeanine Mailloux

IMPORTANT NOTICE: The information contained herein is proprietary to Bell Canada and may not be used, reproduced, or disclosed to others except as specifically permitted in writing by the originator of the information. The recipient of this information, by its retention and use, agrees to protect the Name and the information contained therein from loss, theft or compromise. If you have received this FAX in error, please notify the originator immediately.

Windsor Airport

Windsor Airport
3200 County Road 42
R.R. #1
Windsor, Ontario
N9A 6J3

Phone: (519) 969-2430
Fax: (519) 969-6053
E-mail: agraham@wincom.net

LaFontaine, Cowie, Buratto & Associates Limited
3260 Devon Drive
Windsor, Ontario
N8X 4L4

RECEIVED
SEP 09 1996
LAFONTAINE, COWIE, BURATTO & ASSOCIATES
Consulting Engineers

September 5, 1996

re: Twin Oaks Industrial Park Proposal

After reviewing the material available in the report and at the public meeting, I would like to offer the following comments:

1. Prior to finalizing the plans for the intersection and stoplight on Lauzon Parkway, I suggest that a surveyor's opinion be obtained on the height restrictions at that spot imposed by the Airport Zoning Regulations. We have had successful dealings with Verhagen Surveyors on similar matters, as they are quite knowledgeable about these regulations.

2. Our other major concern is on the stormwater management proposals. We are pleased to have been involved in the initial planning in this area. However, we would like to note the following regarding the alternatives proposed by the report:

   Section 5. Online Storage - Little River
   Advantages - Subsection v)

   Under some configurations, this proposal could encourage waterfowl nesting if it resulted in residual ponds. We would like to be involved in the planning of this option to assure that this possibility is eliminated.

Thank you for this opportunity to comment on the planning to this point.

Alan N. Graham, AAE
Airport Manager

Wednesday, September 4, 1996

RECEIVED
SEP 05 1996
LAFONTAINE, COWIE, BURATTO & ASSOCIATES Consulting Engineers

Lil' Reg
Little River Enhancement Group
ESSEX-WINDSOR

Don Joudry
LCBA Consulting Engineers
3 260 Devon Drive
Windsor, ON
N8X 4L4

Dear Mr. Joudry,

The Little River Enhancement Group (Lil' Reg) wish to add our comments and concerns to the *Draft, Phase 1 &2 Report, Class Environmental Assessment, Twin Oaks Industrial Park, City of Windsor.*

Page 10, 4.3 Environmental Effects and Mitigating Measures,
(4) Aquatic Environment;
(5) Terrestrial Environment. We support both of these points.

Page 12, 5.0 Servicing Considerations;
Page 14, 5.3 Stormwater Management.
Stormwater management, runoff and water quality and quantity issues are a concern for our group. We expect the quality of water in the Little River to be improved.

Page 16, Dry Pond (Figure 7);
Page 17, Wet Pond (Figure 8);
Page 18, Online Storage (Little River) (Figure 10);
Page 19, Grass Swales (Figure 12).
The Lil' Reg is keenly interested in the Online Storage option for the Little River. We would like to see the streambank stabilized to control erosion and improve water quality downstream. Environment Canada does have Great Lakes 2000 Cleanup funding available for projects like streambank rehabilitation; this supports the recommendations of the Detroit River Remedial Action Plan. Additional off-line water quality control could take the form of a dry pond with a permanent wet sediment forebay and grass swales. We prefer the wet pond concept, but realize the concern of the Windsor Airport.

Page 20, 5.4 Recreation.
Lil' Reg endorses the greenway concept along the entire Little River and throughout the watershed. We support the City of Windsor Parks and Recreation and the Essex Region Conservation Authority in this recommendation. Our group participated in an environmental project at McAuliffe Woods Conservation Area in Sandwich South Township in 1992 and 1993. Environment Canada provided funding to create nature trails throughout the woodlot. As part of that project we contacted Ontario Hydro, who support the concept of a trail connection between McAuliffe Woods Conservation Area and Twin Oaks Industrial Park along the Hydro right of way if adjacent landowner's concerns can be addressed. Lil' Reg encourages the greenway

399 Woodridge, Windsor, Ontario N8N 3A7 Ph. (519) 735-2087 ~~Phone~~/Fax (519) 974-~~6958~~ -3825

connection between the areas of the Little River Watershed. This greenway connection should be considered in the *Phase 3 Report* as part of the trail adjacent to the Little River flowing through Twin Oaks.

Page 22, 6.1 Site Clearing.

Consideration for the existing trees on the site, especially those by the Little River, is highly recommended.

Conceptual Plans.

All conceptual plans have the main access road from Lauzon Parkway crossing the Little River. Consideration must be given for the trail users safety when crossing the road/trail intersection.

Stormwater Management Alternatives Meeting 1996 06 27

Page 3, 5.d.

The suggestion of rerouting Little River will be opposed by Lil' Reg as we do not support any alteration to the natural course of the river.

Respectfully submitted,

Ian Naisbitt

Ian Naisbitt
Little River Enhancement Group
399 Woodridge Drive
Tecumseh, ON
N8N 3A7

Phone 735-2078 (H) 974-3450 (W) Fax 974-3825 (W)

MEMO TO FILE

RE: TWIN OAKS INDUSTRIAL PARK
PHASE 1/2 CLASS EA REPORT

Call from Rick Wellwood, Planner/Deputy Clerk, Township of Sandwich South on September 6, 1996 at 9:40 a.m.

He made the following comments regarding wording of parts of the Draft Report.

Section 5.1	Roads	-	Should mention that provisions will be made for future roads in the Township of Sandwich South
Section 5.2.2	Sanitary	-	Remove the word possible from 4th paragraph
Section 5.3	Stormwater Management	-	Should mention that outlets will be maintained to accept pre-developed flows from Sandwich South
Section 5.5	Water Supply	-	Indicate trunk mains will be sized to service future development in Sandwich South

QUESTIONNAIRE

PLANNING AND DESIGN PROCESS FOR THE PROPOSED TWIN OAKS INDUSTRIAL PARK IN THE CITY OF WINDSOR

You are invited to comment or express concerns regarding the proposed Twin Oaks Industrial Park. The preliminary Phase 1&2 Report identifies the problem and it also reviews a number of alternative solutions, identifies advantages and disadvantages of each including impacts on the natural, social and economic environments.

Please leave your completed questionnaire at the Open House or send your reply to:

LaFontaine, Cowie, Buratto & Associates Limited
3260 Devon Drive
WINDSOR, Ontario
N8X 4L4

on or before September 20, 1996.

COMMENTS OR CONCERNS:

1) - Concerned with additional traffic
- concerned with traffic movement blockage because of new stop light
2) - Concerned with Forest Glade Drive bridge ice blockage in winter - development will aggravate problem
3) - Concerned with truck turning from Service Road B to Lauzon Parkway

(Attach additional sheets if necessary)

NAME: GEORGE POPMARKOV

ADDRESS: 2971 Stillmeadow

TELEPHONE NO.: 735-7879

FAX NO.:

AFFILIATION OR GROUP:

DATE: SIGNATURE:

Jan

QUESTIONNAIRE

PLANNING AND DESIGN PROCESS FOR THE PROPOSED TWIN OAKS INDUSTRIAL PARK IN THE CITY OF WINDSOR

You are invited to comment or express concerns regarding the proposed Twin Oaks Industrial Park. The preliminary Phase 1&2 Report identifies the problem and it also reviews a number of alternative solutions, identifies advantages and disadvantages of each including impacts on the natural, social and economic environments.

Please leave your completed questionnaire at the Open House or send your reply to:

LaFontaine, Cowie, Buratto & Associates Limited
3260 Devon Drive
WINDSOR, Ontario
N8X 4L4

on or before September 20, 1996.

COMMENTS OR CONCERNS:

- favour online storage & dry pond concept
- definitely need trail - future hookup to McAuliffe Woods along hydro R.O.W.
  ≈ 30' wide - 10' gravel path + 10' sod side
- apply for Great Lakes Clean Up 2000 fund
  Brian ~~[illegible]~~ McHatty - Fed Gov't ~~[illegible]~~ - bank restoration

(Attach additional sheets if necessary)

Stan Taylor has plans of Little River before golf course!

NAME: Jan Naisbitt

ADDRESS:

TELEPHONE NO.:

FAX NO.:

AFFILIATION OR GROUP:

DATE:

SIGNATURE:

Airport

QUESTIONNAIRE

PLANNING AND DESIGN PROCESS FOR THE PROPOSED TWIN OAKS INDUSTRIAL PARK IN THE CITY OF WINDSOR

You are invited to comment or express concerns regarding the proposed Twin Oaks Industrial Park. The preliminary Phase 1&2 Report identifies the problem and it also reviews a number of alternative solutions, identifies advantages and disadvantages of each including impacts on the natural, social and economic environments.

Please leave your completed questionnaire at the Open House or send your reply to:

LaFontaine, Cowie, Buratto & Associates Limited
3260 Devon Drive
WINDSOR, Ontario
N8X 4L4

on or before September 20, 1996.

COMMENTS OR CONCERNS:

Get zoning restrictions from Windsor Airport and identify if traffic signal on overpass will prohibit traffic signal due to height

McGill Drain - is it called the [illegible] drain?

Al Grakovac 969-2430 Windsor Airport

(Attach additional sheets if necessary)

Phil Roberts

NAME: WINDSOR AIRPORT

ADDRESS:

TELEPHONE NO.:

FAX NO.:

AFFILIATION OR GROUP:

DATE: SIGNATURE:

QUESTIONNAIRE

PLANNING AND DESIGN PROCESS FOR THE PROPOSED TWIN OAKS INDUSTRIAL PARK IN THE CITY OF WINDSOR

You are invited to comment or express concerns regarding the proposed Twin Oaks Industrial Park. The preliminary Phase 1&2 Report identifies the problem and it also reviews a number of alternative solutions, identifies advantages and disadvantages of each including impacts on the natural, social and economic environments.

Please leave your completed questionnaire at the Open House or send your reply to:

LaFontaine, Cowie, Buratto & Associates Limited
3260 Devon Drive
WINDSOR, Ontario
N8X 4L4 FAX 966-5523

on or before September 20, 1996.

COMMENTS OR CONCERNS:

THE DEVELOPMENT OF TWIN OAKS INDUSTRIAL PARK SHOULD BE PUT IN PLACE AS QUICKLY AS POSSIBLE, THE INDUSTRIAL LAND IS NEEDED NOW!! PLEASE HURRY THE PROCESS.

(Attach additional sheets if necessary)

NAME: STEWARD R. FULFORD

ADDRESS: 1537 HOWARD AVE WINDSOR N8X 3T5

TELEPHONE NO.: 519-256-2200 FAX 519-258-9647

FAX NO.: 519-258-9647

AFFILIATION OR GROUP: NONE

DATE: 29AUG96 SIGNATURE: [signature]

QUESTIONNAIRE

PLANNING AND DESIGN PROCESS FOR THE PROPOSED TWIN OAKS INDUSTRIAL PARK IN THE CITY OF WINDSOR

You are invited to comment or express concerns regarding the proposed Twin Oaks Industrial Park. The preliminary Phase 1&2 Report identifies the problem and it also reviews a number of alternative solutions, identifies advantages and disadvantages of each including impacts on the natural, social and economic environments.

Please leave your completed questionnaire at the Open House or send your reply to:

LaFontaine, Cowie, Buratto & Associates Limited
3260 Devon Drive
WINDSOR, Ontario
N8X 4L4

on or before September 20, 1996.

COMMENTS OR CONCERNS:

At the open house the consultants for the project seemed to put the concerns of citizens aside and seemed only to care about getting the project started as quickly as possible. I have two main concerns, the first being that I do not want the land in question to be turned into industrial land, and my second concern is that your proposed street layouts has it's main enterance way in a dangerous spot.

(Attach additional sheets if necessary)

NAME: Stephen Goodwin

ADDRESS: 9436 Ashland Drive

TELEPHONE NO.: 735-3971

FAX NO.:

AFFILIATION OR GROUP:

DATE: September 19, 1996 SIGNATURE: Stephen Goodwin

Twin Oaks Industrial Park Concerns

My first concern is that I don't like the idea of the city turning an old golf course into industrial since as far as I see it, people in Forest Glade and Meadowbrook have too much industrial land surrounding them already. We already have all the land from the E.C Row northward to just south of Tecumseh Road and west to Jefferson boulevard as industrial land which as I see it has some room left to expand but could be more if the city managed it better. I believe the residents of Forest Glade and Meadowbrook are getting sick of industrial land beginning to surround them when it shouldn't be that way. If people weren't so afraid to confront civic leaders and major decision people I think the whole city would be arriving at the offices of important people in this city in angry mobs telling them how they are messing up the city and to stop it or else.

I know you are trying to fix a problem the city says exists but as I see it you could be causing more problems then fixing. After reading your phase 1 & 2 report it has come to my attention that your report seems not to take in consideration the residents of the surrounding area, in fact one part of report says there is no conflict with surrounding property which makes me believe you didn't do a through analysis for your report . It has come to my attention that the city thinks there is a shortage of industrial land and there may be, but there wouldn't be if the city made the buildings more than just one floor and to make the buildings easy to change uses easily when a company has no more use for the building. And also making lot sizes smaller and street layouts better the city could use the space in these industrial spaces more effectively thus making expropriating more land for industrial purposes not necessary.

Oh by the way be careful what you hear from the city, lately the seem to only care about their selfish needs as opposed to what is best for the city. Case in point is that just recently city council approved 900,000 dollars to build a glass entranceway to nowhere to greet people coming out of the tunnel to the city. I personally think they could have used about half of that to repair the roof on the old Windsor Arena and the other half could been used to fix the road and sewers in our city that are in deplorable condition and are an embarrassment to city residents.

I know you probably don't care one bit about what I think about this project but I am going to tell you anyway. After reading your report and diagrams my first concern is safety, namely for people who use Luzon Parkway everyday. What I mean about this is the placement of your main access road which would intersect Lauzon Parkway at the south service road for the E.C Row expressway. By doing this you would create a dangerous intersection since it is on a steep hill. The intersection could be the cause of many accidents because people wouldn't be able to see the light until the last minute making it almost impossible to stop causing deadly accidents as people try to swerve trucks and look out for people merging from E.C Row off ramps or right lanes ending or starting.

My suggestion to solve this problem would to bring the entrance way a little further south to the nearest road that intersects Lauzon Parkway, which I believe is a service road and not county road 42, which is at the same height making it easier for people to enter and exit the area. I know that you said in report that the bridge on Lauzon Road going over little was in bad condition but to get this project rolling with no problems you should think about building a new bridge over little river on Lauzon Road in the industrial park. I know the above suggestion is not cost effective but it could solve two main stumbling block to concerned residents, safety and congestion of relying on just your main access road to exit and enter the industrial park.

When I suggested this idea I was basically laughed at and told that it could be done since it brought everybody going into the industrial park out of the city, which in the last little while with amalgamation talks could be part of Windsor soon. When I heard this it led to me that you just had the public meeting since it was a requirement by the city or province and not to get solid and good suggestions from concerned residents. I also suggested at the meeting that there should be a bridge crossing the E.C Row at Lauzon road, this time I felt as though you seemed to care about taking care of concerns before diving into a project full steam, your concern was that you were worried about industrial traffic going onto a residential road. And lastly on the road concerns I think your street layout in figure 5 is the best except that I just don't like the main access road connecting to Lauzon Parkway.

For stormwater management systems I like your proposal in figure 10 since it changes the existing landscape the least plus the possibility of a recreation area on the river. My final thought for you to ponder is that I believe the area in question would be better suited for residential development or to keep it as it is, but since I doubt the city plans to change its' mind so I guess I am in a losing battle here. By for now.

Sincerely,

Stephen Goodwin

PS: If you have anymore information about this project or any other project happening within in the county please mail it to me, or if you have e- mail capability you can e-mail it to me at ggoodwin@mnsi.net

CORPORATION OF THE CITY OF WINDSOR

TWIN OAKS INDUSTRIAL PARK

CLASS ENVIRONMENTAL ASSESSMENT

DRAFT PHASE 1 & 2

The following preliminary Mandatory Contacts will be contacted during the various stages of the Class EA process. Agencies which indicate no direct interest will be deleted and new ones which express interest will be added to the list.

Federal and Provincial Agencies

Ministry of Environment and Energy
    London Regional Office
    Windsor District Office

Environment Canada

Canadian Pacific Railway

Ministry of Culture, Tourism and Recreation - Windsor

Ontario Ministry of Agriculture and Food - Essex

Ministry of Natural Resources - Chatham District Office

Ministry of Municipal Affairs

Transport Canada - Windsor Airport

Municipal and Private Agencies

Essex Region Conservation Authority

City of Windsor
    Public Works Department
    Parks and Recreation
    Planning Department
    Traffic Engineering and other affected Departments

Township of Sandwich South

Windsor-Essex County Development Commission

Windsor Utilities Commission - Hydro and Water

Bell Canada - Windsor

Union Gas - Windsor

Little River Enhancement Group

CONSULTING ENGINEERS

THE CORPORATION OF THE

CITY OF WINDSOR

THOMAS W. LYND M.A., A.M.C.T.
CITY CLERK

CITY HALL
WINDSOR, ONTARIO
N9A 6S1

PHONE: (519) 255-6212
255-6215
FAX: (519) 255-6868

IN REPLY, PLEASE REFER
TO OUR FILE NO.________

OFFICE OF THE CLERK

October 25, 1996

MDI1996 mq 5

Harold Horneck
Lafontaine, Cowie, Burratto and Associates
3260 Devon Drive
Windsor, Ontario N8X 4L4

The following resolution was adopted by Council at its meeting held on October 21, 1996:

CR1091/96 That the Class Environmental Assessment Report - Phase 1 and 2 for the Twin Oaks Industrial Park **BE ADOPTED** and further, the report **BE TABLED** for a 30 day period for public comment and Notice **BE GIVEN** in the Windsor Star of the appeal process for this report.

Nancy Leavoy
Deputy Clerk
/jr

RECEIVED
OCT 28 1996
LAFONTAINE, COWIE, BURATTO
& ASSOCIATES
Consulting Engineers

NOTICE OF COMPLETION
PUBLISHED IN WINDSOR STAR ON
THURSDAY, OCTOBER 24TH, 1996

CITY OF WINDSOR
CLASS ENVIRONMENTAL ASSESSMENT
TWIN OAKS INDUSTRIAL PARK

The City of Windsor has identified a need for additional serviced industrial land to meet existing and future growth demands. The City of Windsor has retained LaFontaine, Cowie, Buratto & Associates Limited, Consulting Engineers, to proceed with the planning and design of services for the area known as the Twin Oaks Industrial Park. The proposed industrial park is located in the south east portion of the City and is bounded on the north by the E.C. Row Expressway, on the south by the Canadian Pacific Railway, on the west by Lauzon Parkway and on the east by the Township of Sandwich South. Servicing requirements for the proposed development include new roads, bridge(s) over watercourses, water distribution and wastewater collection systems, stormwater management facilities and areas for parks/recreational use.

The project is being planned in accordance with the procedures contained in the Class Environmental Assessment for Municipal Road, Water and Wastewater Projects (June 1993). To date, a Phase 1 & 2 Report has been prepared which identifies the proposed undertaking. Servicing components such as the watermains, storm and wastewater collection systems qualify as Schedule B Activities. The Phase 1 & 2 planning process for these services has been completed and this advertisement constitutes the **Notice of Completion** for the components of the undertaking classified as **Schedule B Activities.** The Phase 1 & 2 Report is available for review at the office of LaFontaine, Cowie, Buratto & Associates Limited as well as the City of Windsor Clerk's Office.

Further planning will include an Environmental Study Report (ESR) for the components of the undertaking that are classified as Schedule C Activities which include new roads, stormwater management and water quality/quantity issues.

Interested persons should provide written comments within 30 calendar days from the date of this Notice directed to the following:

City of Windsor
Office of the City Clerk
350 City Hall Square West
WINDSOR, Ontario
N9A 6S1

LaFontaine, Cowie, Buratto
& Associates Limited
3260 Devon Drive
WINDSOR, Ontario
N8X 4L4

Should you have questions or comments regarding the report, please contact one of the following persons:

Attention: Mr. Mario Sonego, P. Eng.
Tel: (519) 255-6356
Fax: (519) 255-9847

Attention: Mr. Harold Horneck, P. Eng.
Tel: (519) 966-2250
Fax: (519) 966-5523

If concerns regarding this project cannot be resolved in discussion with the City of Windsor, a person may request that the Minister of Environment and Energy "bump-up" the project to an individual environmental assessment. "Bump-up" requests must be received by the Minister at the address below within 30 days from the date of this Notice. A copy of the "bump-up" request must also be sent to the City of Windsor. If no "bump-up" requests are received the components of the undertaking classified as Schedule B Activities will proceed as outlined in the Phase 1 & 2 Report.

Ministry of Environment and Energy
135 St. Clair Avenue West, 15th Floor
TORONTO, Ontario
M4V 1P5

This Notice Issued October 24, 1996

PHASE 3 CONSULTATION

- Notice of Public Open House
- Open House Sign-In Sheet
- Open House Handout and Sample Questionnaire
- Preferred Road Plan and Preferred Stormwater Management Plan Displayed at Open House
- Comments
- Little River Enhancement Group

Essex County Field Naturalist's Club

- Mr. S. R. Fulford
- Essex Region Conservation Authority
- Windsor Airport - Transport Canada

CITY OF WINDSOR
CLASS ENVIRONMENTAL ASSESSMENT
TWIN OAKS INDUSTRIAL PARK

NOTICE OF PUBLIC MEETING

The City of Windsor has identified a need for additional serviced industrial land to meet existing and future growth demands. The City of Windsor has retained LaFontaine, Cowie, Buratto & Associates Limited, Consulting Engineers, to proceed with the planning and design of services for the area known as the Twin Oaks Industrial Park. The proposed industrial park is located in the south east portion of the City and it is bounded on the north by the E. C. Row Expressway, on the south by the Canadian Pacific Railway, on the west by Lauzon Parkway and on the east by the Township of Sandwich South. Servicing requirements for the proposed development include new roads, bridge(s) over watercourses, water distribution and wastewater collection systems, stormwater management facilities and areas for parks/recreational use.

Project planning is being carried out in accordance with procedures outlined in the Class Environmental Assessment for Municipal Road, Water and Wastewater Projects (June 1993). A Phase 1 & 2 Report has been completed which describes the proposed undertaking and identifies servicing components such as watermains, storm and wastewater collection systems as Schedule B Activities. Notice of completion of the Phase 1 & 2 Report was published on October 24, 1996.

Phase 3 of the Class EA planning process has now progressed to the stage that preferred design concepts have been developed for Schedule C Activities which include new roads and stormwater management water quantity/quality servicing issues. All interested parties are invited to attend an open house to review and discuss these servicing issues. Representatives from the City of Windsor and LaFontaine, Cowie, Buratto & Associates Limited will be present to answer questions and address comments. The open house will be held on:

Thursday, January 9th, 1997
2 p.m. to 4 p.m. & 6 p.m. to 8 p.m.
Forest Glade Community Centre
3215 Forest Glade Drive
Windsor, Ontario

For additional information, please contact:

Mr. Mario Sonego, P. Eng.
City of Windsor
350 City Hall Square West
WINDSOR, Ontario
N9A 6S1

Tel: (519) 255-6356
Fax: (519) 255-9847

Mr. Harold Horneck, P. Eng.
LaFontaine, Cowie, Buratto
& Associates Limited
3260 Devon Drive
WINDSOR, Ontario
N8X 4L4

Tel: (519) 966-2250
Fax: (519) 966-5523

Comments are invited for incorporation into the planning and design of this project and will be received until January 24, 1997.

This notice issued January 3, 1997.

CONSULTING ENGINEERS

CITY OF WINDSOR
TWIN OAKS INDUSTRIAL PARK
CLASS ENVIRONMENTAL ASSESSMENT

OPEN HOUSE - JANUARY 9TH, 1997

NAME (Please Print)	ADDRESS (Please Print)	DO YOU WISH TO BE NOTIFIED OF ANY FUTURE PUBLIC INFORMATION MEETINGS FOR THIS PROJECT?	
		Yes	No
RUSTY WRIGHT	SHORELINE WEEK	✓	
PHIL ROBERTS	WINDSOR AIRPORT	X	
GEORGE POPMARKOV	2971 STILLMEADOW. WIND.	X	
JIM MAITRE	WINDSOR AIRPORT	✓	
Stephen Gourdin	9436 Ashland Drive, Windsor	✓	
Jim Breschuk	Dillon Consulting Ltd		
	on behalf of Sandwich		
	South Twp	✓	
STEW FULFORD	S.R. FULFORD; BROKER	✓	
Stan Taylor	Essex Region Conservation	✓	

CITY OF WINDSOR

TWIN OAKS INDUSTRIAL PARK
CLASS ENVIRONMENTAL ASSESSMENT

OPEN HOUSE

THURSDAY, JANUARY 9TH, 1997
2:00-4:00 pm
6:00-8:00 pm

CONSULTING ENGINEERS

MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT

The Environmental Assessment Act is an Ontario Statute which has been designed to ensure the protection, conservation and wise management of the environment in Ontario.

The Environmental Assessment Act recognizes there is a certain class of municipal undertakings which occur frequently, are small in nature and have a somewhat predictable range of effects which are relatively minor in environmental significance.

A Class Environmental Assessment for Municipal Road, Water and Wastewater Projects provides an approved procedure under the Environmental Assessment Act for the planning, design and construction of municipal road, water and sewage projects to ensure the requirements of the Environmental Assessment Act are followed.

The Class EA Process is divided into five phases with an opportunity for public involvement during or following each phase. The Phases of the Class EA process are as follows:

PHASE 1 - Problem Identification

PHASE 2 - Identification and Evaluation of Alternative Solutions and selection of the Preferred Alternative

PHASE 3 - Identification and Evaluation of Alternative Design Concepts (technical alternatives) and selection of the Preferred Technical Design. The evaluation of technical alternatives includes documentation of potential environmental impacts, determining mitigating measures for those possible impacts and reasons for rejecting other specific alternatives in an Environmental Study Report (ESR)

PHASE 4 - Review and Acceptance of the ESR by the Public and Government Agencies which establishes the overall design concept to be used in final design

PHASE 5 - Final Design, Construction and Commissioning of the Selected Technical Alternative while monitoring for and mitigating any identified potential environmental impacts.

From a review of internal servicing cost estimates and the criteria contained in the Class EA documents, it appears that the proposed undertaking is a Schedule C activity because the proposed works include construction of new roads not shown on an approved development plan and in excess of $1.5 million (including a new bridge). However, other servicing components such as watermains, stormwater management and sanitary sewage collection qualify as Schedule B activities.

PLANNING COMPLETED TO DATE

Under the Class Environmental Assessment for Municipal Road, Water and Wastewater Projects, a Draft Environmental Assessment Report has been prepared, the findings of which are summarized as follows:

Background and Problem Identification

The City of Windsor has identified a need for additional serviced industrial property to meet existing and future growth demands. In order to meet this need, the City intends to provide servicing for a proposed industrial park in the south east area of the City. This area, known as the Twin Oaks Industrial Park, is comprised of 200 acres of land bounded on the north by the E. C. Row Expressway, on the south by the Canadian Pacific Railway, on the west by Lauzon Parkway and on the east by the City of Windsor/Township of Sandwich South municipal boundary.

The issues to be resolved include the provision of all internal servicing for the subject land and includes new roads, bridge(s) over watercourses, water distribution and wastewater collection systems, stormwater management facilities, utility servicing (electricity, telephone, gas, etc.) and appropriate parks and recreational requirements.

Existing Conditions and Alternative Solutions

The Draft Environmental Study Report (ESR) provides an inventory of the existing conditions within the study area, reviews a number of alternative solutions and identifies the advantages and disadvantages of each. The alternative solutions are evaluated with respect to the impact of each on the natural, social and economic environments in the study area, the most significant of which include impacts on the Little River and the Windsor Airport.

For reasons documented in the Draft ESR, the development of the Twin Oaks Industrial Park has been identified as the preferred alternative. The Draft ESR also documents the detailed evaluation of alternative road designs and identifies and evaluates alternative stormwater management facilities including impacts on the natural, social and economic environments. Further, the Draft ESR discusses various conceptual alternatives for servicing the proposed industrial park with sanitary sewers, a municipal water supply, recreational facilities and other services such as electricity, natural gas and telephone. Other factors such as site clearing, building height restrictions, railway considerations and zoning are also included in the draft report.

Recommended Solution

The Draft ESR recommends the preferred solution to the identified problem is development of the proposed Twin Oaks Industrial Park. With respect to the alternative road concepts and stormwater management facilities, the Draft ESR recommends the following:

- The preferred alternative solution to satisfy traffic requirements includes construction of a signalized intersection to access the proposed Industrial Park from Lauzon Parkway just south of the E.C. Row Expressway. This solution will satisfy the initial development of the park. However, as development progresses, it will be necessary to construct an additional entrance to the industrial park. At this time, the preferred ultimate solution includes a second entrance to the industrial park from the E. C. Row Expressway located east of Lauzon Parkway.

- The preferred stormwater management facility includes widening of the Little River to provide storage within the channel of the river to satisfy a 100 year storm.

Further Planning and Timing

Following review of comments received from the public and the various review agencies, the Draft Environmental Study Report (ESR) will be finalized and a Notice of Completion will be issued for the portions of the project that qualify as Schedule C Activities. The ESR will consider comments received from the various agencies and the public prior to finalizing the recommendations discussed under the previous heading.

The final ESR will be available for review and comment for a 30 day period following the publication of the Notice of Completion.

QUESTIONNAIRE

PLANNING AND DESIGN PROCESS FOR THE PROPOSED TWIN OAKS INDUSTRIAL PARK IN THE CITY OF WINDSOR

You are invited to comment or express concerns regarding the proposed Twin Oaks Industrial Park. The preliminary Environmental Study Report identifies the problem and it also reviews a number of alternative solutions, identifies advantages and disadvantages of each including impacts on the natural, social and economic environments.

Please leave your completed questionnaire at the Open House or send your reply to:

LaFontaine, Cowie, Buratto & Associates Limited
3260 Devon Drive
WINDSOR, Ontario
N8X 4L4

on or before January 24, 1997.

COMMENTS OR CONCERNS:

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____

____

____

____

____

____

(Attach additional sheets if necessary)

NAME: ______________________________

ADDRESS: ______________________________

TELEPHONE NO.: ______________________________

FAX NO.: ______________________________

AFFILIATION OR GROUP: ______________________________

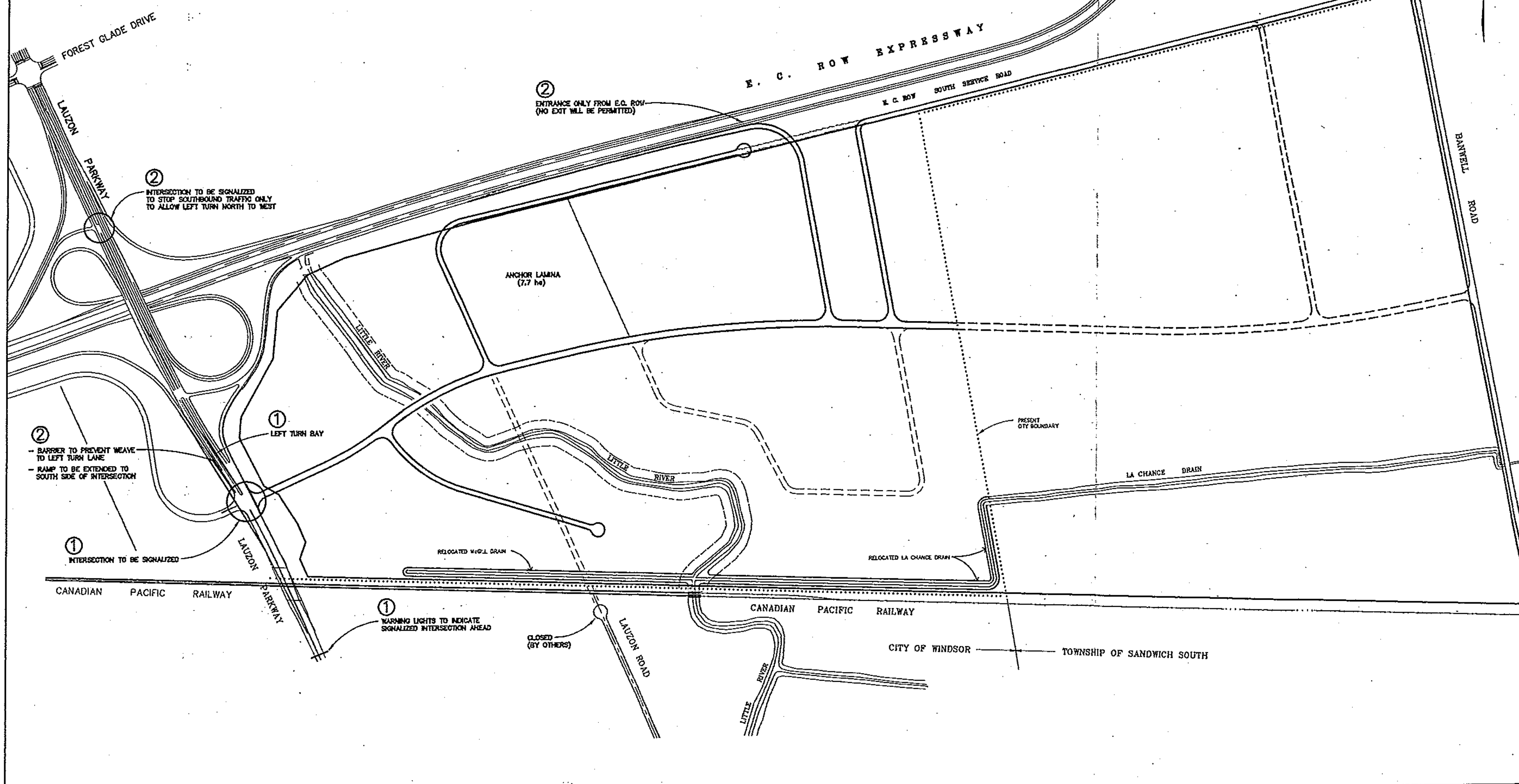
DATE: ________________ SIGNATURE: ______________________

TWIN OAKS INDUSTRIAL PARK
PREFERRED ROAD PLAN
[ULTIMATE]

PRIORITIES

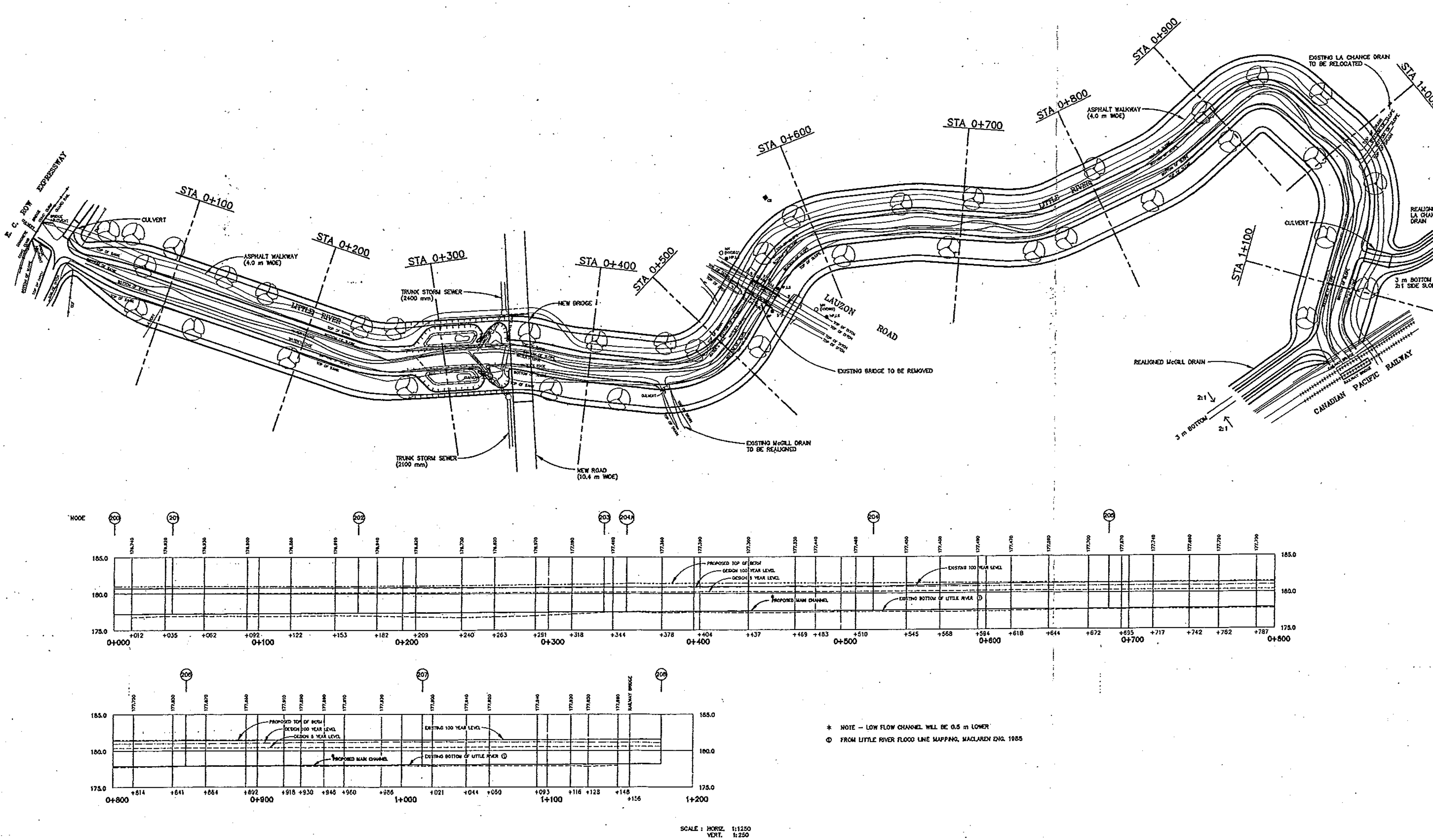
① THESE ITEMS WILL BE REQUIRED IMMEDIATELY

② THESE ITEMS WILL BE CONSTRUCTED WHEN TRAFFIC DEMAND DICTATES. THEY WILL NOT BE REQUIRED FOR INITIAL DEVELOPMENT OF THE PARK.



DWGS\WD1002\19970109\C-BASE Mon Mar 10 07:07:38 1997 K.F.F.

TWIN OAKS INDUSTRIAL PARK
PREFERRED STORMWATER MANAGEMENT PLAN



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Lil' Reg
Little River Enhancement Group
ESSEX-WINDSOR

January 4, 1997

Mr. John Shaw, Chief, Great Lakes 2000 Clean-Up Fund
Environmental Technologies Advancement Division
Environmental Protection Branch
867 Lakeshore Rd., P.O. Box 5050
Burlington, ON
L7R 4A6

RE: <u>LITTLE RIVER REHABILITATION PROJECT</u>
<u>TWIN OAKS INDUSTRIAL PARK</u>
<u>ERCA APPLICATION TO G.L.C.U.F.</u>

Dear Mr. Shaw:

The Little River Enhancement Group is pleased to confirm our strong support for the above.

We also confirm our participation in the project, with the plantings of native trees and shrubs, for example. In conjunction with various schools and other partners, we have already carried out successful "Clean-Up Crusades" of the Little River at the Twin Oaks site amongst numerous other volunteer projects.

The Little River is very degraded at this site and the project is badly needed. The project will be an excellent example of a community based partnership approach, involving ERCA, the City of Windsor and others in the enhancement of the Little River.

Yours truly,

Ian Naisbitt

Ian Naisbitt,
President

IN/jg

399 Woodridge, Windsor, Ontario N8N 3A7 Ph. (519) 735-2087 Phone/Fax (519) 974-6958

Essex County FIELD NATURALISTS' CLUB

Devonshire Mall P.O., P.O. Box 23011, Windsor, Ontario N8X 5B5

ECFNC

January 9, 1997

Mr. John Shaw, Chief, Great Lakes 2000 Clean-up Fund
Environmental Technologies Advancement Division
Environmental Protection Branch
867 Lakeshore Road, P.O. Box 5050
Burlington
Ontario L7R 4A6

Re:
Little River Rehabilitation Project
Twin Oaks Industrial Park
ERCA Application to G.L.C.U.P.

Dear Mr. Shaw:

The Essex County Field Naturalists' Club was organized in 1984. The goals of the ECFNC are to promote the appreciation and conservation of the diverse natural heritage of Essex County and surrounding region; to provide the opportunity for people to become acquainted with and better understand the natural environment; to promote the identification, preservation, maintenance, and restoration of high quality natural areas for living things and to co-operate and support other organizations with similar objectives.

The Essex County Field Naturalists' Club would certainly support the activities that are proposed to be addressed by the Little River Rehabilitation Project such as the restoration of the natural flood plain, the restoration of riparian habitat and the linking of habitat corridors through the development of a greenway. Members of our Field Naturalists' Club would be pleased to be involved with plantings to assist with the restoration of natural vegetation along Little River within Twin Oaks Industrial Park.

Little River needs restoration at the Twin Oaks Industrial Park site. A partnership of local agencies would aid in the efforts to restore the site.

Yours sincerely,

Thomas Hurst

Thomas Hurst
President, Essex County Field Naturalists' Club

QUESTIONNAIRE

PLANNING AND DESIGN PROCESS FOR THE PROPOSED TWIN OAKS INDUSTRIAL PARK IN THE CITY OF WINDSOR

You are invited to comment or express concerns regarding the proposed Twin Oaks Industrial Park. The preliminary Environmental Study Report identifies the problem and it also reviews a number of alternative solutions, identifies advantages and disadvantages of each including impacts on the natural, social and economic environments.

Please leave your completed questionnaire at the Open House or send your reply to:

LaFontaine, Cowie, Buratto & Associates Limited
3260 Devon Drive
WINDSOR, Ontario
N8X 4L4

on or before January 24, 1997.

COMMENTS OR CONCERNS: Preferred Storm Water Management and Preferred Road Plan are excellent answers to the problem - we should proceed at once while the economy will support further land sales in the PARK

(Attach additional sheets if necessary)

NAME: S. R. FULFORD

ADDRESS: 1537 HOWARD AVE

TELEPHONE NO.: 519-256-2200

FAX NO.: 519-258-9647.

AFFILIATION OR GROUP:

DATE: 9 JAN 97 SIGNATURE: S.R. Fulford

WD 1002-1D

Essex Region Conservation Authority

360 Fairview Avenue West, Essex, Ontario N8M 1Y6 • (519) 776-5209 • Fax (519) 776-8688

To (Name): DON JOUDREY P. ENG

Company: LCBA

Fax Number: 519-966-5523

Regarding: GREAT LAKES CLEAN-UP FUND (TWIN OAKS) SUPPORT LETTERS

No. of Pages: 3 (including cover)

Date: JAN. 10, 1997 **Time:** 10:30

From: STAN TAYLOR, P.ENG

Lil' Reg
Little River Enhancement Group
ESSEX-WINDSOR

January 4, 1997

Mr. John Shaw, Chief, Great Lakes 2000 Clean-Up Fund
Environmental Technologies Advancement Division
Environmental Protection Branch
867 Lakeshore Rd., P.O. Box 5050
Burlington, ON
L7R 4A6

RE: LITTLE RIVER REHABILITATION PROJECT
TWIN OAKS INDUSTRIAL PARK
ERCA APPLICATION TO G.L.C.U.F.

Dear Mr. Shaw:

The Little River Enhancement Group is pleased to confirm our strong support for the above.

We also confirm our participation in the project, with the plantings of native trees and shrubs, for example. In conjunction with various schools and other partners, we have already carried out successful "Clean-Up Crusades" of the Little River at the Twin Oaks site amongst numerous other volunteer projects.

The Little River is very degraded at this site and the project is badly needed. The project will be an excellent example of a community based partnership approach, involving ERCA, the City of Windsor and others in the enhancement of the Little River.

Yours truly,

Ian Naisbitt

Ian Naisbitt,
President

IN/jg

399 Woodridge, Windsor, Ontario N8N 3A7 Ph. (519) 735-2087 Phone/Fax (519) 974-6958

Essex County
FIELD NATURALISTS'
CLUB

Devonshire Mall P.O., P.O. Box 23011, Windsor, Ontario N8X 5B5

ECFNC

January 9, 1997

Mr. John Shaw, Chief, Great Lakes 2000 Clean-up Fund
Environmental Technologies Advancement Division
Environmental Protection Branch
867 Lakeshore Road, P.O. Box 5050
Burlington
Ontario L7R 4A6

Re:
Little River Rehabilitation Project
Twin Oaks Industrial Park
ERCA Application to G.L.C.U.P.

Dear Mr. Shaw:

The Essex County Field Naturalists' Club was organized in 1984. The goals of the ECFNC are to promote the appreciation and conservation of the diverse natural heritage of Essex County and surrounding region; to provide the opportunity for people to become acquainted with and better understand the natural environment; to promote the identification, preservation, maintenance, and restoration of high quality natural areas for living things and to co-operate and support other organizations with similar objectives.

The Essex County Field Naturalists' Club would certainly support the activities that are proposed to be addressed by the Little River Rehabilitation Project such as the restoration of the natural flood plain, the restoration of riparian habitat and the linking of habitat corridors through the development of a greenway. Members of our Field Naturalists' Club would be pleased to be involved with plantings to assist with the restoration of natural vegetation along Little River within Twin Oaks Industrial Park.

Little River needs restoration at the Twin Oaks Industrial Park site. A partnership of local agencies would aid in the efforts to restore the site.

Yours sincerely,

Thomas Hurst

Thomas Hurst
President, Essex County Field Naturalists' Club

THE CITY OF WINDSOR

OFFICE OF THE COMMISSIONER OF WORKS

G. T. HARDING, B.S.C.E., P.ENG.
COMMISSIONER OF WORKS

FAX NO.: (519) 255-9847
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To: LCBA

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Attention: DON JOUDREY

Extension: 255-6350 ext 6356

Fax: 966-5523

Date: FEB 12/97

Pages (including cover): 2

Re: TWIN OAKS

☐ Urgent ☐ For Review ☑ Please Comment ☐ Please Reply

Comments:

AIRPORT CONCERNS

Hard copy to follow: ☐ Yes ☐ No

Please contact sender if all pages are not received.

STORMWATER MANAGEMENT REPORT

FEBRUARY 1997

TWIN OAKS BUSINESS PARK
CITY OF WINDSOR

STORMWATER MANAGEMENT REPORT

1997 02 20

1.0 INTRODUCTION

Construction of a Business Park is proposed on parts of Lots 125, 126, 127, 134, 135, 136, 137 and 138, Concession 3 in the City of Windsor. The total site designated for development is 170 hectares of which 81 hectares are in the City boundaries and the remainder in the Township of Sandwich South. A large part of the site was previously used as a golf course. This study deals with the portion in the City of Windsor (see Figure 1). When the portion of the Park in the Township of Sandwich South is developed, further stormwater management studies will be required.

The entire site is part of the Little River Drainage Area. The Little River watershed drains an area of approximately 6080 hectares and stretches 13 kilometers from Lake St. Clair to 2.5 kilometers south of Highway 401 A total of 2944 hectares are located south of the proposed Twin Oaks Industrial Park. A total of 1054 hectares are added to the system through the park.

There are a number of tributaries entering the drain in the vicinity of the park. These include the McGill Drain, the La Chance Drain, the Gouin Drain and the Russette Drain. The Lepain Drain at the south west corner of the park used to drain through the park to the McGill Drain, but at some time it was apparently closed and rerouted. Development of the park will involve improvements to or relocation of sections of some of these drains in addition to work proposed for Little River.

The Stormwater Management Study is being carried out in conjunction with a Class Environmental Assessment. Background information regarding existing conditions is included in the Phase 1 & 2 Report, Class Environmental Assessment, Twin Oaks Industrial Park, City of Windsor, September 1996. This report also outlines the various options for stormwater management with the advantages and disadvantages of each. These items are reviewed in more detail in the Phase 3 report.

Twin Oaks is officially designated as a Business Park. Any references to Twin Oaks as an Industrial Park should be interpreted as Business Park. Reference in this report to the Park implies Twin Oaks Business Park.

1.1 PREVIOUS STUDIES

This site has been proposed for industrial development for a number of years. There have been a number of previous stormwater management studies carried out.

1. Stormwater Management Report on the Proposed Industrial Park (Lauzon-Banwell Road) Dr. J. A. McCorquodale, 1989

The following is an outline of the works to be carried out on each waterway associated with the site.

2.1. LITTLE RIVER

Little River is the main drainage channel. The alignment will generally remain in its present location, but the cross-section will be significantly changed.(See Figure 3) The channel will be widened with flatter slopes and will be terraced to provide extra storage capacity during major rainfall events and to provide space for a walkway/bikeway/greenway. The bottom of the channel will be approximately 10.8 metres wide. A low flow channel will meander through this bottom section. The low flow channel will be V shaped approximately 0.5 metres deep. There will be occasional small pools and riffles to collect silt and provide a varied appearance. The banks of the lower channel section will be constructed at 3 to 1 sideslopes except for a short section just south of E. C. Row which will be left with its present 2 to 1 sideslopes. This section is being left to restrict flow out of the Park to pre-development levels. The banks will be hydramulch seeded with a shorter variety, low maintenance grass to provide stability and reduce erosion. These banks will be up to 1.7 metres high and will flatten out to terraces on both sides of the channel. The terraces will be graded at 3%. The upper banks will be sloped at approximately 5 to 1. The top of the bank will be constructed to an elevation 300 mm above the water elevation of the 100 year storm.

A 3.5 metre wide asphalt path will be constructed on the terraced area along the east side of the channel. This path will be constructed above the 5 year storm water levels. Trees will also be planted on the terraced area. The type and number of trees and shrubs and the type of grass will be determined in the final design stages in consultation with ERCA and the City of Windsor Parks and Recreation Department. Little River crosses the Canadian Pacific Railway right-of-way through a railway bridge. The south half of the bridge is constructed of steel spanning a width of 14.7 metres. The channel has a bottom width of 4 metres and a height of 3.7 metres to the underside of the bridge. The north half of the bridge is a wood bridge which spans 15.6 metres, has a 4 metre bottom width and a 3.6 metre height. The present invert of the river under the bridge is 177.98. This bridge is adequately sized and will be maintained.

The outlet culvert for the site under E.C.Row is a box culvert 12 metres wide and 5 metres high. The present bottom invert is 176.75 which is 0.34 metres lower than the design invert indicated in the M.T.O. construction drawings for E.C.Row. The culvert is adequately sized and will be maintained. Visual inspection indicates sediment should be dredged from the culvert.

2.2 McGILL DRAIN

The McGill Drain drains the airport property and other lands west and south of the Park. The drain enters the park under the Canadian Pacific railway tracks just east of Lauzon Parkway through a 1.8 by 1.8 metre box culvert which connects to a 1.8 by 1.67 oval corrugated steel pipe (CSP). There is also another 1500 mm CSP under the tracks 250 metres east which would appear to provide an additional outlet for the McGill Drain during higher flows. Windsor airport staff have reported flooding problems upstream of the railway crossings.

The McGill Drain currently outlets to Little River approximately 200 metres north of the railway right-of-way. It is proposed to realign approximately 400 metres of the drain through the Park along the railway right-of-way. This will require construction of approximately 550 metres of new drain. The drain will be constructed with a 3 metre bottom width. The banks will be constructed with 2 to 1 sideslopes and hydramulch seeded to reduce the potential for erosion. C. P. Rail has indicated they will be exercising an option to close Lauzon Road across the railway right-of-way, therefore no bridges or culverts will be required over this section of the McGill Drain at Lauzon Road.

2.3 LA CHANCE DRAIN

The La Chance Drain crosses the site east of Little River. It is currently located between 150 metres and 350 metres from the railway right-of-way. The first 420 metres of the drain immediately east of Little River will be realigned along the railway right-of-way. This new 750 metres of drain will be constructed with a 3 metre bottom, 2 to 1 bank sideslopes and hydramulch seeded.

2.4 GOUIN DRAIN

The Gouin Drain is located along the north side of the site and drains an area mainly in the north part of the Township of Sandwich South lands and east of Banwell Drive. It crosses South Service Road through 2 - 1500 mm culverts and then crosses E.C.Row through a 6 metre by 1.8 metre box culvert approximately 1200 metres east of Lauzon Parkway. It outlets to Little River north of E.C.Row. No improvements are anticipated for this section of drain at this time. A small section of the park will drain to this drain. Improvement will likely be required when the Sandwich South lands are developed.

2.5 RUSSETTE DRAIN

The Russette Drain drains an area immediately west of Lauzon Parkway. It outlets to Little River just south of E.C.Row. This drain will not be affected by the proposed work.

2.6 LEPAIN DRAIN

At one time, the Lepain Drain entered the site along the railway under Lauzon Parkway. There is a 1200 mm CSP along both sides of the railway. The pipe on the north side appears to be abandoned. The pipe on the south side appears to be operating, but staff at Windsor Airport have indicated that the Lepain Drain has been blocked off west of Lauzon Parkway. The upper reaches of the drain have been rerouted to the McGill Drain. No work is to be done to this drain in conjunction with the development of the Park.

3.0 REVIEW OF STORMWATER MANAGEMENT OPTIONS

Site Level Controls

Industrial development is required to control post-development runoff from individual sites to pre-developed rates. This requires a restricted outlet into the storm sewer system and on-site collection of excess runoff in parking lots, on roof tops, or in individual grassed depressions or similar facilities. This on site storage and flow restriction will have to be designed as each site develops. The Developer of each site will be responsible for the design.

The native soils in this area have poor infiltration capability. These soils generally have percolation rates of less than 15 mm/hour. Soak-away pits or other systems which rely on the percolation of water through the soils are not recommended.

The sites will generally be in the range of 0.2 hectares minimum to 8 or more hectares in size. Parking will be provided on each site. We recommend an oil/grit separator (Stormceptors or equal) be a requirement for each site to provide quality control at the source for contaminants and spills. The number and size of oil/grit separator would have to be determined for each site individually.

Stormwater Conveyance Controls

Perforated storm sewers and pervious catchbasins would not be a viable option because of the poor permeability of the native soils.

Servicing of the site by grassed ditches and driveway culverts is not an acceptable servicing option to the City of Windsor for this development..

Storm sewer manholes would be constructed with sumps. These and catch basin sumps would collect heavier grit and silt. The City would inspect and clean these sumps on a regular basis.

End-of-Pipe Stormwater Management Facilities

Storage of stormwater is a requirement for this development. There must be no increase in the downstream water elevations or flows in Little River due to this development.

Off-line storage in a wet pond/wetland is preferable but is not possible in this case due to the proximity of the Windsor Airport. This development is directly in the airport flight path. The end of the runway is 1,900 metres west of the site. Safety concerns with water fowl, especially geese, essentially eliminates the opportunity for a permanent pond which could attract these birds.

A dry pond could provide the required storage capacity, but would not be as effective as a wet pond for quality control. It would also require a large land commitment and ponds would be required on both sides of the river channel. Additional improvements to Little River would be required to stabilize the slopes and improve the aesthetics and flow carrying capability.

In-line storage in the Little River channel could be accommodated and the cross-section could be improved and the banks stabilized at the same time. Some quality control could be accomplished in the channel with additional quality control measures incorporated at the inlet sewers in the form of sedimentation basins.

Infiltration basins, infiltration trenches, filter strips, buffer strips and sand filters were eliminated as options because of the large size of the development and the general impermeability of the native soils.

Oil/grit separators (Stormceptor manholes) are recommended for individual lots. The mainline storm sewers would be too large to permit installation of these units.

3.1 RECOMMENDED OPTION

The conclusion reached through the evaluation of the available options is that in-line storage in an improved Little River channel with quality control enhancements (check dams and riffles, sedimentation basins, vegetation, meandering low flow channel) in combination with site level controls (oil/grit separators, grassed areas, flow restrictions and conveyance controls including sumps in manholes and catchbasins) is the preferred option and will provide a satisfactory level of quantity and quality control.

4.0 DESIGN METHOD

This plan was analyzed using XP-SWMM Stormwater Management Model, Version 1.44, developed by WP Software and XP Software. The program is based on the U.S. EPA Stormwater Management Model Version 4.3 originally developed by Metcalf and Eddy Inc., University of Florida and Camp, Dresser And McKee Inc.

XP-SWMM is capable of simulating real storm events on the basis of rainfall hyetographs, catchment and sewer system characteristics to predict outcomes of quantity and quality values.

The runoff block of XP-SWMM generates surface and subsurface runoff based on rainfall hyetographs, preceding conditions, land use and topography. The routing method used in runoff is the non-linear reservoir performed by coupling the continuity equation with Manning's equation. Runoff is used to calculate the overland flow(including infiltration and evaporation) and routing in smaller diameter pipes (450 mm diameter or less).

The Extran Block is a very sophisticated hydraulic flow routing model for both open channel and closed conduits in branched and looped networks. Extran receives hydrograph inputs at specific nodal locations by interface files from an upstream block (Runoff or Transport) and/or by direct user input. The model performs dynamic routing of stormwater flows throughout the storm drainage system to the outfall points of the receiving water system. The routing method for Extran is based on the St. Venant equations for gradually varied one dimensional flow and handles backwater effects, surcharging and flow reversal.

Pipe sizes were calculated using Eagle Point Advantage Series Version 12.0a Storm Sewers. Storm Sewers uses the Rational Method to calculate the flow rate in each pipe of the network and then performs a standard step hydraulic analysis on the sewer network to determine the hydraulic grade line. Rainfall intensity is based on the intensity-duration frequency curves generated by data input from the Windsor Airport - Atmospheric Environment Service information (AES).

The water surface elevations determined in the Little River Flood Line Mapping Report were computed using the U.S. Army Corps of Engineers Model Hec-2. Our model was tested using Water Surface Profiling version 7.0 from Eagle Point which uses the methodology of the Hec-2 program to verify that the results obtained were comparable to the original study.

4.1 DESIGN CRITERIA

The basic design constraint is that the flows in Little River are not adversely impacted by the increased flows from the development.

Based on the Little River Flood Line Mapping Report, the following are the existing parameters.

- 100 year flood elevation - north limit of park 180.72
- 100 year flood elevation - south limit of park 181.56
- 100 year peak flow - upstream of park 39.50 m^3/sec.
- 100 year peak flow - downstream of park 42.80 m^3/sec.

The following were also determined from information in the Little River Flood Line Mapping Report.

- 5 year peak flow - upstream of park (assumed 60 % of 100 year flow) 23.70 m^3/sec.
- 5 year water elevation - north limit of park 180.07
- Manning's n value for channel 0.045
- The hydrograph used was based on the hydrograph generated by HYMO in the Little River Flood Line Mapping Report.
- The stage boundary condition was based on the rating curve in the Little River Flood Line Mapping Report.

Hydrologic inputs:

Parameter	Pre-development	Post-development
Soil	Clay (Class C)	Clay (Class C)
Percent Impervious	3 to 10 Average 2	50
Maximum Infiltration Rate	50 mm/hour	50 mm/hour
Minimum Infiltration Rate	2.54 mm/hour	2.54 mm/hour
Infiltration Decay Rate	0.001/second	0.001/second
Surface Retention - Pervious - Impervious	 12.7 mm 2.54 mm	 12.7 mm 2.54 mm
Overland slopes	0.1 to 0.2 %	2 %
Zero Detention %	0 %	30 %

Storm sewers were designed using the Rational Method for a 5 year storm. A runoff coefficient of 0.60 was used with an inlet time of 20 minutes. Pipes were designed with a minimum of 1.05 metres of cover.

Predeveloped runoff rates for the site were calculated using XP-SWMM. The rainfall distribution was calculated using a Chicago Storm. The duration and total rainfall is shown in the following table.

Storm Frequency	Duration	Total Rainfall
5 year	3.3 hours	53.8 mm
100 year	5.5 hours	114.3 mm

Minimum building and road elevations will be based on the 100 year flood elevations. The minimum building elevation will be 0.30 metres higher than the 100 year flood elevation and the minimum road elevation will be 0.30 metres lower than the 100 year flood elevation. These values will vary depending on location along the river.

5.0 SELECTED PLAN

The Little River channel between the C.P.R. tracks at the south limit of the park and the E.C.Row Expressway at the north limit of the park will be widened to provide additional storage capacity for the developed flows from the proposed industrial park. The new cross-section will typically have a 10.8 metre bottom width. A meandering low flow channel approximately 0.5 metres deep will be constructed. The lower section of the channel will be constructed with 3 to 1 sideslopes. The channel will then widen to terraced areas with 3% slopes. At the outer edges of the terraced area, the banks would be constructed with 5 to 1 sideslopes to a point 0.30 metres above the 100 year flood level. Typical cross-sections are shown in Figure 3. A walkway/bikeway could be located along the upper banks of the east side of the river above the 5 year water elevations.

The channel widths could vary slightly along the length of the channel but generally will be constructed to the cross-section shown in Figure 3. The channel would be left at its present cross-section just south of the bridge under E.C.Row to provide a control structure to regulate downstream flows. Existing structures in the channel will be removed including the bridge at Lauzon Road and the dam approximately 340 metres south of E.C.Row. A new bridge will be constructed as part of the construction of the park. The length of the bridge will be approximately 20 metres. A length of 13 metres or more will have a negligible effect on the channel hydraulics.

The calculated channel hydraulics for Little River show the proposed cross-section will control the maximum water elevations from the fully developed site at or below those currently expected based on the Little River Flood Plain Mapping (See Tables 5.1 and 5.2).

For purposes of modelling, the Little River channel was divided into smaller sections to determine water elevations at various points. A total of 10 nodes were defined. The following tables show the nodes and corresponding stations and the calculated water elevation for various situations. The location of the nodes is shown in Figure 4.

- Predeveloped XPSWMM refers to calculated water elevations using flows from the Little River Flood Plain Mapping and existing channel cross-sections.

- Developed XPSWMM calculates the water elevations using increased flows from the fully developed site and the proposed widened cross-sections.

- Developed W.S.P. refers to calculated water elevations using the Water Surface Profiling software which is based on Hec-2 methodology.

TABLE 5.1 - 5 YEAR WATER ELEVATION

NODE	STATION	PREDEVELOPED XPSWMM	DEVELOPED XPSWMM	DEVELOPED W.S.P.(HEC-2)
200	0+000.00	180.07	180.07	180.07
201	0+040.00	180.08	180.11	180.08
202	0+169.18	180.11	180.13	180.11
203	0+338.36	180.16	180.18	180.14
204A	0+353.36	180.32	180.20	180.14
204	0+501.88	180.36	180.25	180.18
205	0+665.40	180.56	180.32	180.23
206	0+828.92	180.80	180.40	180.28
207	0+992.44	180.93	180.50	180.35
208	1+155.96	181.12	180.61	180.43

TABLE 5.2 - 100 YEAR WATER ELEVATION

NODE	STATION	PREDEVELOPED XPSWMM	PREDEVELOPED HEC-2 (LITTLE RIVER FLOOD PLAIN MAPPING)	DEVELOPED XPSWMM	DEVELOPED W.S.P.(HEC-2)
200	0+000.00	180.72	180.72	180.72	180.72
201	0+040.00	180.73	180.73	180.77	180.73
202	0+169.18	180.74	180.86	180.79	180.76
203	0+338.36	180.78	180.89	180.83	180.79
204A	0+353.36	180.81	180.90	180.86	180.84
205	0+665.40	181.25	181.34	180.93	180.88
206	0+828.92	181.34	181.40	180.99	180.92
207	0+992.44	181.40	181.48	181.05	180.97
208	1+155.96	181.55	181.56	181.13	181.03

TABLE 5.3

CONDUIT	STATION	5 YEAR PREDEVELOPED XPSWMM (m^3/sec.)	5 YEAR DEVELOPED XPSWMM (m^3/sec.)	100 YEAR PREDEVELOPED XPSWMM (m^3/sec.)	100 YEAR DEVELOPED XPSWMM (m^3/sec.)	PREDEVELOPED 100 YEAR LITTLE RIVER FLOOD PLAIN MAPPING (m^3/sec.)
101	40.00	-	24.11	-	40.53	42.8
102	169.18	24.37	24.05	40.81	40.52	39.5
103	338.36	23.88	23.95	40.14	40.59	39.5
104A	353.36	-	23.58	-	39.61	39.5
104	501.88	23.78	23.52	39.83	39.59	39.5
105	665.40	23.74	23.42	39.67	39.49	34.0
106	828.92	23.62	23.37	39.63	39.42	34.0
107	992.44	23.59	23.35	39.63	39.42	34.0
108	1155.96	23.64	23.36	39.48	39.42	34.0

The channel bottom will include features related to water quality improvements including small sedimentation basins, selected vegetation and low rock dams. Detailed specifications will be developed at the final design stage to the requirements and satisfaction of Essex Region Conservation Authority and City of Windsor.

Storage Requirements:

Storm	Pre-developed Runoff m^3	Post-developed Runoff m^3
100 year	50494	74623
5 year	13581	28729

The storm sewer outlets to Little River will incorporate treatment facilities for low flows (10 mm storms over 4 hours duration or less) (see figure 5). Low flows will be directed to small sedimentation ponds through a 600 mm pipe. The runoff will then be released to Little River through a 100 mm pipe so that retention and settling will occur in the pond area. Higher flows will overtop the facility at an overflow channel at the end opposite the inlet pipe. Occasional cleaning of the small forebay area will be required in conjunction with normal cleaning and maintenance of the channel. Details on exact sizes and layouts will be determined at the time of final design when the actual road layout is known.

Generally three (3) such ponds will be required, one for each outlet to Little River. An outlet will be required for lands west of Little River (20 ha), one for the north part of the lands east of the river (39 ha) and one for the south part of the lands east of the river (16 ha). They will be dry except during storm runoff events. Average depth will be approximately 1 metre when they are full. Depending on the area of the pond to be drained, the ponds will be empty within 12 hours for the smaller pond to 30 hours for the larger pond. The ponds will drain by gravity.

The largest pond for the drainage area northeast of Little River will have a surface area of 550 square metres. The pond will be approximately 10 metres wide and 55 metres long.

The smallest pond for the drainage area southeast of Little River will have a surface area of 227 square metres.

The pond west of Little River will have a surface area of 277 square metres.

A small forebay area for collection of heavier sediments (150 mm and larger) will likely pond water for longer periods of time. The forebay will have a surface area of less than 100 square metres. Settling velocities through these ponds will be approximately 0.0003 metres per second.

These ponds are incorporated into the design to capture runoff from the 'first flush' of a rainfall event. This is when most road surface pollutants will be entering the drainage system.

5.1 PHASING

The Little River improvements may be constructed in phases. We have reviewed the hydraulics based on proposed improvements only between E.C. Row Expressway and Station 0+450. We have assumed Phase 1 development of approximately 40 hectares which includes all of the area west of Little River (approximately 20 hectares) and 20 hectares northeast of Little River.

The following tables show resulting water elevations and flows.

TABLE 5.4 - WATER ELEVATIONS
(PHASE 1 CONSTRUCTION ONLY)

NODE	STATION	5 YEAR		100 YEAR		PREDEVELOPED HEC-2 (LITTLE RIVER FLOOD PLAIN MAPPING)
		DEVELOPED XPSWMM (Full Development)	DEVELOPED XPSWMM (Phase 1 Only)	DEVELOPED XPSWMM (Full Development)	DEVELOPED XPSWMM (Phase 1 Only)	
200	0+000.00	180.07	180.07	180.72	180.72	180.72
201	0+040.00	180.11	180.11	180.77	180.77	180.73
202	0+169.18	180.13	180.13	180.79	180.79	180.86
203	0+338.36	180.18	180.18	180.83	180.83	180.89
204A	0+353.36	180.20	180.20	180.86	180.86	180.90
205	0+665.40	180.32	180.47	180.93	181.18	181.34
206	0+828.92	180.40	180.73	180.99	181.29	181.40
207	0+992.44	180.50	180.89	181.05	181.36	181.48
208	1+155.96	180.61	181.09	181.13	181.53	181.56

TABLE 5.5

CONDUIT	STATION	5 YEAR DEVELOPED XPSWMM (m^3/sec.)		100 YEAR PREDEVELOPED XPSWMM (m^3/sec.)	100 YEAR DEVELOPED XPSWMM (m^3/sec.)		PREDEVELOPED 100 YEAR LITTLE RIVER FLOOD PLAIN MAPPING (m^3/sec.)
		Phase 1 Only	Full Development		Phase 1 Only	Full Development	
101	40.00	24.15	24.11	-	40.67	40.53	42.8
102	169.18	24.04	24.05	40.81	40.63	40.52	39.5
103	338.36	23.94	23.95	40.14	40.57	40.54	39.5
104A	353.36	23.89	23.58	-	40.40	39.61	39.5
104	501.88	23.83	23.52	39.83	40.36	39.59	39.5
105	665.40	23.78	23.42	39.67	40.28	39.49	34.0
106	828.92	23.72	23.37	39.63	40.25	39.42	34.0
107	992.44	23.66	23.35	39.63	40.26	39.42	34.0
108	1155.96	23.66	23.36	39.48	39.50	39.42	34.0

Water levels and flows in the improved downstream reaches (Station 0+000 to 0+500) will not be adversely affected by construction of Phase 1 only. These water levels and flows will essentially remain the same during a 100 year storm.

Water levels and flows in the unimproved reaches will be significantly higher than the ultimate water levels in a fully improved channel, but are basically at the current predeveloped HEC-2 Little River Mapping elevations.

Flows leaving the site would increase very marginally from a phased construction, but would still be less than the flows predicted in the Little River Mapping Study.

5.2 PLANTING STRATEGY

A detailed planting strategy will be discussed with ERCA and confirmed with the MOEE prior to the start of construction. The plantings will incorporate native species as much as possible and will incorporate recommendations outlined in the MOEE Stormwater Management Practices Planning and Design Manual regarding the different planting zones.

The grasses selected will be varieties which do not grow at fast rates or heights above 250 mm. The channel area will be designed to reduce or eliminate the need for regular maintenance (lawn cutting).

Shrubs or other plantings will be selected with public safety concerns in mind. Low shrubs adjacent to the walkway which offer areas for concealment will be avoided.

5.3 GREENWAY/WALKWAY

The improved Little River channel will be approximately 65 metres wide. As noted, it will incorporate a 3.5 metre wide asphalt walkway/bikeway along the top of the east bank. The walkway will be at or above the ultimate 100 year water elevations.

Ultimately, the walkway/bikeway will connect to the existing city walkway system on the north side of E. C. Row and Lauzon Road. The walkway will also continue southerly into the Township of Sandwich South. The City will determine how the crossing of E. C. Row and the C. P. Rail tracks will be made as part of future construction projects.

6.0 EROSION AND SEDIMENT CONTROLS

The largest amount of sediments and pollutants will obviously be coming off the site during initial construction periods for roads and underground servicing and later, site construction. The construction of roads and services will require control of significant amounts of sediment. This will involve the following mitigating measures.

1. At the start of construction, silt fencing must be installed and maintained at all overland flow routes. A typical silt fence is shown in Figure 6.

   This silt barrier must be monitored and cleaned and repaired as required.

2. After road construction is complete, we recommend catch basin filters be installed (similar to StreamGuard™ Type II-S (sediment) Catch Basin Filters). (See Appendix) According to the manufacturer, the filter bag removes up to 95% of incoming sediments from stormwater by direct filtration. If the filter bag becomes clogged by excess sediments, the filter bag fills with water to the level of the overflow holes. At this point, heavier sediments such as sand particles are still effectively removed. The unit is replaced by opening the catch basin cover and retrieving the unit by the attached cord. The filter can be emptied and reused or disposed of.

   All catch basins would have a filter installed.

   Their use could be extended indefinitely by the City of Windsor.

3. A maintenance monitoring system will be set up by the City to verify compliance with the stormwater management plan.

   Site inspections will be carried out every 2 weeks once the road construction is complete and during construction. Inspections would also be made after significant rainfall events (25 mm or more). If warranted, more frequent inspections will be arranged. These inspections would be less frequent when construction is complete or no work is ongoing on the site.

The inspections will include a visual check of the catch basin filters, silt barriers as required, and the silt basins. The extent of sediment collection will be noted and cleaning arranged as required.

An inspection log will be maintained by the developer which will include the date and time of the inspection, inspectors name, the condition of the collection and treatment facilities, and any cleaning or repairs carried out. This log would be available at all times for review by the City of Windsor, ERCA and MOEE.

6.1 MAINTENANCE

Occasional maintenance will be required to clean out the sediment basins and repair rock dams or erosion damage as required. Maintenance frequency will depend on the extent of siltation as noted during regular inspections and on the aesthetic appearance.

During initial construction stages, more frequent maintenance will be required, especially for the temporary sediment controls such as silt fences and catch basin filter bags.

Once the park is complete, maintenance requirements will be minimal except for grass cutting as desired.

7.0 CONCLUSIONS AND RECOMMENDATIONS

1. The Stormwater Management Plan as outlined in this report should be implemented.

2. Implementation of this plan will not adversely affect water levels in Little River or flows downstream.

3. Implementation of this plan will provide a satisfactory level of quantity and quality control.

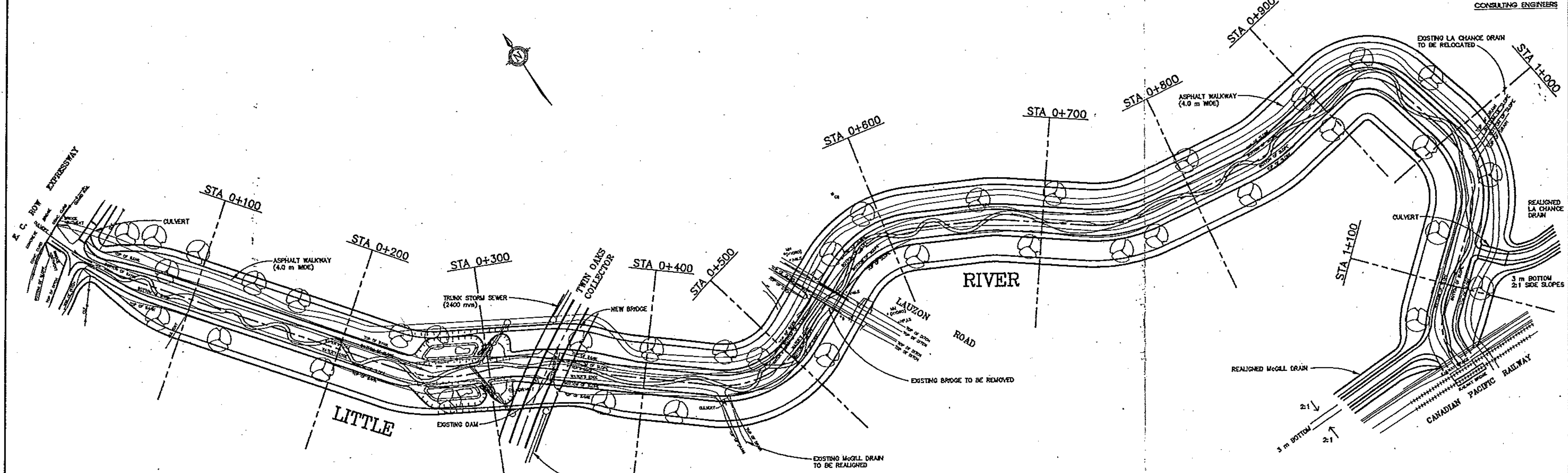
4. Construction phasing could be carried out without adversely affecting downstream flows and water levels.

5. Regular inspection and maintenance of the system is required to ensure it functions as designed. A log must be maintained by the City.

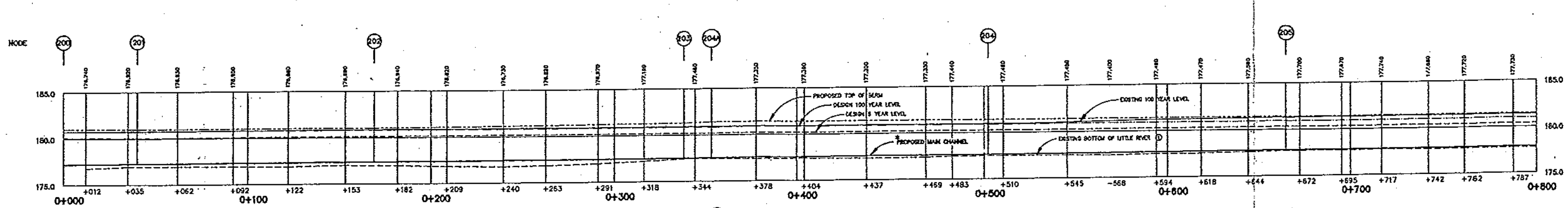
APPENDIX

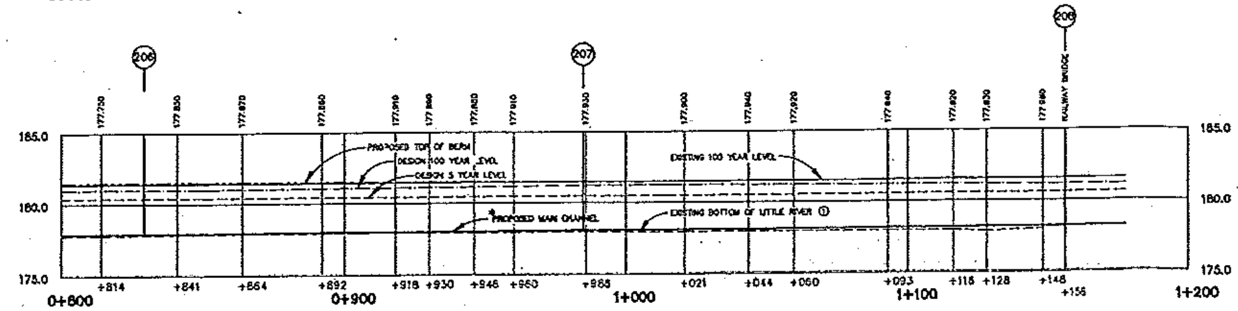
SITE PLAN
FIGURE 1

CONSULTING ENGINEERS

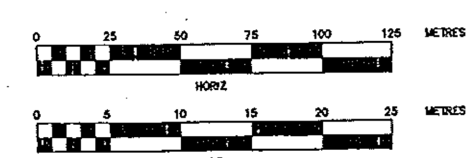


TWIN OAKS STORMWATER MANAGEMENT PLAN LITTLE RIVER ELEVATIONS						
NODE	STA.	INV.	MAXIMUM 5 YEAR WATER LEVEL	MAXIMUM 100 YEAR WATER LEVEL	PROPOSED TOP OF BANK ELEV.	EXISTING 100 YEAR WATER ELEV.
200	0+000	177.20	180.07	180.72	181.00	180.72
201	0+040	177.23	180.11	180.77	181.00	180.73
202	0+169	177.35	180.13	180.79	181.20	180.86
203	0+338	177.49	180.18	180.83	181.30	180.89
204A	0+353	177.51	180.20	180.86	181.40	180.90
204	0+502	177.63	180.25	180.89	181.40	180.97
205	0+665	177.77	180.32	180.93	181.40	181.34
206	0+829	177.91	180.40	180.99	181.50	181.40
207	0+992	178.06	180.50	181.05	181.50	181.48
208	1+156	178.20	180.61	181.13	181.60	181.56





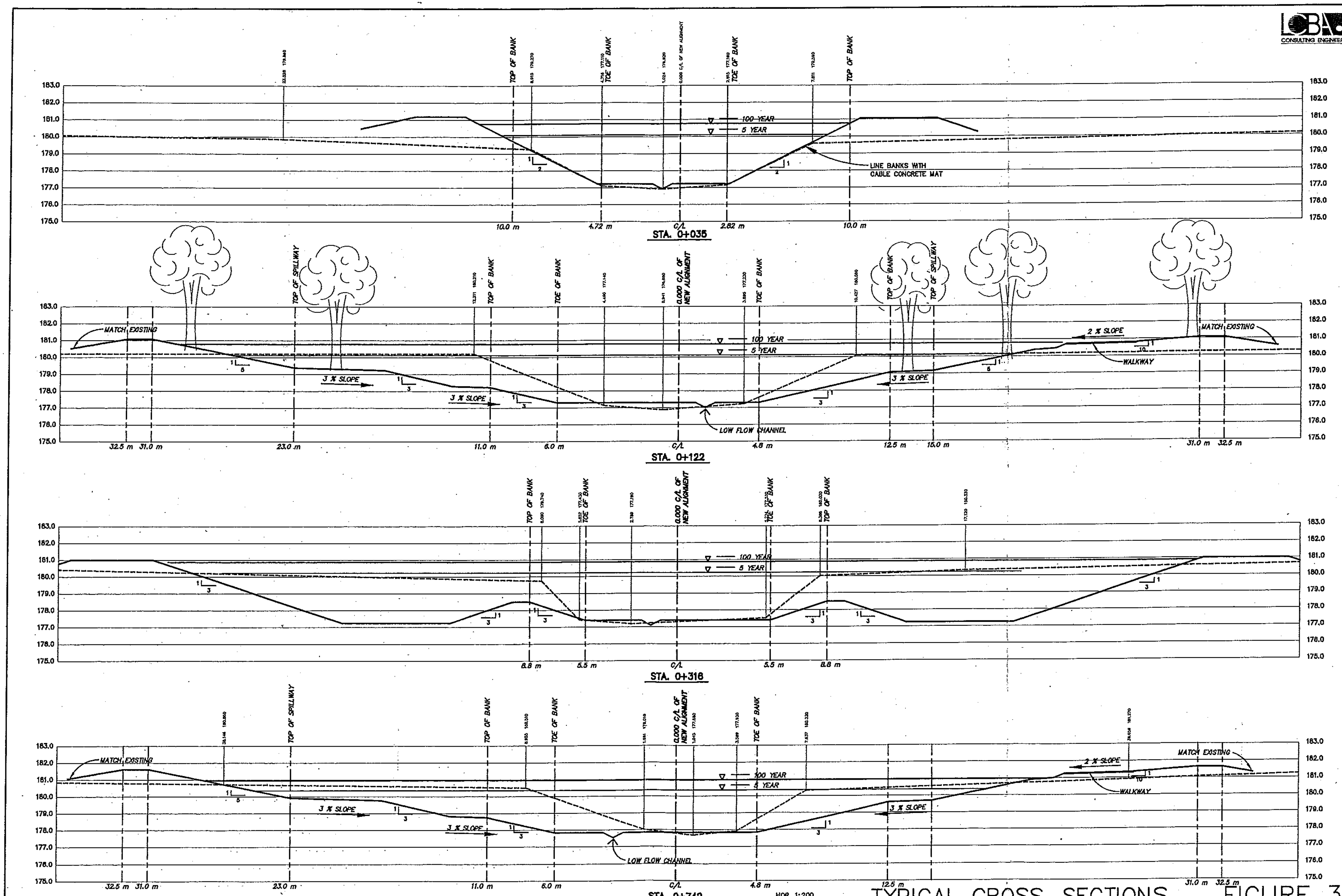
* NOTE – LOW FLOW CHANNEL WILL BE 0.5 m LOWER
① FROM LITTLE RIVER FLOOD LINE MAPPING, MACLAREN ENG. 1985



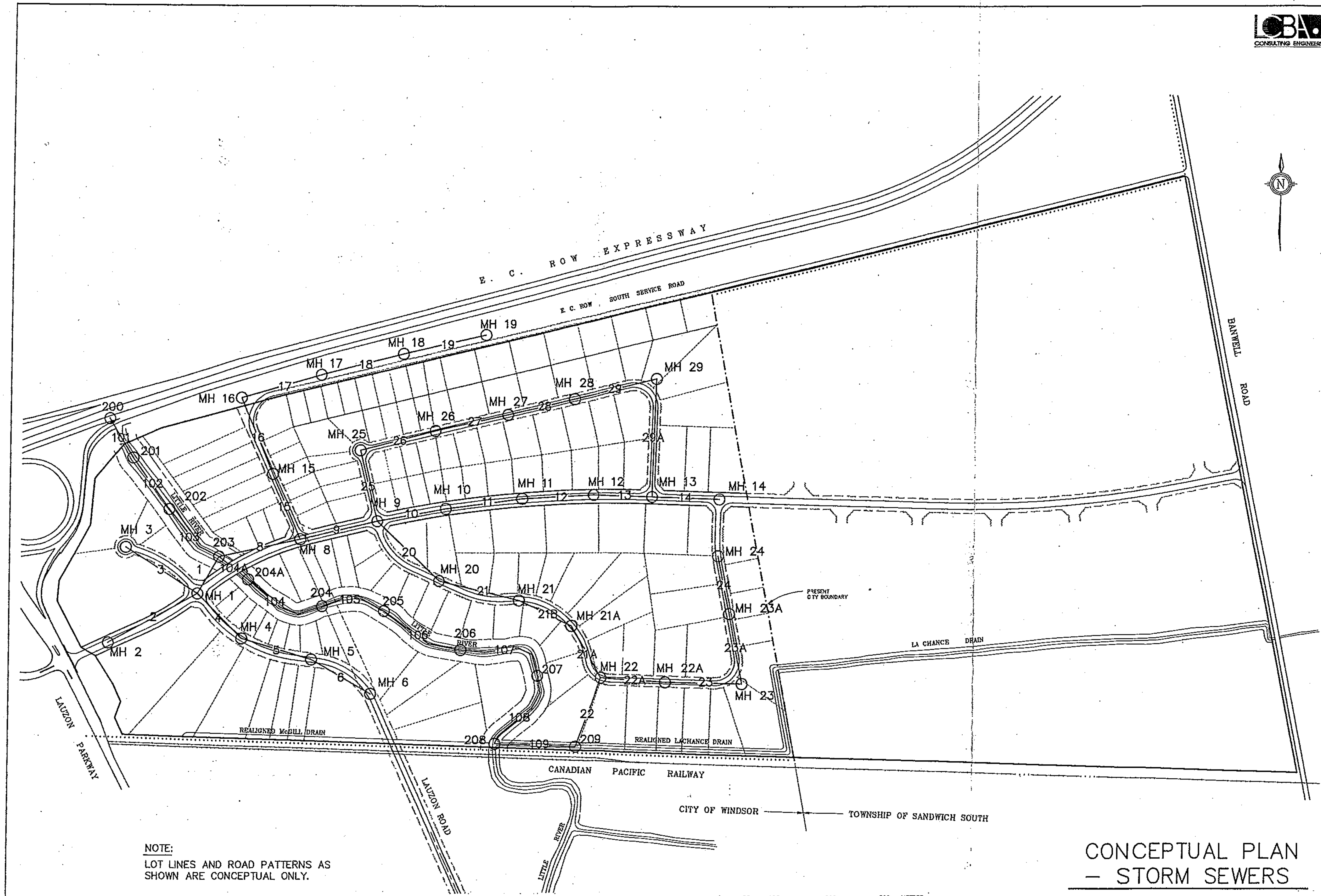
PROPOSED STORMWATER MANAGEMENT PLAN

FIGURE 2

DWGS\WD1002\REPORT\3085FIG2 Tue Feb 11 15:46:31 1997 K.F.F.



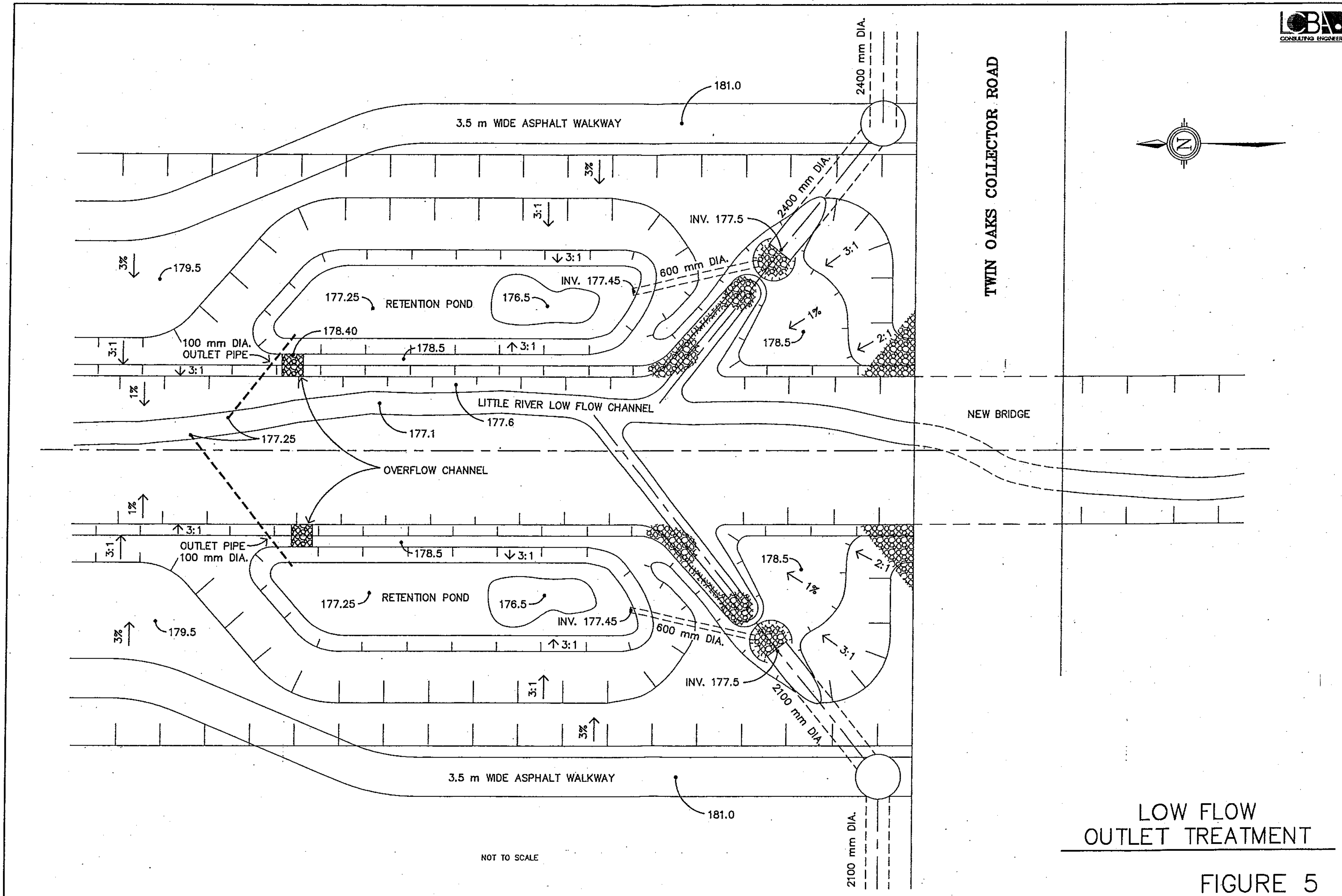
TYPICAL CROSS-SECTIONS FIGURE 3



NOTE:
LOT LINES AND ROAD PATTERNS AS SHOWN ARE CONCEPTUAL ONLY.

CONCEPTUAL PLAN
– STORM SEWERS

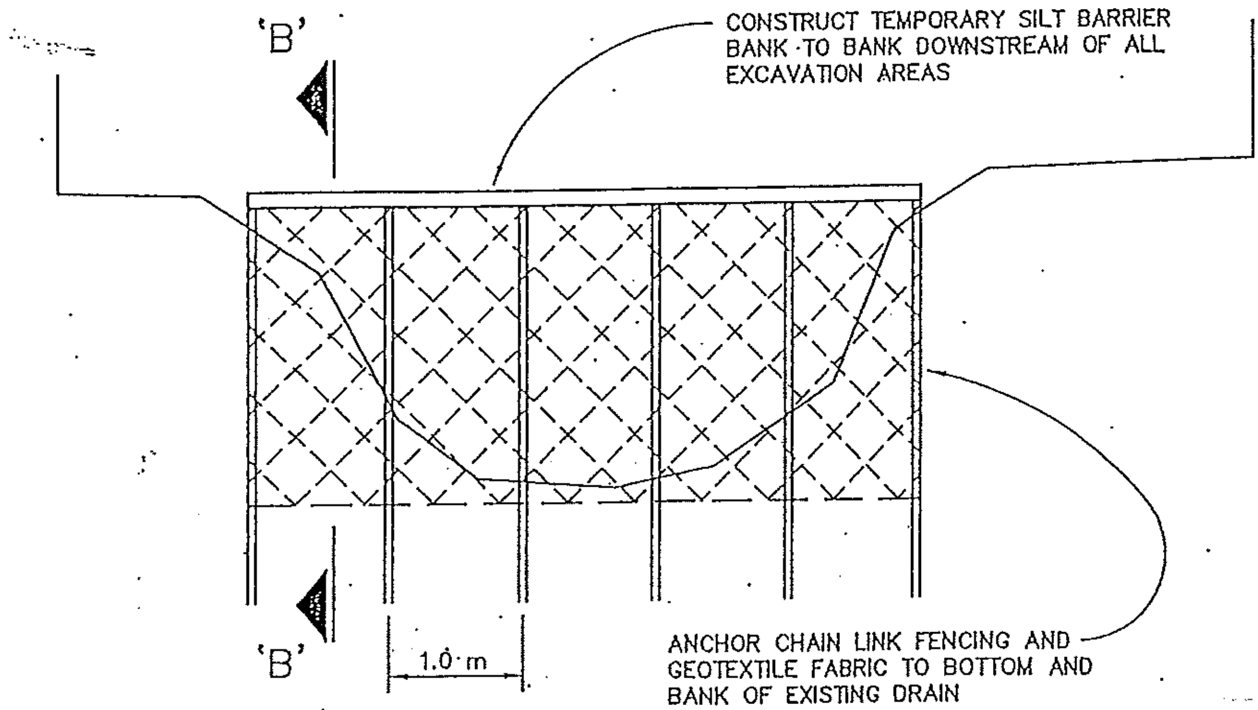
FIGURE 4



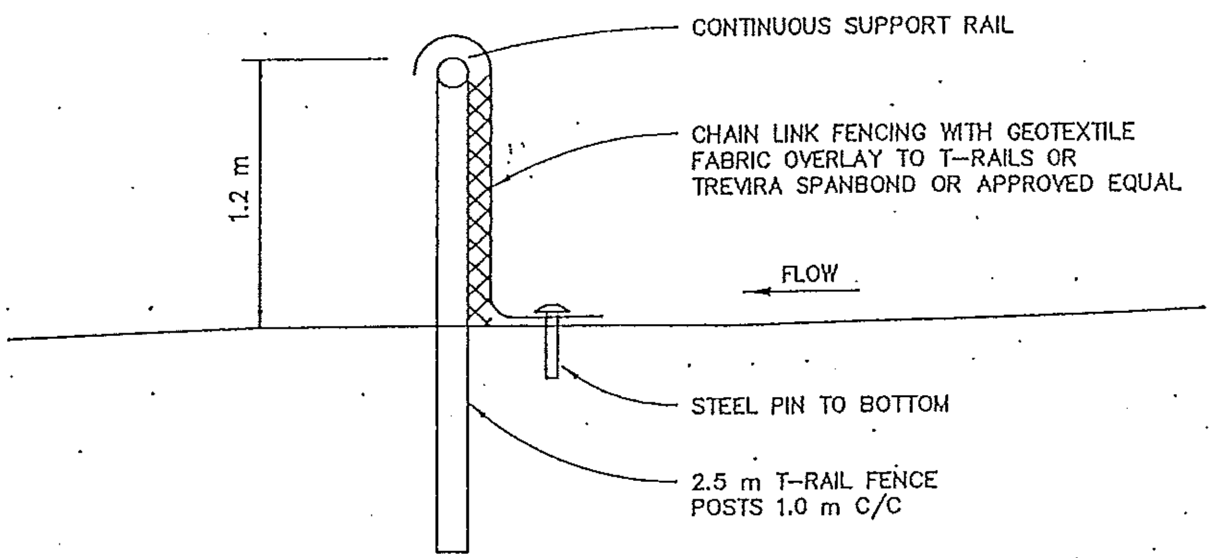
LOW FLOW
OUTLET TREATMENT

FIGURE 5

WO1002\REPORT2\3085FIG5.DWG



ELEVATION



SECTION 'B'–'B'

TEMPORARY SILT BARRIER

NOT TO SCALE

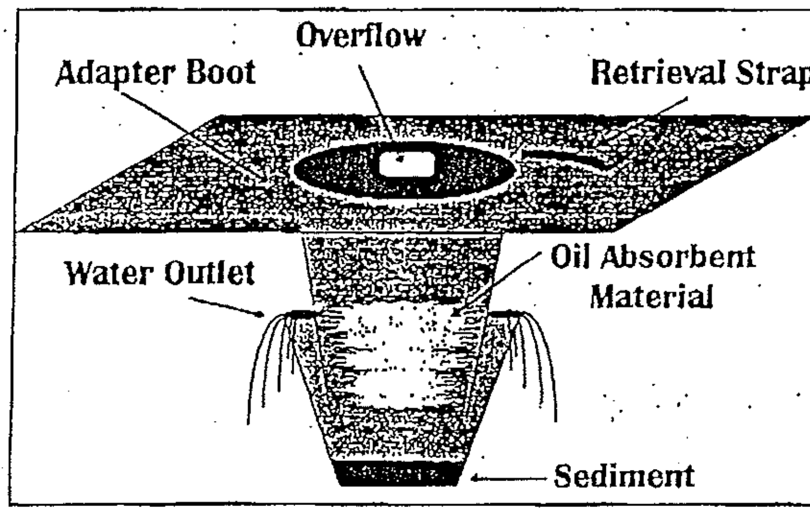
FIGURE 6

The StreamGuard™ Catch Basin Insert

INNOVATIVE TECHNOLOGY AGENCY APPROVED

Stormdrain Protection

The *StreamGuard™ Catch Basin Insert* is an extensively tested and engineered device designed to remove contaminants such as oil and grease, sediment, floatables, and debris from stormwater. The inserts are cost-effective, disposable, and universally fit nearly all catch basins.

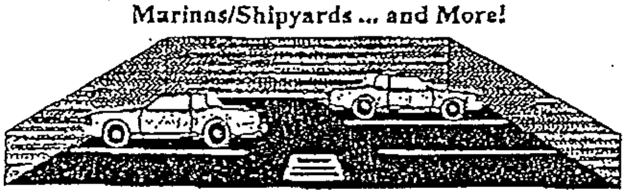


The *StreamGuard™ Insert* is easily installed in the catch basin and works passively (no chemicals or power required) to remove contaminants from stormwater or industrial washwater.

Three types of inserts are available: for oil and sediment, for sediment only, and for floatables and debris. Custom fabrication is also available for specific applications and/or sizes. The type you select depends on your specific application.

Applications:

Construction Sites, Industrial Facilities, Car and Truck Washing, Parking Lots, Marinas/Shipyards ... and More!



How It Works

The *StreamGuard™ Catch Basin Insert* is made entirely of nonwoven geotextile fabric, sewn with heavy-duty marine grade monofiliment thread. It is universally fitting because of its unique fabric adapter "boot" (see drawing below). To install, just remove the catch basin grating, lay the insert "boot" over the opening, then replace the grating. The weight and snug fit of the grating locks the insert in place. Next, simply cut away the excess fabric of the boot from around the grating and the installation is complete. When stormwater enters the catch basin, it will flow into the insert. The fabric will act as a filter at first, allowing water to pass but retaining sediment and absorbing oil and grease. When the fabric can no longer filter due to accumulated contaminants, it begins to operate in its designed long-term mode.

In this mode, the body of the oil and sediment unit fills with water which provides detention for the gravity settling of sediment. The sediment is captured in the bottom of the insert. Oil entering the unit will conversely prefer to remain floating at the surface of the water where it is absorbed into the oil absorbent material as depicted in the drawing above.

Insert Maintenance

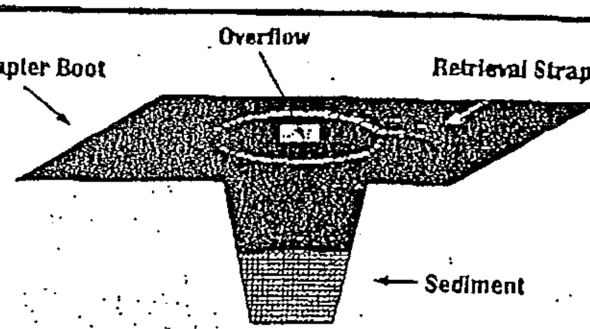
Insert maintenance is quick and inexpensive with replacement frequency dependent on contaminant loading and stormwater volume. In many storm drain applications with drainage areas less than 10,000 square feet, the inserts will operate as designed for 5 inches of rain or longer. In heavy-loading applications or poorly controlled sites, however, the inserts will need to be replaced on an "as needed" basis. The manufacturer recommends inspecting catch basins frequently and logging observations as a BMP (best management practice).

To remove the insert, simply pull the retrieval strap from under the grating, secure it by sliding a bar through the strap loop, then slide the grating half-way off the catch basin and reach in to remove the insert.

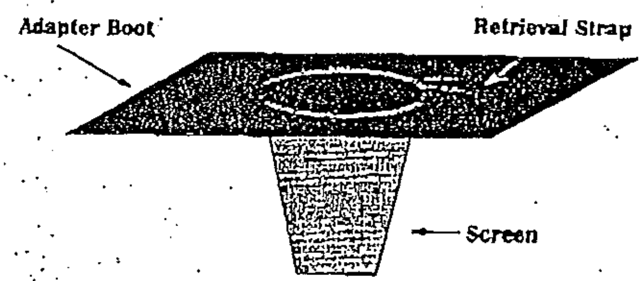
Sediment units and floatables/debris units may be reused by emptying and replacing. Reusing the oil and sediment units is not recommended due to the potential for release of captured oil which is absorbed in the insert fabric.

Insert Disposal

For most applications the primary contaminants removed by the inserts will be sediment and oil. In these cases, the spent inserts can usually be disposed of as a standard solid waste. Drip-dry to comply with the "no free liquids" rule for solid waste. In applications where hazardous materials may be present in the stormwater, disposal of the inserts should be in accordance with local environmental regulations.



Also available is the *StreamGuard™ Insert* for sediment only. This unit has been approved as a BMP for construction sites by regulatory authorities.



For floatables and debris, this *StreamGuard™ Insert* with its unique self-cleaning screen has proven very effective.

Manufacturer:
Foss Environmental & Infrastructure Services
7440 West Marginal Way S.
Seattle, WA 98108-4141
Phone: 206-767-0441
Fax: 206-767-3460
Internet: fossenv@fossenv.com
http://www.eskimo.com/~bwest/foss.html

Distributor/Agent:

SPEC SARNIA LTD.
1550 Confederation Street
SARNIA, ONTARIO N7W 1A3
(519) 336-2405 Fax (519) 336-1177

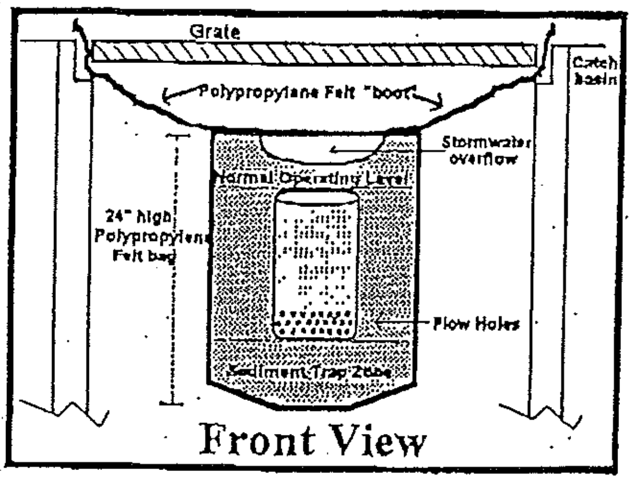
⇨ ***New & Improved*** ⇦

StreamGuard™
CATCH BASIN FILTERS

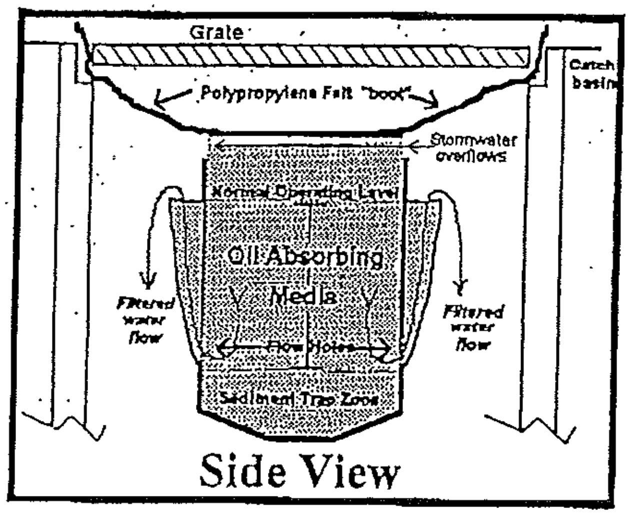
THE MOST TALKED ABOUT BEST MANAGEMENT PRACTICE FOR STORMWATER POLLUTION REDUCTION SINCE THE IMPLEMENTATION OF THE NPDES STORMWATER PROGRAM!

BY REMOVING OVER 90% OF OIL AND SEDIMENT FROM STORMWATER RUNOFF AT THE CATCH BASIN INLET, *StreamGuard™ Catch Basin Filters* KEEP THE ENVIRONMENT CLEANER, REDUCE THE NEED FOR CATCH BASIN CLEANING AND . . . *will not cause flooding!*

CBF Type II-OS



Front View



Side View

Innovative Design

☑ *4 Models* ☑ *Inexpensive* ☑ *Universal Fit* ☑ *Durable*
☑ *Effective* ☑ *Easy Installation and Removal* ☑ *Disposable*

StreamGuard™ ...THE FUTURE OF INLET PROTECTION

MANUFACTURED BY:

STORMWATER SERVICES CORPORATION

"LEADERS IN INLET PROTECTION..."

DISTRIBUTED BY:

SPEC SARNIA LTD.
1550 Confederation Street
SARNIA, ONTARIO N7W 1A3
(519) 336-2405 Fax (519) 336-1177

StreamGuard™...THE FUTURE OF INLET PROTECTION

Description

A StreamGuard™ Type II Catch Basin Filter (CBF) consists of a specially designed, nonwoven polypropylene felt filter bag which is suspended in the catch basin using a nonwoven polypropylene felt fabric "boot". ***StreamGuard™*** units can be quickly installed in most catch basins by simply removing the catch basin grating, placing the filter in the basin opening, and replacing the grating. The weight of the grating holds the catch basin filter in place, even when full. There are four (4) ***StreamGuard™*** models to choose from: oil and sediment (OS), industrial (IND), sediment (S) and trash (T).

Operation

The *StreamGuard™* Type II-OS has been specially designed to remove oil, grease, and sediment from stormwater runoff. The unit differs from the sediment only unit in that it has a measured amount of specially modified hydrophobic and oleophilic polypropylene oil absorbent in the bag. Every major component of the *StreamGuard™* Type II-OS (the felt fabric bag, felt fabric "boot" and special oil-absorbent media) attracts oil like a magnet. As water enters the catch basin inlet, it is directed into the filter bag. Contaminants are initially filtered from the runoff by the boot, and then the bag and absorbent media where oil, grease and sediment are captured. Soon this felt cloth is masked over and then the bag operates in the "normal" mode with the bag ¾ full of water. This gives the oil-absorbing media more time to capture the oil and grease, also allowing the sediment to drop directly into the sediment trap zone (see drawings on reverse side). Water flow is down through the oil-absorbing media and then through the flow holes back up to the overflow pockets where it is released to the catch basin. During the peak storm periods, emergency overflow openings allow the unit to be bypassed at a rate of up to 200 gallons per minute (the industrial unit does not have this overflow mechanism).

Maintenance

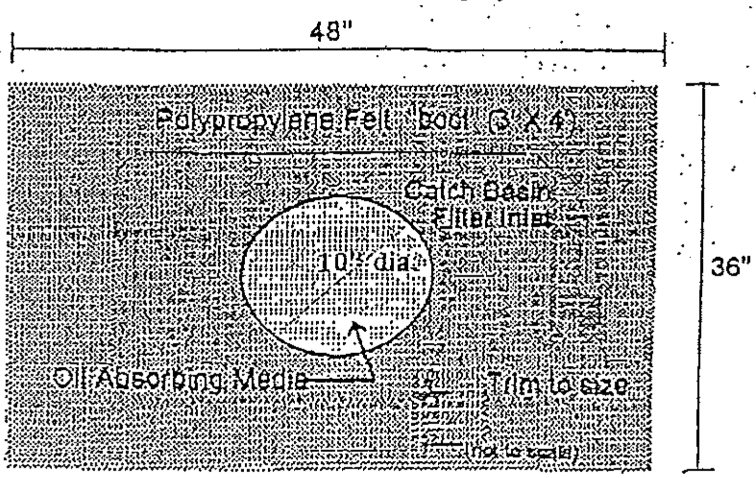
Maintaining *StreamGuard™* CBFs is a quick and inexpensive procedure; replacement frequency depends on sediment/oil loading and runoff volume. The maintenance interval can be as often as weekly at busy construction sites for the sediment (S) only unit. For use in parking lot applications the oil and sediment (OS) unit is an excellent choice. Frequency of replacement is very site dependant; a good rule of thumb is to replace the filter every 3-5 inches of rainfall. For industrial (IND) applications with heavier sediment and oil loads, more frequent maintenance may be required. The *StreamGuard™* is disposable, so maintenance of the units is as simple as removing the used unit (using the handy retrieval strap attached to the boot) and installing a new one. In all cases it is recommended that a monitoring program be put into place after the installation of any catch basin filter.

Disposal

Disposal of the material accumulated in the *StreamGuard™* catch basin filters (CBFs), and the filters themselves is dependent on the nature of the pollutants being collected. At some sites, the Type II-OS CBFs could contain up to 50 percent oil (dry weight basis). In certain industrial applications, the accumulated sediment may contain other contaminants (e.g., heavy metals) and should be managed in accordance with local, state and federal regulations. In all cases, the generator is responsible for the proper characterization and disposal of the waste.

Applications

StreamGuard™ Catch Basin Filters provide a cost-effective BMP for removal of oil, grease, sediment and floatables at: *industrial facilities, car and truck washing locations, construction sites, steam cleaning operations, parking lots, ports, marinas, shipyards, airports, intermodal rail yards, service stations, truck stops, shopping malls and many other sites where sediment, oil, trash and floatables can enter storm water drainage systems.*



Top View

Specifications

<u>Type II-OS (oil and sediment):</u>

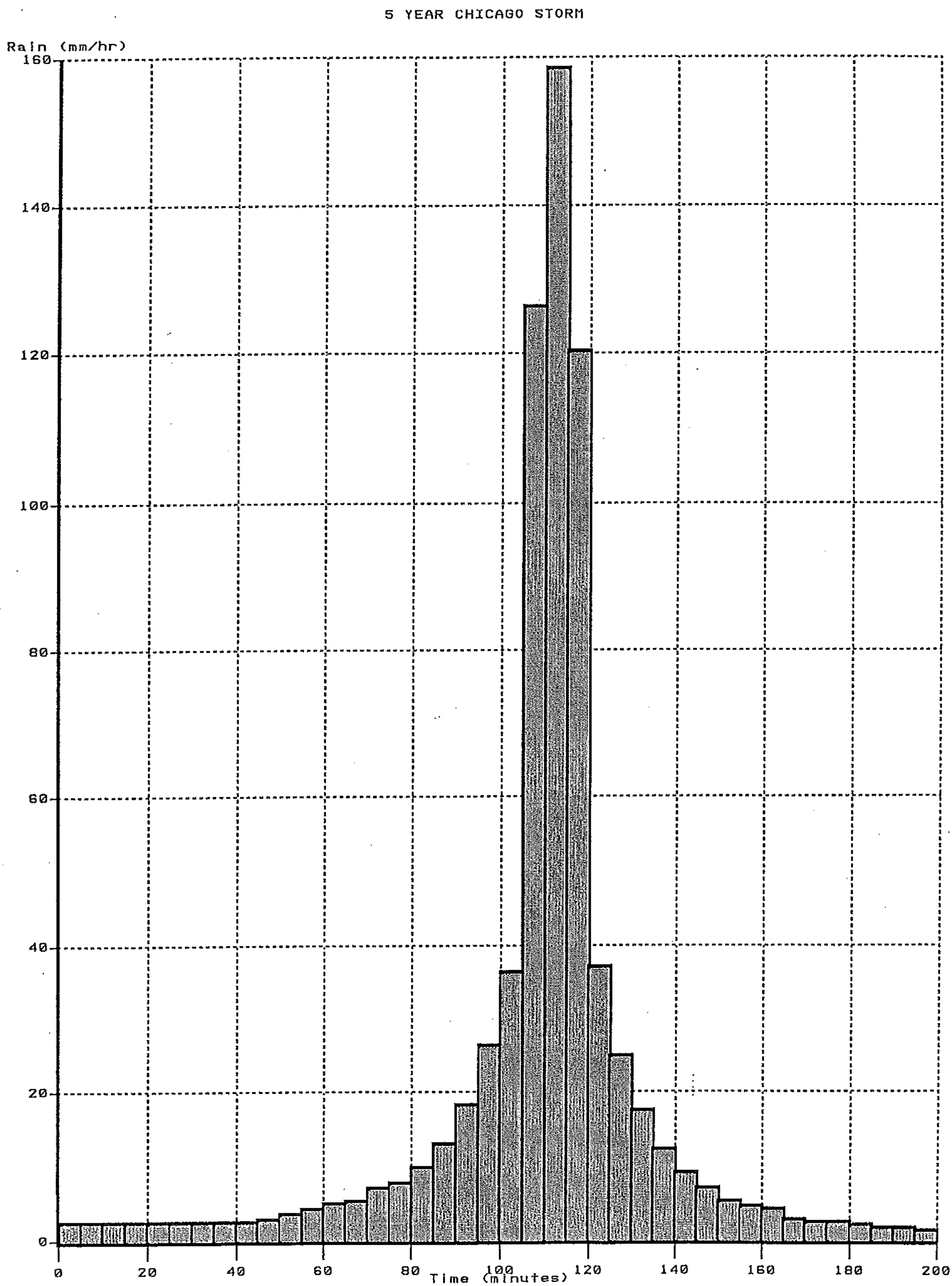
Construction material:	8 oz. polypropylene felt
Maximum overflow rate:	>200 GPM (except IND model)
Absorbent Material:	Polypropylene (oleophilic)
Optimum filtration rate:	>5-10 GPM (Type-OS)
Boot adapter dimensions:	36" X 48"
Nominal depth:	24"

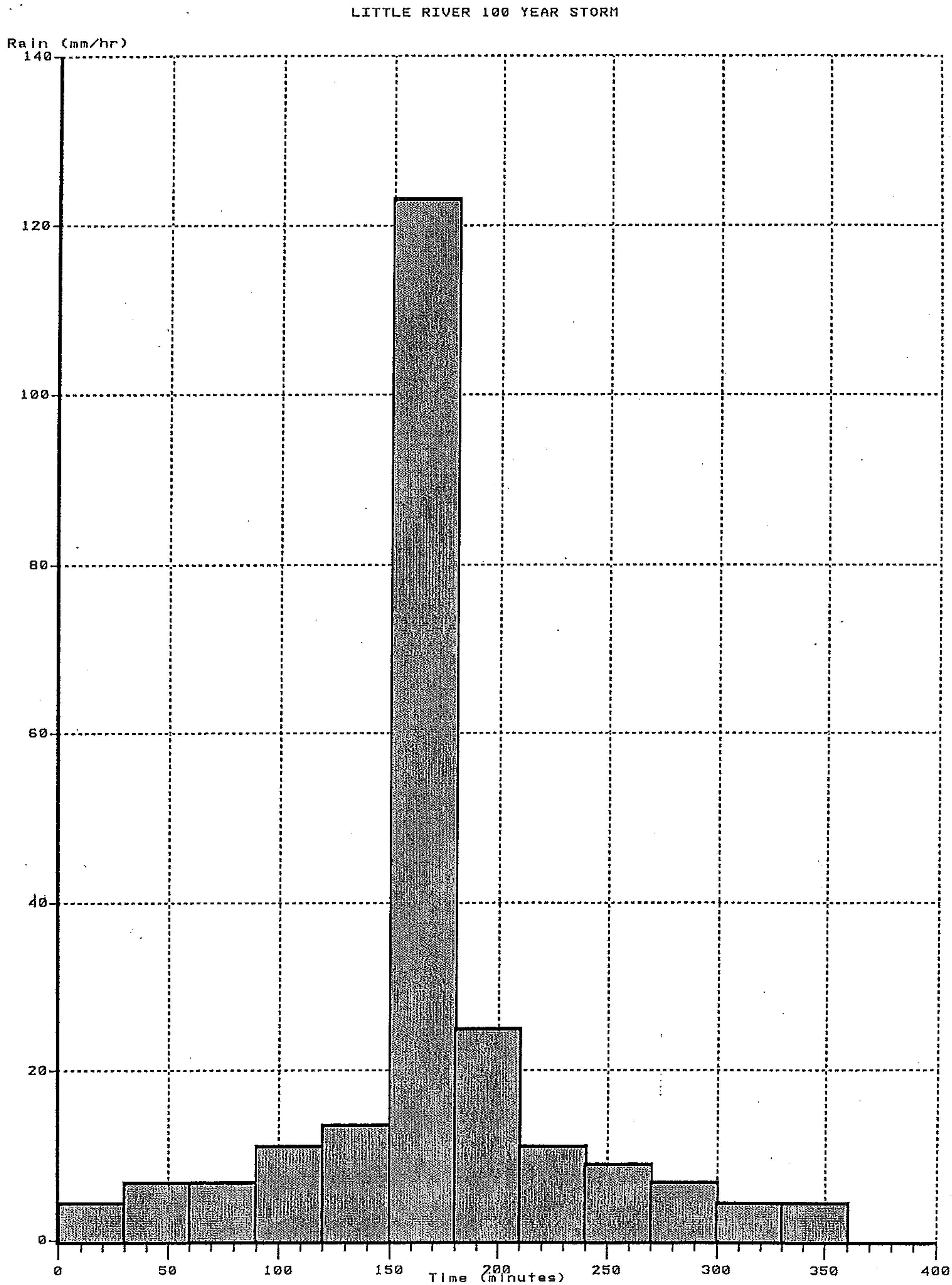
Note: Boot adapter may be trimmed to size for a neat appearance

Stormwater Services Corporation (SSC) expressly warrants this product to be free from defects in material and workmanship. Except as specifically provided above, SSC makes no representation or warranty, either expressed or implied, with respect to the Catch Basin Filter, including its performance, merchantability, or fitness for a particular purpose. In no event will SSC be liable for any lost profits or consequential or special damages.

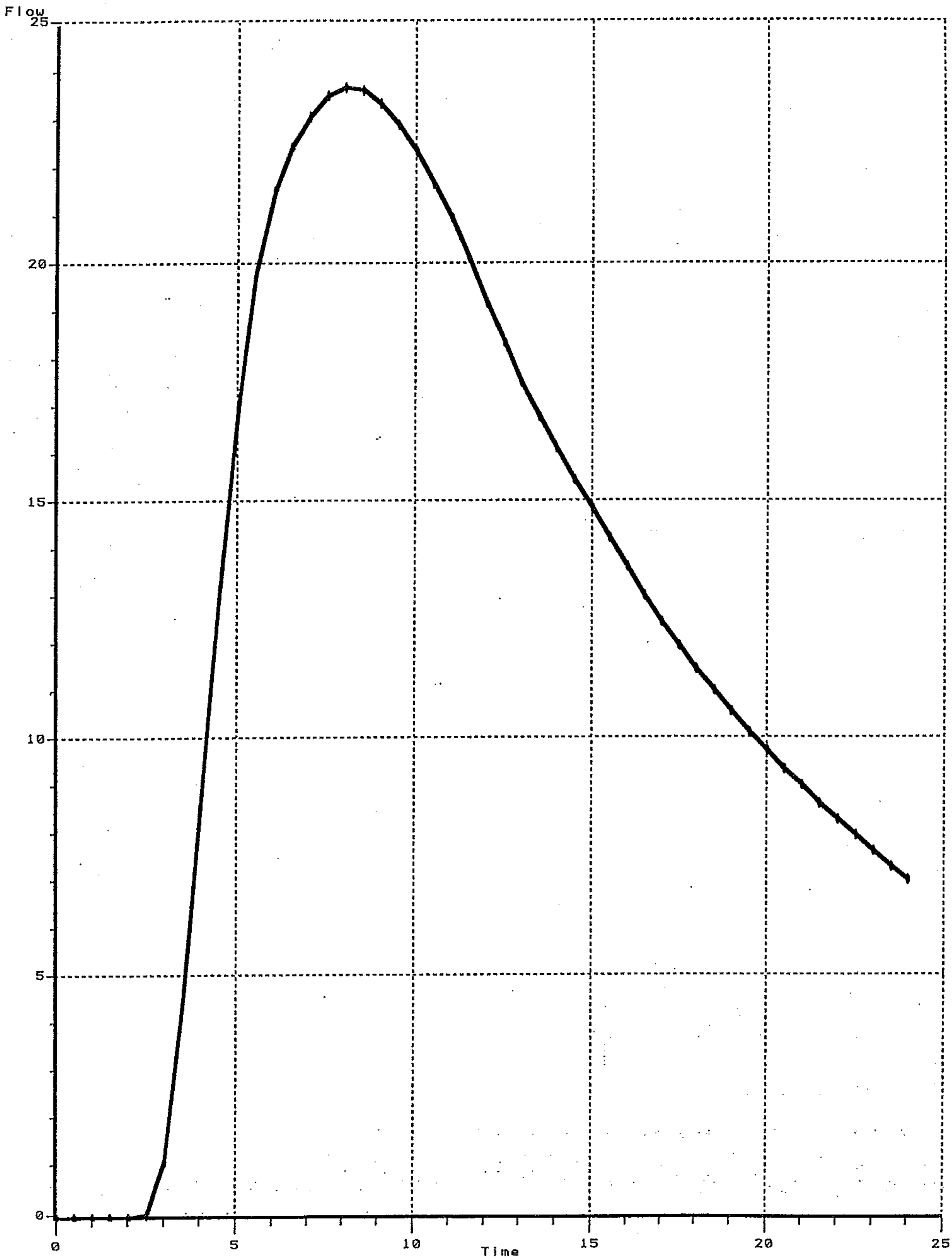
SWMM OUTPUT

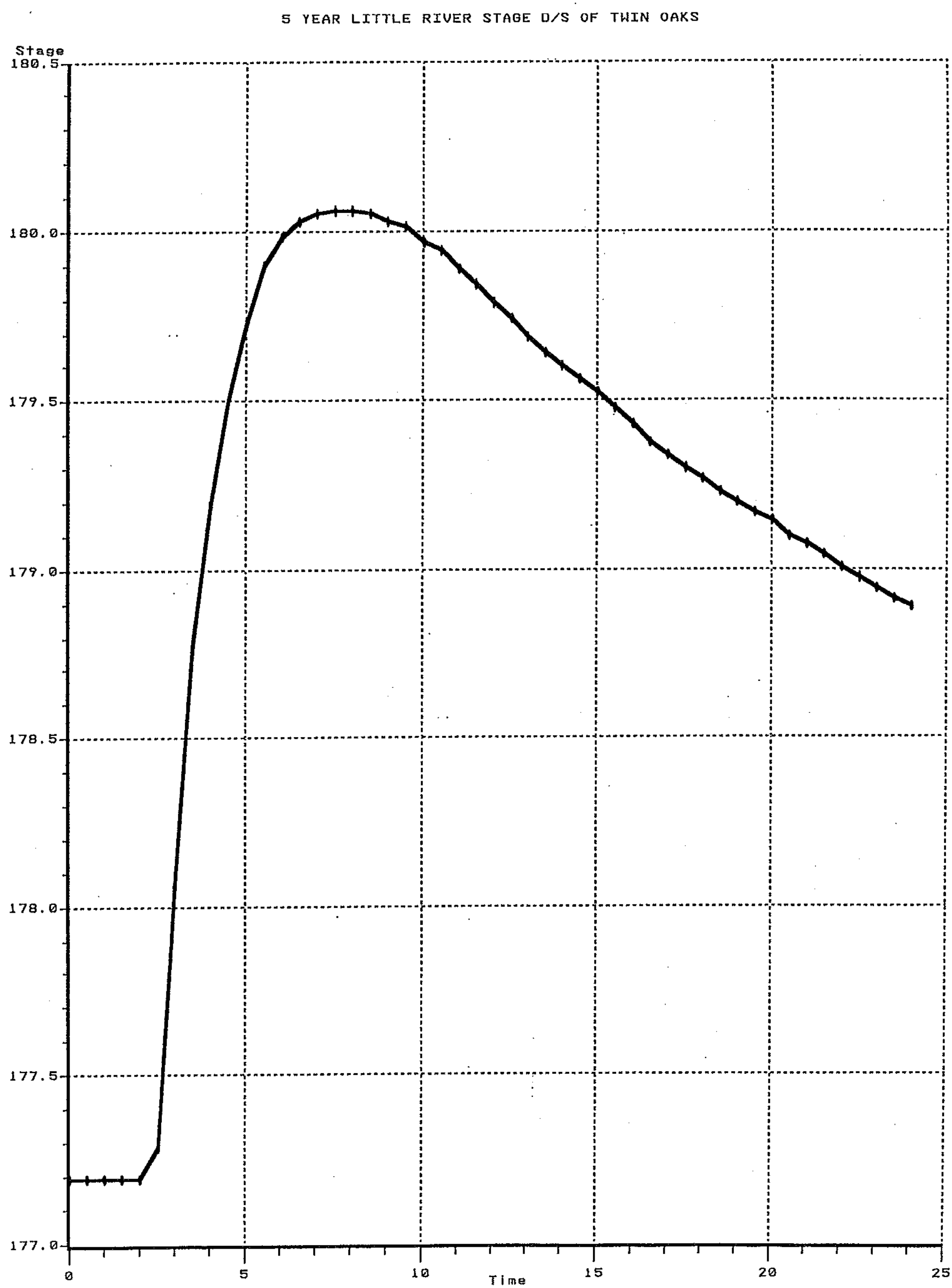
- Storm Distribution for 5 Year and 100 Year Storms
- Upstream Little River Hydrograph for 5 Year and 100 Year Storms
- Downstream Little River Stage for 5 Year and 100 Year Storms
- Little River Hydraulic Profile and Maximum Flows for 5 Year and 100 Year Storms
- Subcatchment, Junction and Conduit Data and Junction and Conduit Summary Statistics for 5 Year and 100 Year Storms

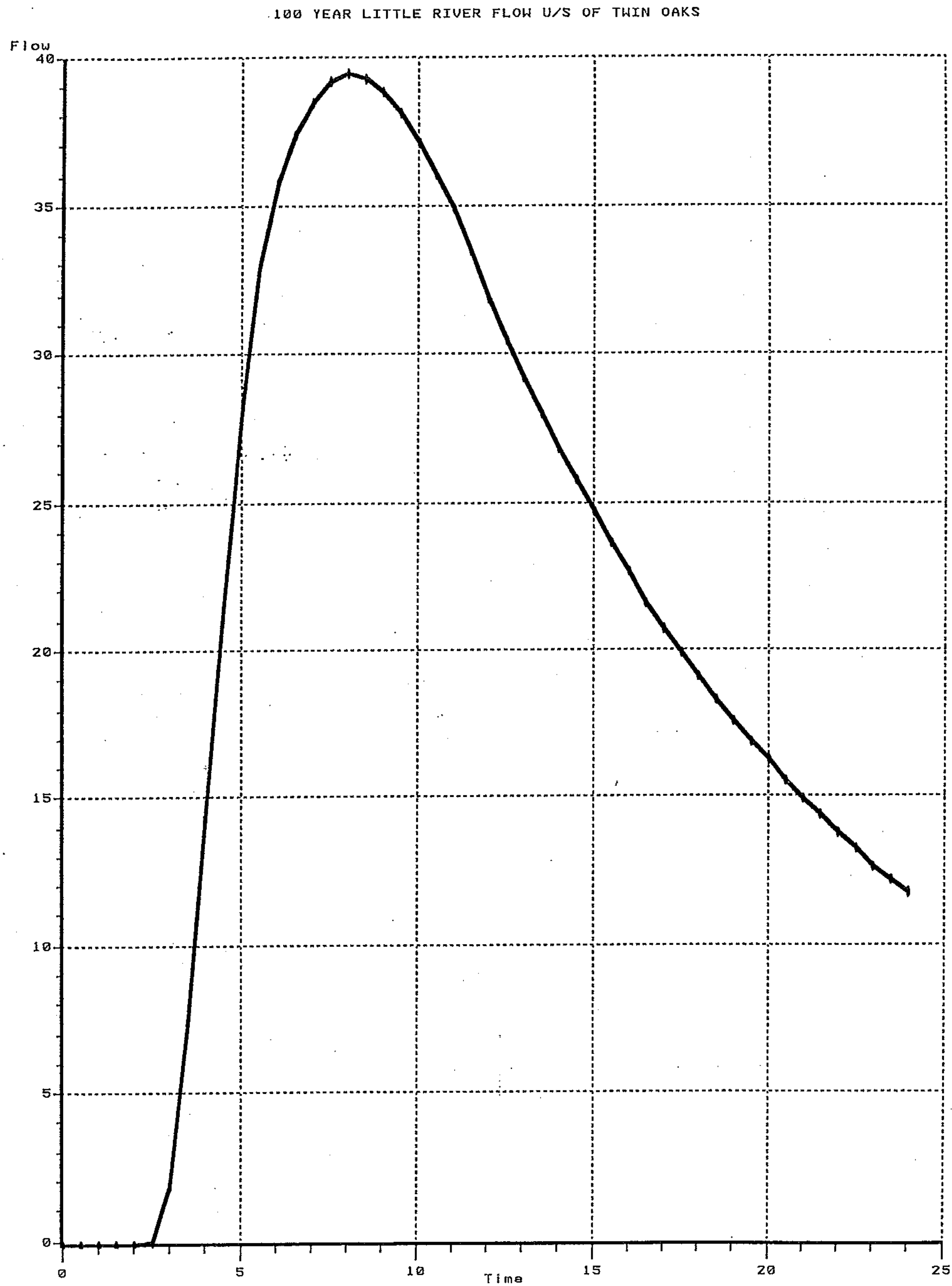

5 YEAR CHICAGO STORM
Rain (mm/hr)
160
140
120
100
80
60
40
20
0
0
20
40
60
80
100
120
140
160
180
200
Time (minutes)

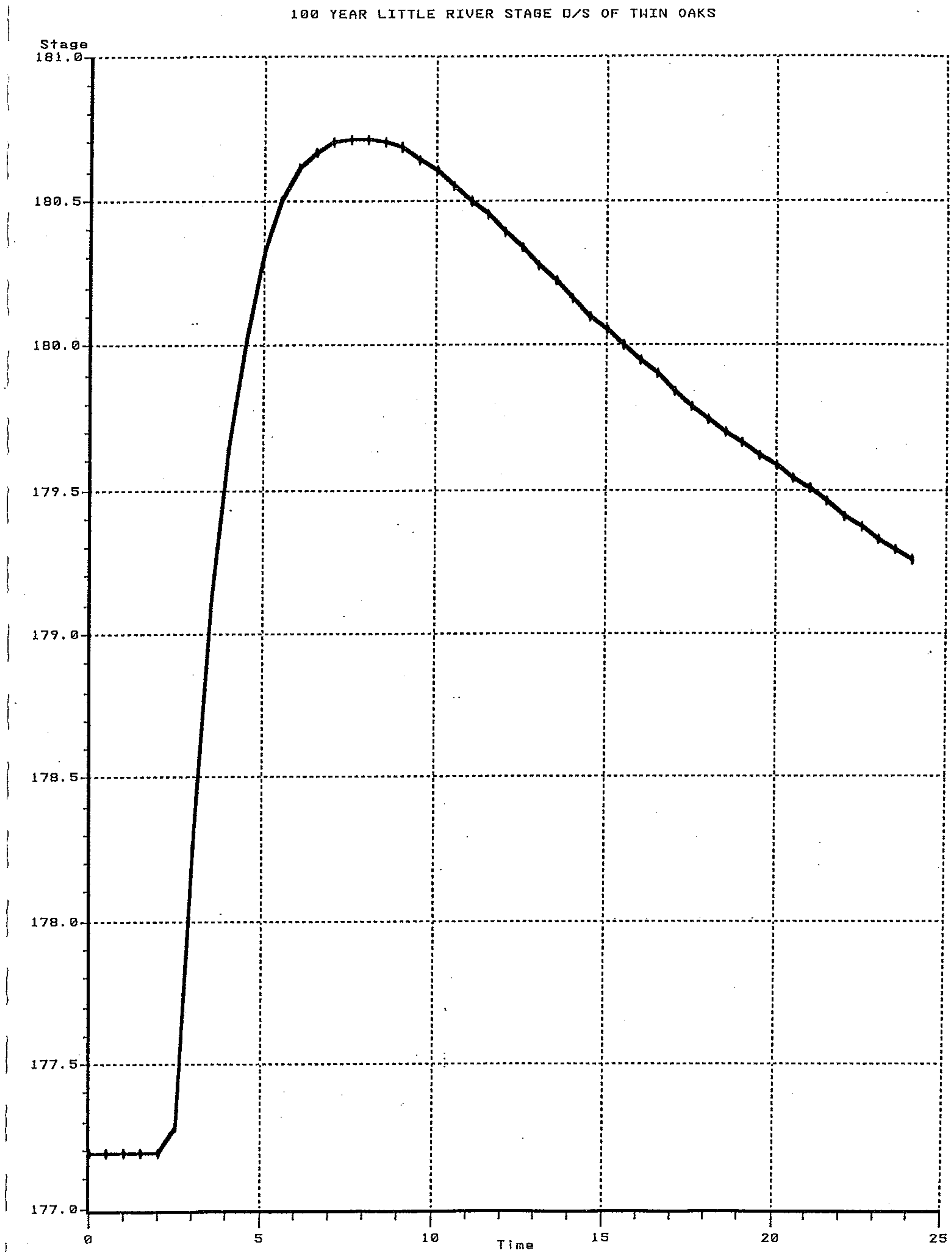

LITTLE RIVER 100 YEAR STORM
Rain (mm/hr)
140
120
100
80
60
40
20
0
0
50
100
150
200
250
300
350
400
Time (minutes)

5 YEAR LITTLE RIVER FLOW U/S OF TWIN OAKS

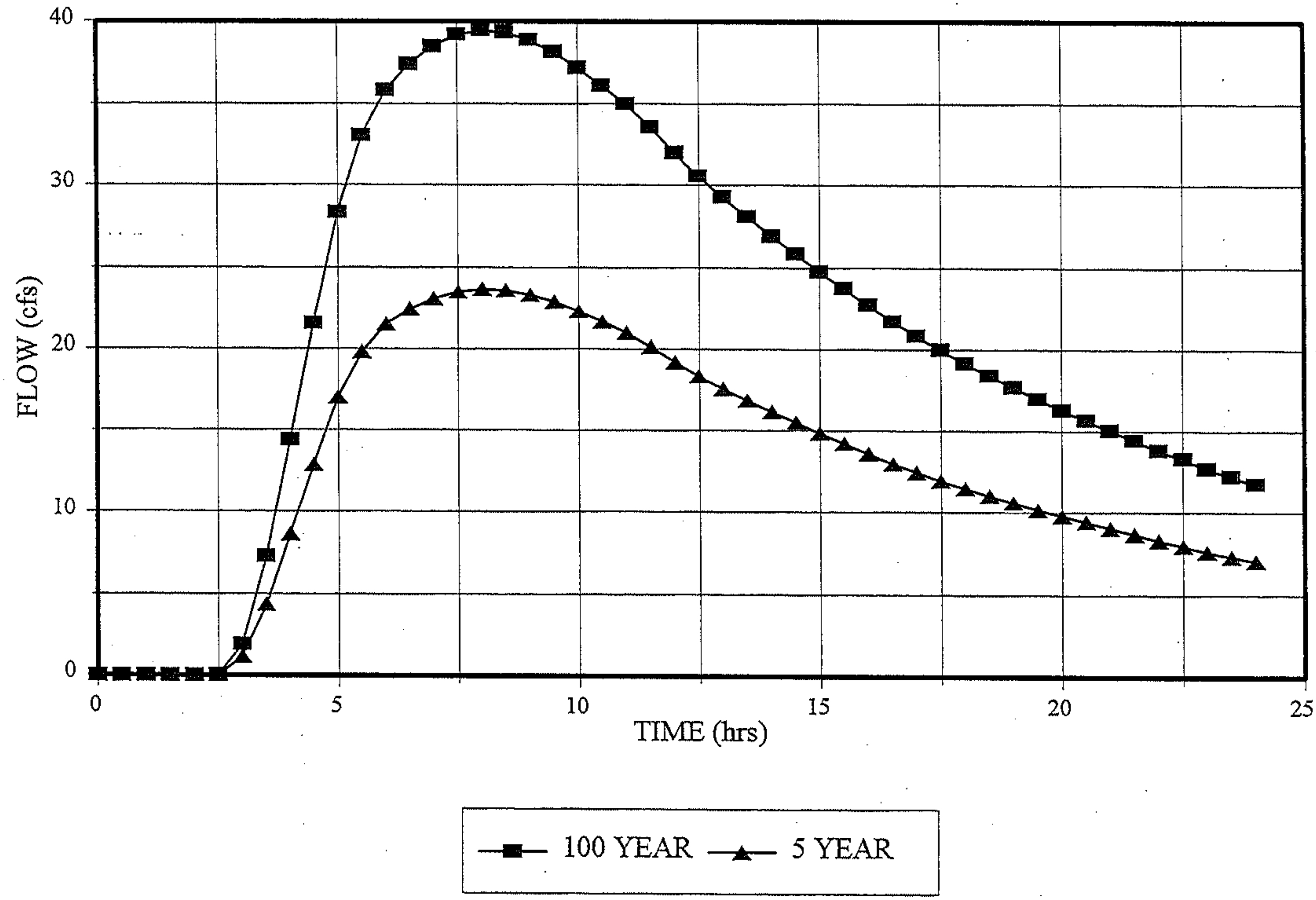



5 YEAR LITTLE RIVER STAGE D/S OF TWIN OAKS
Stage
180.5
180.0
179.5
179.0
178.5
178.0
177.5
177.0
0
5
10
15
20
25
Time

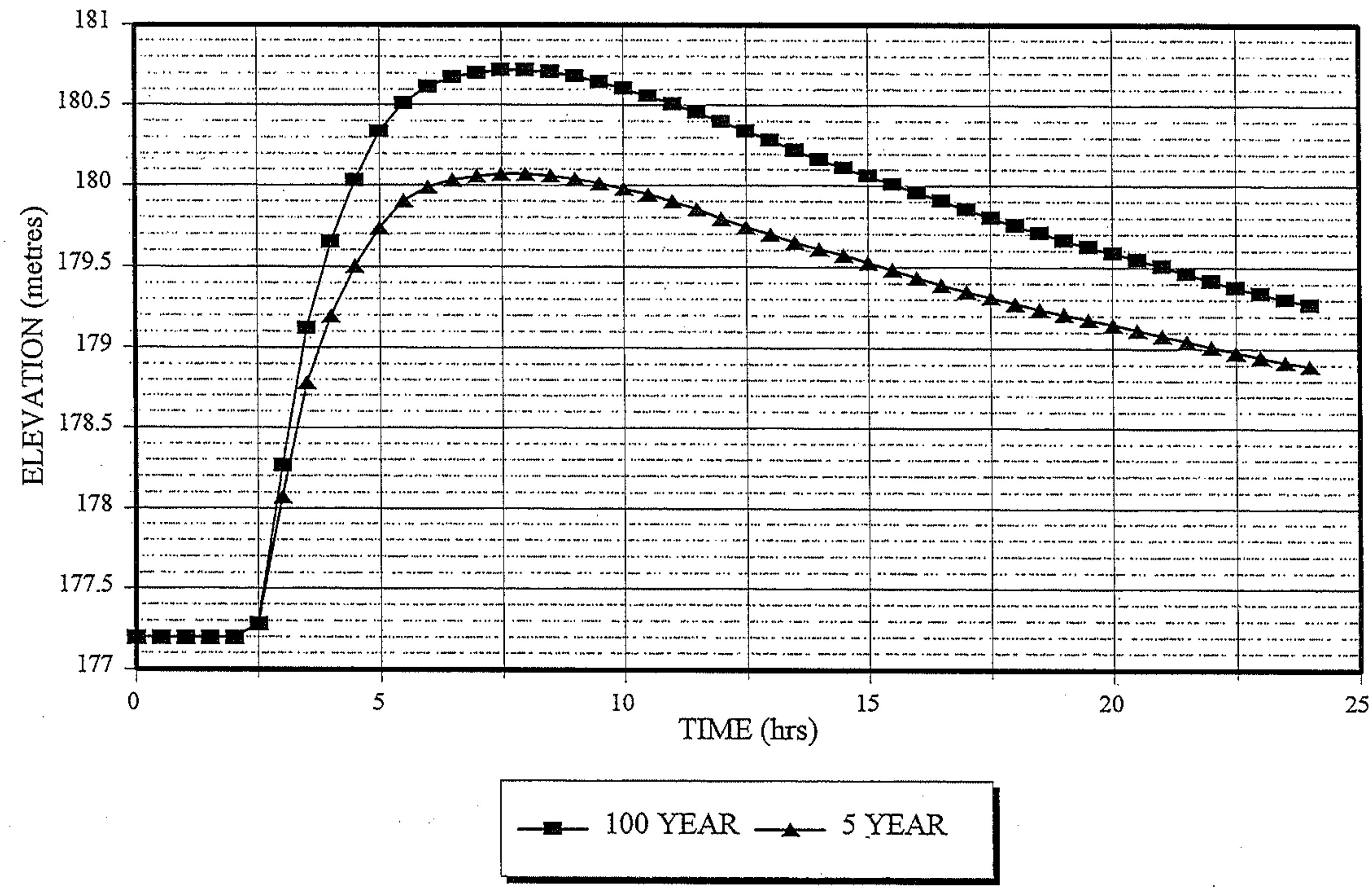

100 YEAR LITTLE RIVER FLOW U/S OF TWIN OAKS
Flow
40
35
30
25
20
15
10
5
0
0
5
10
15
20
25
Time


100 YEAR LITTLE RIVER STAGE D/S OF TWIN OAKS
Stage
181.0
180.5
180.0
179.5
179.0
178.5
178.0
177.5
177.0
0
5
10
15
20
25
Time

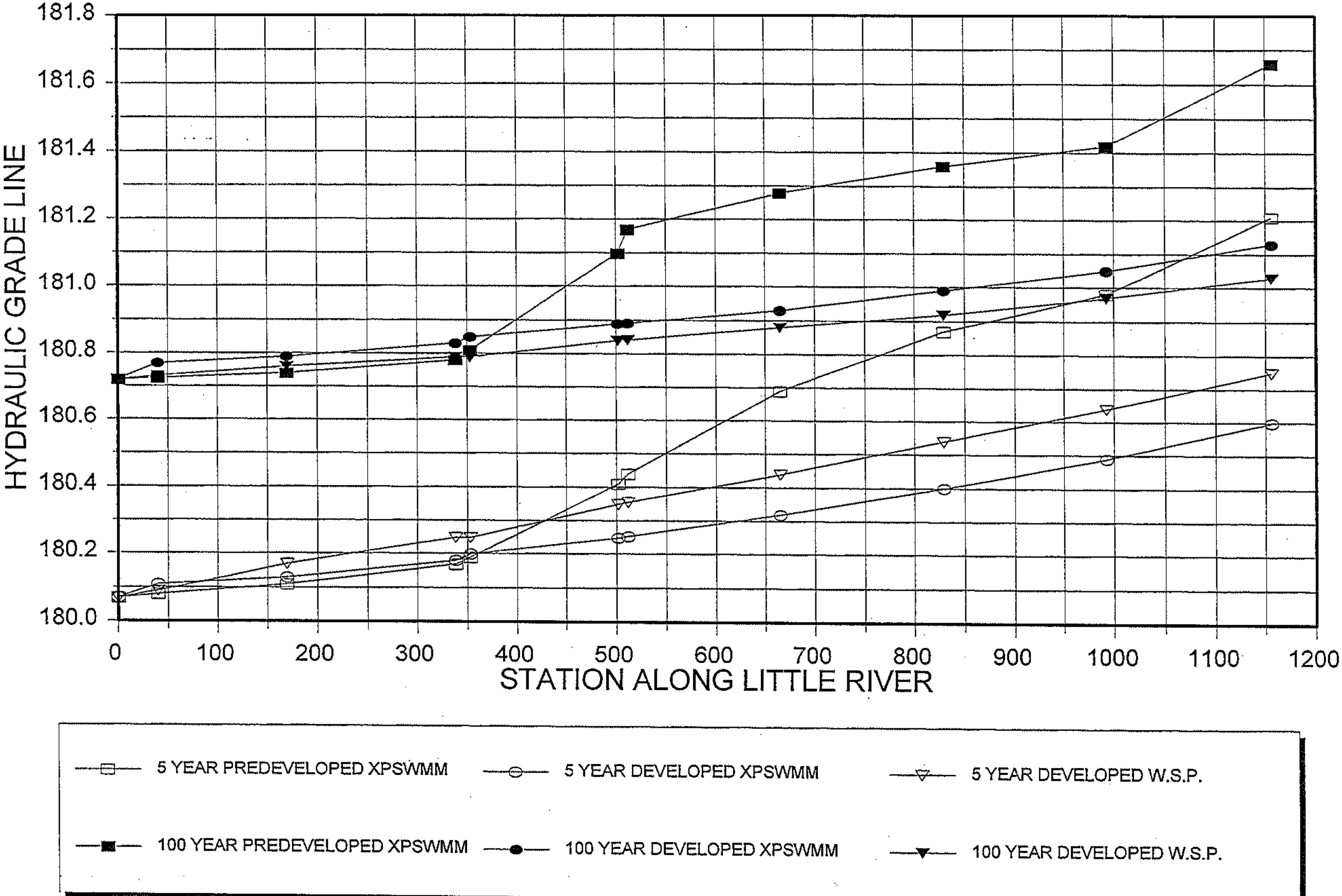
TWIN OAKS BUSINESS PARK - WD1002
UPSTREAM FLOW



TWIN OAKS BUSINESS PARK - WD1002
DOWNSTREAM STAGE



TWIN OAKS INDUSTRIAL PARK
LITTLE RIVER HYDRAULIC GRADE LINE



TWIN OAKS BUSINESS PARK
XPSWMM - 5 YEAR STORM
INPUT DATA

SUBCATCHMENT NAME	AREA ha	IMPERV. %	PIPE NUMBER	LENGTH m	PIPE DIAMETER m	PIPE SLOPE %	PIPE CAPACITY cms	UPSTREAM INVERT m	DOWNSTREAM INVERT m	JUNCTION NUMBER	GROUND ELEVATION m	INVERT ELEVATION m
MH 2	0.504	50	2	168.970	0.300	4.971	0.216	187.548	179.148	MH 2	189.0	187.548
MH 3	4.925	50	3	152.373	1.050	0.057	0.652	178.207	178.120	MH 3	181.0	178.207
MH 6	3.105	50	6	123.230	1.050	0.092	0.827	178.645	178.532	MH 6	181.0	178.645
-	3.305	50	-	-	-	-	-	-	-	-	-	-
MH 5	3.193	50	5	133.445	1.350	0.050	1.205	178.233	178.165	MH 5	181.0	178.233
MH 4	4.618	50	4	134.738	1.650	0.033	1.666	177.865	177.820	MH 4	181.0	177.865
MH 1	0.309	50	1	81.452	1.950	0.025	2.230	177.520	177.500	MH 1	181.2	177.520
MH 19	0.932	50	19	160.163	0.525	0.140	0.161	179.935	179.711	MH 19	181.0	179.935
MH 18	0.932	50	18	127.933	0.750	0.089	0.332	179.486	179.372	MH 18	181.0	179.486
MH 17	0.700	50	17	148.146	0.825	0.078	0.402	179.316	179.200	MH 17	181.0	179.316
MH 16	3.487	50	16	135.332	1.050	0.057	0.651	179.034	178.957	MH 16	181.0	179.034
MH 15	1.912	50	15	137.816	1.200	0.047	0.847	178.657	178.592	MH 15	181.2	178.657
MH 29	3.547	50	29	148.852	0.750	0.089	0.332	179.526	179.394	MH 29	181.3	179.282
-	1.827	50	-	-	-	-	-	-	-	-	-	-
MH 29	3.547	50	29A	188.301	0.975	0.062	0.559	179.282	179.165	MH 29	181.3	179.282
-	1.827	50	-	-	-	-	-	-	-	-	-	-
MH 14	3.309	50	14	123.286	0.975	0.062	0.556	179.241	179.165	MH 14	181.0	179.241
MH 13	2.653	50	13	145.127	1.500	0.035	1.325	178.640	178.589	MH 13	181.0	178.640
MH 12	1.886	50	12	107.632	1.500	0.035	1.328	178.539	178.501	MH 12	181.3	178.539
MH 11	1.968	50	11	121.014	1.650	0.031	1.615	178.351	178.313	MH 11	181.5	178.351
MH 10	1.999	50	10	131.050	1.650	0.031	1.612	178.263	178.222	MH 10	181.5	178.263
MH 28	1.833	50	28	129.298	0.900	0.069	0.475	179.244	179.155	MH 28	181.3	179.244
MH 27	2.083	50	27	140.245	1.050	0.058	0.656	179.005	178.924	MH 27	181.3	179.005
MH 26	1.589	50	26	101.949	1.200	0.047	0.846	178.774	178.726	MH 26	181.3	178.774
MH 25	1.689	50	25	135.001	1.350	0.040	1.068	178.576	178.522	MH 25	181.3	178.576
MH 21	2.411	50	21	171.865	0.750	0.089	0.332	179.367	179.214	MH 21	181.5	179.367
-	2.616	50	-	-	-	-	-	-	-	-	-	-
MH 21	2.411	50	21B	106.987	0.750	0.089	0.332	179.545	179.450	MH 21	181.5	179.367
-	2.616	50	-	-	-	-	-	-	-	-	-	-
MH 21A	2.616	50	21A	105.331	1.050	0.057	0.652	179.150	179.090	MH 21A	181.2	179.150
MH 24	2.133	50	24	117.884	0.750	0.089	0.332	179.659	179.554	MH 24	181.3	179.659
MH 23A	2.133	50	23A	121.212	1.050	0.057	0.652	179.254	179.185	MH 23A	181.3	179.254
MH 23	3.371	50	23	129.468	1.350	0.040	1.070	178.885	178.833	MH 23	181.3	178.885
MH 22A	3.371	50	22A	123.235	1.500	0.035	1.320	178.683	178.640	MH 22A	181.2	178.683
MH 22	-	-	22	141.276	1.800	0.028	1.934	178.340	178.300	MH 22	181.3	178.340
209	-	-	109	150.000	2.700	0.067	16.972	178.300	178.200	209	181.5	178.300
208	1.155	50	108	163.520	3.403	0.087	85.181	178.197	178.056	208	181.6	178.197
207	1.155	50	107	163.520	3.444	0.087	88.348	178.056	177.915	207	181.5	178.056
206	-	-	106	163.520	3.585	0.087	99.536	177.915	177.774	206	181.5	177.915
205	1.155	50	105	163.520	3.626	0.087	102.888	177.774	177.633	205	181.4	177.774
204	-	-	104	148.520	3.767	0.087	114.662	177.633	177.505	204	181.4	177.633
204A	-	-	104A	15.000	3.767	0.087	118.940	177.505	177.492	204A	181.4	177.505
MH 20	1.359	50	20	132.985	0.900	0.069	0.476	179.064	178.972	MH 20	181.5	179.064
MH 9	0.948	50	9	144.514	2.250	0.021	3.002	177.622	177.592	MH 9	181.5	177.622
MH 8	1.974	50	8	131.265	2.250	0.032	3.728	177.542	177.500	MH 8	181.5	177.542
203	1.477	50	103	169.180	3.808	0.087	118.269	177.492	177.346	203	181.3	177.492
202	-	-	102	129.180	3.766	0.087	114.923	177.346	177.234	202	181.2	177.346
201	-	-	101	40.000	3.766	0.087	52.453	177.234	177.200	201	181.0	177.234

WD1002

TWIN OAKS BUSINESS PARK
XPSWMM - 100 YEAR STORM
INPUT DATA

SUBCATCHMENT NAME	AREA ha	IMPERV. %	PIPE NUMBER	LENGTH m	PIPE DIAMETER m	PIPE SLOPE %	PIPE CAPACITY cms	UPSTREAM INVERT m	DOWNSTREAM INVERT m	JUNCTION NUMBER	GROUND ELEVATION m	INVERT ELEVATION m
MH 2	0.504	50	2	168.970	0.300	4.971	0.216	187.548	179.148	MH 2	189.0	187.548
MH 3	4.925	50	3	152.373	1.050	0.057	0.652	178.207	178.120	MH 3	181.0	178.207
MH 6	3.105	50	6	123.230	1.050	0.092	0.827	178.645	178.532	MH 6	181.0	178.645
-	3.305	50	-	-	-	-	-	-	-	-	-	-
MH 5	3.193	50	5	133.445	1.350	0.050	1.205	178.233	178.165	MH 5	181.0	178.233
MH 4	4.618	50	4	134.738	1.650	0.033	1.666	177.865	177.820	MH 4	181.0	177.865
MH 1	0.309	50	1	81.452	1.950	0.025	2.230	177.520	177.500	MH 1	181.2	177.520
MH 19	0.932	50	19	160.163	0.525	0.140	0.161	179.935	179.711	MH 19	181.0	179.935
MH 18	0.932	50	18	127.933	0.750	0.089	0.332	179.486	179.372	MH 18	181.0	179.486
MH 17	0.700	50	17	148.146	0.825	0.078	0.402	179.316	179.200	MH 17	181.0	179.316
MH 16	3.487	50	16	135.332	1.050	0.057	0.651	179.034	178.957	MH 16	181.0	179.034
MH 15	1.912	50	15	137.816	1.200	0.047	0.847	178.657	178.592	MH 15	181.2	178.657
MH 29	3.547	50	29	148.852	0.750	0.089	0.332	179.526	179.394	MH 29	181.3	179.282
-	1.827	50	-	-	-	-	-	-	-	-	-	-
MH 29	3.547	50	29A	188.301	0.975	0.062	0.559	179.282	179.165	MH 29	181.3	179.282
-	1.827	50	-	-	-	-	-	-	-	-	-	-
MH 14	3.309	50	14	123.286	0.975	0.062	0.556	179.241	179.165	MH 14	181.0	179.241
MH 13	2.653	50	13	145.127	1.500	0.035	1.325	178.640	178.589	MH 13	181.0	178.640
MH 12	1.886	50	12	107.632	1.500	0.035	1.328	178.539	178.501	MH 12	181.3	178.539
MH 11	1.968	50	11	121.014	1.650	0.031	1.615	178.351	178.313	MH 11	181.5	178.351
MH 10	1.999	50	10	131.050	1.650	0.031	1.612	178.263	178.222	MH 10	181.5	178.263
MH 28	1.833	50	28	129.298	0.900	0.069	0.475	179.244	179.155	MH 28	181.3	179.244
MH 27	2.083	50	27	140.245	1.050	0.058	0.656	179.005	178.924	MH 27	181.3	179.005
MH 26	1.589	50	26	101.949	1.200	0.047	0.846	178.774	178.726	MH 26	181.3	178.774
MH 25	1.689	50	25	135.001	1.350	0.040	1.068	178.576	178.522	MH 25	181.3	178.576
MH 21	2.411	50	21	171.865	0.750	0.089	0.332	179.367	179.214	MH 21	181.5	179.367
-	2.616	50	-	-	-	-	-	-	-	-	-	-
MH 21	2.411	50	21B	106.987	0.750	0.089	0.332	179.545	179.450	MH 21	181.5	179.367
-	2.616	50	-	-	-	-	-	-	-	-	-	-
MH 21A	2.616	50	21A	105.331	1.050	0.057	0.652	179.150	179.090	MH 21A	181.2	179.150
MH 24	2.133	50	24	117.884	0.750	0.089	0.332	179.659	179.554	MH 24	181.3	179.659
MH 23A	2.133	50	23A	121.212	1.050	0.057	0.652	179.254	179.185	MH 23A	181.3	179.254
MH 23	3.371	50	23	129.468	1.350	0.040	1.070	178.885	178.833	MH 23	181.3	178.885
MH 22A	3.371	50	22A	123.235	1.500	0.035	1.320	178.683	178.640	MH 22A	181.2	178.683
MH 22	-	-	22	141.276	1.800	0.028	1.934	178.340	178.300	MH 22	181.3	178.340
209	-	-	109	150.000	3.200	0.067	25.499	178.300	178.200	209	181.5	178.300
208	1.155	50	108	163.520	3.403	0.087	85.181	178.197	178.056	208	181.6	178.197
207	1.155	50	107	163.520	3.444	0.087	88.348	178.056	177.915	207	181.5	178.056
206	-	-	106	163.520	3.585	0.087	99.536	177.915	177.774	206	181.5	177.915
205	1.155	50	105	163.520	3.626	0.087	102.888	177.774	177.633	205	181.4	177.774
204	-	-	104	148.520	3.767	0.087	114.662	177.633	177.505	204	181.4	177.633
204A	-	-	104A	15.000	3.767	0.087	118.940	177.505	177.492	204A	181.4	177.505
MH 20	1.359	50	20	132.985	0.900	0.069	0.476	179.064	178.972	MH 20	181.5	179.064
MH 9	0.948	50	9	144.514	2.250	0.021	3.002	177.622	177.592	MH 9	181.5	177.622
MH 8	1.974	50	8	131.265	2.250	0.032	3.728	177.542	177.500	MH 8	181.5	177.542
203	1.477	50	103	169.180	3.808	0.087	118.269	177.492	177.346	203	181.3	177.492
202	-	-	102	129.180	3.766	0.087	114.923	177.346	177.234	202	181.2	177.346
201	-	-	101	40.000	3.766	0.087	52.453	177.234	177.200	201	181.0	177.234

WD1002

TWIN OAKS BUSINESS PARK
XPSWMM - 5 YEAR STORM
OUTPUT DATA

SUBCATCHMENT NAME	TOTAL RUNOFF DEPTH mm	TOTAL RAINFALL DEPTH mm	PIPE NUMBER	MAXIMUM FLOW cms	MAXIMUM VELOCITY m/s	DESIGN FULL FLOW cms	JUNCTION NUMBER	FLOODED TIME min	MAXIMUM WATER ELEVATION m	FREEBOARD m	TOTAL INFLOW m^3
MH2	36.4	53.8	2	0.148	2.61	0.216	MH2	0	187.73	1.271	183
MH3	35.8	53.8	3	1.053	1.21	0.652	MH3	0	180.19	0.806	1764
MH6	35.3	53.8	6	1.281	1.47	0.827	MH6	0	180.63	0.368	2280
MH5	35.8	53.8	5	1.961	1.37	1.205	MH5	0	180.24	0.757	1144
MH4	35.6	53.8	4	2.873	1.32	1.666	MH4	0	180.20	0.805	1642
MH1	36.4	53.8	1	4.166	1.38	2.230	MH1	0	180.20	1.001	112
MH19	36.0	53.8	19	0.186	0.87	0.161	MH19	1	180.69	0.309	335
MH18	36.0	53.8	18	0.364	0.82	0.332	MH18	0	180.40	0.597	335
MH17	36.0	53.8	17	0.499	0.93	0.402	MH17	0	180.27	0.733	252
MH16	35.7	53.8	16	1.066	1.21	0.651	MH16	0	180.21	0.789	1244
MH15	35.8	53.8	15	1.305	1.13	0.847	MH15	0	180.22	0.980	684
MH29	35.9	53.8	29	0.273	0.68	0.332	MH29	0	180.86	0.390	1920
MH29	35.9	53.8	29A	0.854	1.14	0.559	MH29	0	180.86	0.390	1920
MH14	35.7	53.8	14	0.638	1.03	0.556	MH14	0	180.43	0.570	1182
MH13	35.8	53.8	13	1.956	1.08	1.325	MH13	0	180.31	0.689	950
MH12	35.9	53.8	12	2.246	1.25	1.328	MH12	0	180.22	1.080	677
MH11	35.9	53.8	11	2.525	1.13	1.615	MH11	0	180.20	1.298	707
MH10	35.9	53.8	10	2.717	1.23	1.612	MH10	0	180.19	1.305	718
MH28	35.9	53.8	28	0.629	0.98	0.475	MH28	0	180.61	0.637	659
MH27	36.0	53.8	27	1.088	1.25	0.656	MH27	0	180.32	0.935	750
MH26	36.0	53.8	26	1.387	1.20	0.846	MH26	0	180.21	1.039	572
MH25	35.8	53.8	25	1.592	1.08	1.068	MH25	0	180.20	1.045	605
MH21	35.8	53.8	21	0.520	1.16	0.332	MH21	0	180.54	0.961	1803
MH21	35.8	53.8	21B	0.562	1.27	0.332	MH21	0	180.54	0.961	1803
MH21A	35.8	53.8	21A	1.074	1.31	0.652	MH21A	0	180.57	0.627	937
MH24	35.8	53.8	24	0.442	1.00	0.332	MH24	0	180.63	0.621	764
MH23A	35.8	53.8	23A	0.855	0.95	0.652	MH23A	0	180.61	0.636	764
MH23	35.8	53.8	23	1.456	1.01	1.070	MH23	0	180.62	0.632	1206
MH22A	35.8	53.8	22A	2.022	1.19	1.320	MH22A	0	180.61	0.586	1206
MH22	-	-	22	3.021	1.32	1.934	MH22	0	180.61	0.693	0
209	-	-	109	2.848	0.50	16.972	209	0	180.61	0.394	0
208	36.4	53.8	108	23.361	0.59	85.181	208	0	180.61	0.994	1138906
207	36.4	53.8	107	23.354	0.55	88.348	207	0	180.50	1.002	420
206	-	-	106	23.373	0.53	99.536	206	0	180.40	1.099	0
205	36.4	53.8	105	23.416	0.51	102.888	205	0	180.32	1.041	420
204	-	-	104	23.517	0.48	114.662	204	0	180.25	1.151	0
204A	-	-	104A	23.580	0.56	118.940	204A	0	180.20	1.201	0
MH20	36.0	53.8	20	0.784	1.22	0.476	MH20	0	180.27	1.231	489
MH9	35.8	53.8	9	4.864	1.22	3.002	MH9	0	180.20	1.303	340
MH8	35.9	53.8	8	6.418	1.70	3.728	MH8	0	180.19	1.311	708
203	36.4	53.8	103	23.948	0.54	118.269	203	0	180.18	1.118	537
202	-	-	102	24.046	0.48	114.923	202	0	180.13	0.977	0
201	-	-	101	24.109	0.79	52.453	201	0	180.11	0.894	0

WD1002

TWIN OAKS BUSINESS PARK
XPSWMM - 100 YEAR STORM
OUTPUT DATA

SUBCATCHMENT NAME	TOTAL RUNOFF DEPTH mm	TOTAL RAINFALL DEPTH mm	PIPE NUMBER	MAXIMUM FLOW cms	MAXIMUM VELOCITY m/s	DESIGN FULL FLOW cms	JUNCTION NUMBER	FLOODED TIME min	MAXIMUM WATER ELEVATION m	FREEBOARD m	TOTAL INFLOW m^3
MH2	93.6	114.3	2	0.171	2.83	0.216	MH2	0	187.751	1.249	471
MH3	93.1	114.3	3	1.198	1.37	0.652	MH3	43	181.401	-0.400	4577
MH6	92.6	114.3	6	0.994	1.14	0.827	MH6	138	181.459	-0.459	5944
MH5	93.1	114.3	5	1.613	1.12	1.205	MH5	26	181.350	-0.350	2967
MH4	92.8	114.3	4	2.390	1.11	1.666	MH4	1	180.965	0.035	4282
MH1	93.6	114.3	1	3.784	1.26	2.230	MH1	0	180.919	0.281	288
MH19	93.2	114.3	19	0.150	0.69	0.161	MH19	240	181.400	-0.400	867
MH18	93.2	114.3	18	0.329	0.74	0.332	MH18	114	181.385	-0.385	867
MH17	93.2	114.3	17	0.402	0.75	0.402	MH17	76	181.380	-0.380	651
MH16	92.9	114.3	16	0.877	1.01	0.651	MH16	51	181.396	-0.396	3236
MH15	93.0	114.3	15	1.272	1.12	0.847	MH15	0	180.946	0.254	1776
MH29	93.2	114.3	29	0.451	1.01	0.332	MH29	82	181.678	-0.428	4990
MH29	93.2	114.3	29A	0.710	0.94	0.559	MH29	82	181.678	-0.428	4990
MH14	93.0	114.3	14	0.728	0.97	0.556	MH14	193	181.452	-0.452	3072
MH13	93.1	114.3	13	1.259	0.71	1.325	MH13	110	181.453	-0.453	2465
MH12	93.1	114.3	12	1.491	0.84	1.328	MH12	0	181.024	0.276	1753
MH11	93.2	114.3	11	1.831	0.85	1.615	MH11	0	181.018	0.482	1830
MH10	93.1	114.3	10	2.211	1.03	1.612	MH10	0	180.978	0.522	1859
MH28	93.2	114.3	28	0.626	0.98	0.475	MH28	62	181.657	-0.407	1705
MH27	93.2	114.3	27	0.896	1.03	0.656	MH27	24	181.586	-0.336	1939
MH26	93.2	114.3	26	1.173	1.03	0.846	MH26	0	181.184	0.066	1479
MH25	93.1	114.3	25	1.613	1.12	1.068	MH25	0	181.074	0.176	1570
MH21	93.1	114.3	21	0.569	1.28	0.332	MH21	49	181.907	-0.407	4674
MH21	93.1	114.3	21B	0.581	1.30	0.332	MH21	49	181.907	-0.407	4674
MH21A	93.1	114.3	21A	1.192	1.37	0.652	MH21A	47	181.561	-0.361	2431
MH24	93.1	114.3	24	0.452	1.02	0.332	MH24	147	181.674	-0.424	1982
MH23A	93.1	114.3	23A	0.835	0.96	0.652	MH23A	60	181.659	-0.408	1982
MH23	93.0	114.3	23	1.321	0.92	1.070	MH23	21	181.575	-0.325	3131
MH22A	93.0	114.3	22A	2.100	1.18	1.320	MH22A	2	181.352	-0.152	3131
MH22	-	-	22	3.275	1.28	1.934	MH22	0	181.137	0.163	0
209	-	-	109	3.376	0.51	25.499	209	0	181.131	0.369	0
208	93.6	114.3	108	39.415	0.62	85.181	208	0	181.130	0.471	1898589
207	93.6	114.3	107	39.424	0.56	88.348	207	0	181.054	0.446	1078
206	-	-	106	39.424	0.54	99.536	206	0	180.989	0.511	0
205	93.6	114.3	105	39.493	0.52	102.888	205	0	180.934	0.425	1078
204	-	-	104	39.594	0.49	114.662	204	0	180.889	0.511	0
204A	-	-	104A	39.609	0.72	118.940	204A	0	180.855	0.545	0
MH20	93.2	114.3	20	0.841	1.31	0.476	MH20	0	181.259	0.241	1265
MH9	93.1	114.3	9	4.736	1.19	3.002	MH9	0	180.921	0.579	881
MH8	93.1	114.3	8	6.503	1.62	3.728	MH8	0	180.870	0.630	1836
203	93.6	114.3	103	40.586	0.48	118.269	203	0	180.827	0.473	1379
202	-	-	102	40.523	0.45	114.923	202	0	180.792	0.320	0
201	-	-	101	40.526	0.94	52.453	201	0	180.769	0.231	0

TRAFFIC ANALYSIS AND PLANNING REPORT

FEBRUARY 1997

TRAFFIC ANALYSIS AND PLANNING REPORT

TWIN OAKS BUSINESS PARK

City of Windsor

February, 1997

Prepared by:
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for:
La Fontaine, Cowie, Buratto, and Associates **3260 Devon Drive** Windsor, Ontario N8X 4L4

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Date: 97-02-28

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Attention: Messrs. Harold Harneck and Don Joudrey
Re: Twin Oaks Business Park
Traffic Analysis and Planning Report

Messrs. Harneck and Joudrey,

I have enclosed my report on the traffic analysis for the Twin Oaks project.

In essence, the analysis found that:

- The existing roads can accommodate most of the future traffic with operational improvements. However, traffic in the morning peak hour, destined for the Twin Oaks Business Park from the E.C. Row Expressway is too great to be accommodated by the existing road configuration. The prime problem being that there is insufficient distance between the Expressway off-ramp (Ramp W-S) and the new collector to accommodate future traffic volumes weaving across Lauzon Parkway to the Twin Oaks collector.

- It has been determined that a first stage of construction should involve extending that part of Ramp W-S paralleling the Expressway straight through to a signalized intersection at Lauzon Parkway. Here, motorists on the ramp will be provided with sufficient green time to prevent the need to turn right on the red signal. In fact, **the 'right turn on red' movement must be expressly prohibited. This is essential since the entire purpose of re-constructing this ramp is to provide a traffic signal that will break the north-south traffic flow making it unnecessary for weaving manoeuvres to take place along the Parkway.** Added benefits are that interrupting the weaving traffic into two separate flows improves motorists' safety and allows the left-turn bay at the South Service Road to be used alternately by the traffic demand for the Twin Oaks Business Park from the north on Lauzon

Parkway and then by that from west on the Expressway. The flow from the north will arrive just as the advance green signal is activated and the flow from Ramp W-S travels into place as the signal switches to solid green.

It has been estimated that with this concept, road safety can be maintained for up to 74 hectares of development (about 183 acres).

- Further improvements will be required to accommodate the future traffic ultimately to be generated by the entire 170-hectare Twin Oaks development (420 acres). For this second stage of construction, a new ramp from the E.C. Row Expressway is required, east of the Parkway, to accommodate traffic from the west destined for Twin Oaks. A 'buttonhook' design is recommended.

- The timing for the commencement of construction work on Lauzon Parkway and on the new ramp has been based upon the assumptions inherent in any traffic analysis and as such it is somewhat arbitrary. More particularly, it depends upon assumptions concerning: trip generation rates, trip distribution patterns, and traffic assignment characteristics. Added to these are circumstances of a more abstract nature such as the effects of: Future marketing strategies of the City, the extent to which development will be less labour-intensive than in the past (following recent trends), future densities, whether the future economic atmosphere will be one in which businesses will expand and intensify development within Twin Oaks, and whether or not the intersection of the Lauzon Parkway at County Road 42 is to be improved within the planning period and whether or not the Parkway is to be extended to Highway 401. Actual determination of the road construction horizons is incorporated in the report.

Thank you for this opportunity to assist you on this interesting project. If there are questions concerning any of the work please call.

Sincerely,

E. Fearnley P.Eng. Fellow, I.T.E.
encl.

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1. INTRODUCTION

1.1 BACKGROUND

The City of Windsor (City) identified a need for serviced industrial property to meet current and future growth demands. The area known as 'Twin Oaks' -in the south-east corner of the City - was selected to satisfy these needs. The area, bounded on the south by the Canadian Pacific Railway (CPR) and on the north by the E.C. Row Expressway, encompasses 200 acres, and extends eastward from the Lauzon Parkway to the eastern City Limits about 9880 feet (3012 metres) east of the centreline of Lauzon Parkway (measured along the CPR right-of-way).

Adjacent to this area directly east of the City boundaries, there is a further 220-acres between the E.C. Row Expressway and the CPR. This area which is, at present, within the jurisdiction of the Township of Sandwich South extends to Banwell Road. A servicing agreement between the two municipalities is on file. It incorporates an Annexation Agreement which has led to the current 200/220 acre split in ownership of the property between Lauzon Parkway and Banwell Road.

To conform to the requirements of a Class Environmental Assessment, an investigation is needed into the potential impact of traffic on adjacent roads and services generated by new development. To this end, LaFontaine Cowie, Buratto and Associates retained the services of E. Fearnley Limited in the Fall of 1996.

1.2 SCOPE OF STUDY

The purpose of this study is to assess the extent of traffic to be generated by the Twin Oaks Business Park - including the 220 acre section in the Township of Sandwich South - and determine how to accommodate future traffic for an industrial development totalling 420 acres.

This report is to be incorporated as an appendix to the Phase 3 Class Environmental Assessment Report being prepared by LaFontaine, Cowie, Buratto and Associates.

1.3 THE STUDY AREA

The study area for this project includes the following:

- The entire 420 acre parcel anticipated for industrial development in the future,
- The two main access roads: Lauzon Parkway and Banwell Road from north of the E.C. Row Expressway to south of the Canadian Pacific Railway.
- Sufficient area to the west to investigate of the role of the South Service Road,
- Sufficient area to the east to allow an assessment of over-all traffic impact on Banwell Road.

The study area is illustrated in Figure 1.1.

1.4 OUTLINE OF STUDY PROCEDURES

Procedures followed throughout the study were a mixture of the requirements for both traffic impact assessment and functional planning for roads. Individual tasks performed were:

Tabulate an inventory of **existing transportation facilities** in the study area including: Roads, Railways, Bus services, Bikeways and Recreationways.

Review City traffic records and carry out **traffic counts** for additional information deemed necessary.

Determine an appropriate **growth rate** for background traffic and apply to existing volumes to derive **future background traffic.**

Determine an appropriate **trip generation rate** for the new business park.

Determine trip generation for the total site. That is, the **site-generated traffic.**

Assess **trip distribution** characteristics to determine, in general, the origins and destinations of site-generated traffic.

Carry out a **traffic assignment** to determine the volumes of site-generated traffic accessing the site via Lauzon Parkway and Banwell Road.

Determine the **anticipated future traffic** (Design Hour Volumes) by adding site-generated traffic to future background traffic.

Assess **traffic issues** and sketch possible alternatives to meet **road requirements.**

Evaluate all alternatives using a two-step procedure.

Determine appropriate **construction stages.**

Analyze **road capacity** and **traffic flow.**

Report on **conclusions** and make recommendations.

1.4 REPORT ORGANIZATION

This report has been organized into four main sections:

1. Introduction
2. Existing Conditions
3. Future Conditions
4. Conclusions

Part 1, Introduction, includes short notes on background, the study area, scope of the project, a general outline of study procedures, and an outline of the report organization.

Part 2, Existing Conditions, introduces adjacent and nearby transportation facilities which might be used as access to the site.

Part 3, Future Conditions, assesses future transportation needs as the Twin Oaks Business Park reaches full development.

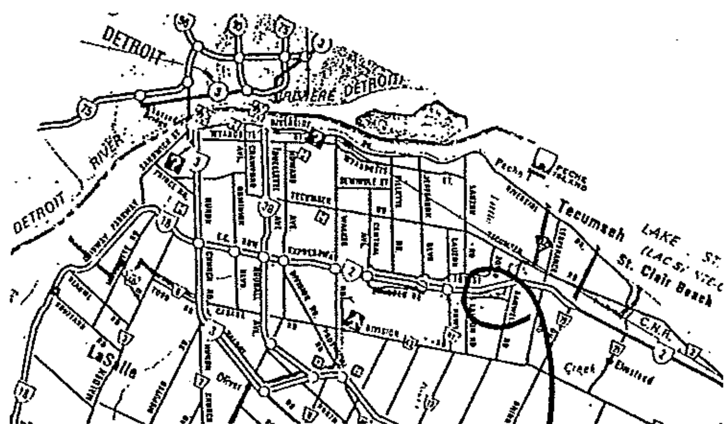
Part 4, Conclusions, gives the findings from the study and recommended actions to accommodate future traffic safely.

Throughout the report, for certain figures, each of sections A and B have been made as **two halves of the same exhibit on two facing pages**. For example, Existing Traffic has two parts: A. Lauzon Parkway, and B. Banwell Road. Parts A and B of this exhibit have been placed on a left and right page facing each other as two parts of a single exhibit. Later, Existing traffic is paired with future traffic in the same way for immediate reference. Although this means that each of the complete figures crosses over the report binding, it was felt that maintaining the continuity of the data justified this approach.

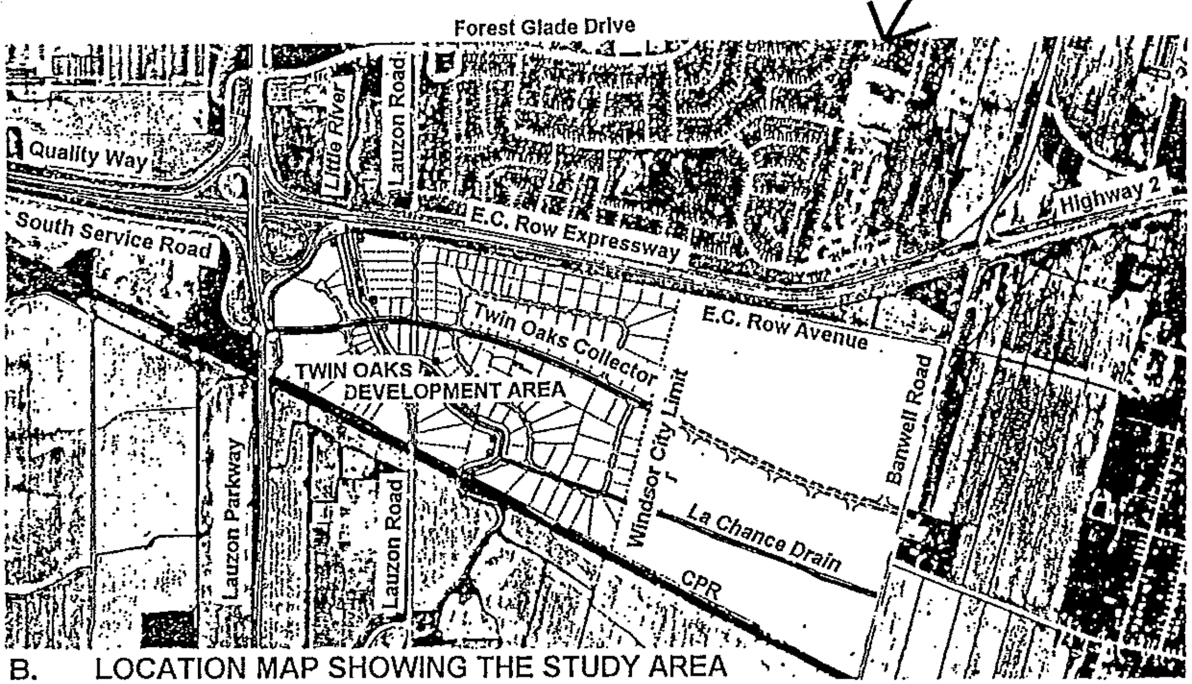
Certain names have been shortened for simplicity and easier reading. Hence, the Lauzon Parkway frequently is referred to as 'Lauzon Parkway' or 'the Parkway', E.C. Row Expressway as 'the Expressway' and E.C. Row Expressway Ramps are referred to simply as 'Ramp W-N' etc. The new collector road serving the Twin Oaks Business Park is the direct extension of the South Service Road. However, because the South Service Road has to be referred to so frequently, for clarity in the text, the new road being planned is generally referred to as 'the Twin Oaks collector' or 'the main collector road'. As well, for clarity when dealing with traffic volumes at the South Service Road intersection on Lauzon Parkway, turns are always referred to as occurring at the service road rather than at the 'Twin Oaks collector'. The Canadian Pacific Railway is referred to as the CPR. The physical plant is referred to as the CP Railway 'line' or 'tracks' depending upon the text. In addition, the firms of LaFontaine, Cowie, Buratto and Associates and E. Fearnley Limited have been shortened to LCBA and EFL.

With regard to the Expressway ramps at the Lauzon Parkway interchange, they are referred to in this report as proper road names in accordance with international nomenclature. That is, each ramp is designated by the first letter of the direction from which traffic has travelled and the first letter of the direction towards which the traffic is moving. Hence, those travelling eastbound along the Expressway turning south on Lauzon Road must travel on Ramp W-S. Similarly, those eastbound turning north must travel from the west to the north via Ramp W-N. In a few instances throughout this report, actual movements are referred to in descriptive text to reinforce understanding of a ramp name.

Throughout the report traffic volumes are presented as passenger car units (pcu). For peak hours the volumes area referred to as passenger car units per hour (pcuph).



A. KEY MAP: CITY OF WINDSOR
SHOWING LOCATION OF DEVELOPMENT SITE



B. LOCATION MAP SHOWING THE STUDY AREA

Figure 1.1 SITE LOCATION

2. EXISTING CONDITIONS

2.1 TRANSPORTATION FACILITIES IN THE STUDY AREA

2.1.a Roads

At present, there are two arterial roads linked to the E.C. Row Expressway which would provide access to the Twin Oaks Area and a railway within the study area.

The E.C. Row Expressway is the main road serving traffic throughout the City of Windsor - for the most part via interchanges with major arterial Roads. To the east, at Banwell Road, a channelized intersection provides for traffic movements onto and off of the Expressway. In the past, since the Expressway served as a major link between Highway 18 in the west and Highway 2 in the east, it was known provincially as Highway 2. Recently, because of provincial 'downsizing' of costs and responsibilities it has been decided that the E.C. Row Expressway should revert solely to City jurisdiction. However, immediately east of Banwell Road, the Expressway will retain its current status as Provincial Highway Number 2.

In general there are gentle grades on the Expressway within the study area in conformity to those required for a major facility to accommodate large volumes of traffic.

Lauzon Parkway, a Class 1 Arterial, is the main arterial road that will be servicing the proposed development . There is a full Parclo-B interchange with the E.C. Row Expressway providing for all traffic movements. Movements to the west and the east are accommodated by left turns onto Ramps S-W and N-E respectively. Within the study area, the cross section of the Parkway varies from four lanes without a median to a basic 6-lane facility with a raised median and an auxiliary right-turn lane at Forest Glade Drive immediately to the north of the Expressway.

The profile of the Lauzon Parkway gently rises from the north to the south, cresting over the E.C. Row Expressway, dropping somewhat to the South Service Road and cresting higher on the overpass carrying the roadway over the CP Railway line.

Farther to the north, preliminary work on the north-easterly extension of the Parkway is currently underway. The study covers the section from Tecumseh Road East to the link with the Lauzon Road right-of-way and Lauzon Road north to Wyandotte Street..

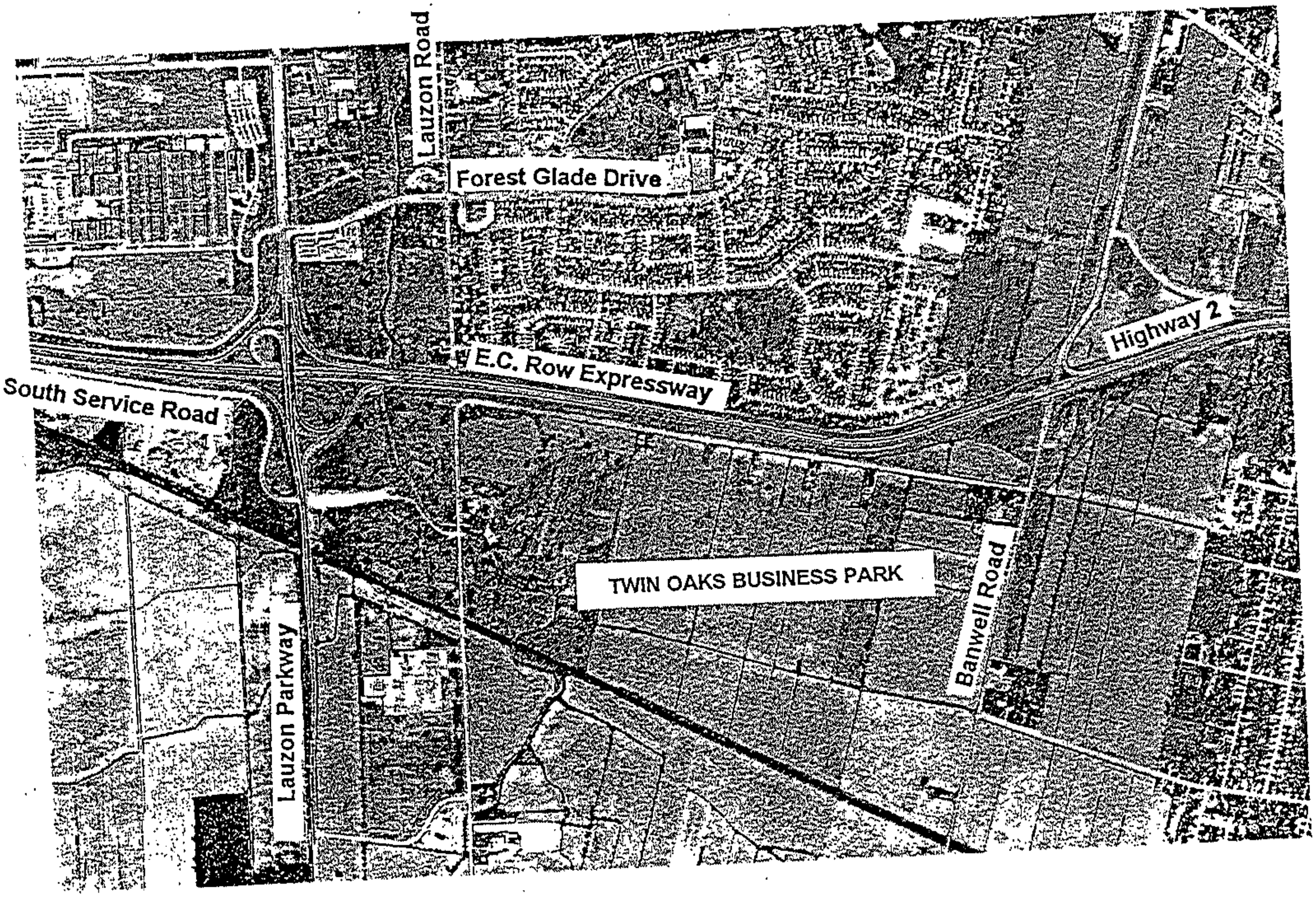


Figure 2.1 MAJOR TRANSPORTATION FACILITIES

TABLE 2.1

CHARACTERISTICS OF MAJOR ROADS IN THE STUDY AREA

Road	Classification	Basic Number of Lanes	Approximate Volume of Daily Traffic (All Vehicles)	Traffic Control	Remarks
WINDSOR					
East-west					
E.C. Row Expressway	Expressway	4	44,000	Free-flow interchange ramps at Lauzon Parkway	Slated for improvement. Traffic volume is for the area east of Jefferson Boulevard.
E.C. Row Avenue	Local Rural Road	2	NA	NA	Gravel Road - Access to Banwell Road and Lauzon Road South
South Service Road	Class 1 Collector	2	3,000	Stop sign at Lauzon Parkway	Links Jefferson Boulevard to Lauzon Parkway
Forest Glade Drive	Class 1 Collector	2	17,000	Traffic Signal at Lauzon Parkway	Traffic volume given for area just east of Lauzon Parkway.
North-south					
Lauzon Parkway	Class 1 Arterial	6	28,000 - 14,000	See above	Traffic values are north and south of the E.C. Row Expressway Road to be extended to meet Lauzon Road north of the CNR
Lauzon Road	Rural Collector	2	Less than 1,000	None	South of E.C. Row Expressway
Expressway Ramps					
Ramp N-W	Ramp	2		Free flow	Good visibility, smooth operation. 50% of volume from Forest Glade
Ramp S-W	Ramp	1		None	Discretionary left turn aided by gaps formed at Forest Glade traffic signal.
Ramp E-N	Ramp	1		Free flow	Flows into an auxiliary right-turn lane at the Forest Glade intersection.
Ramp E-S Loop	Ramp	1		Free flow	Very little traffic on this loop in peak hours.
Ramp W- Loop	Ramp	2		Free flow	Extremely heavy traffic during peak hours on this loop.
Ramp W-S	Ramp	1		Free flow	The distance from the end of the southbound merge for this ramp to the South Service Road is only 540 feet making a manoeuvre to turn left into the Twin Oaks Industrial Area nearly impossible in the morning peak hour
Ramp N-E	Ramp	1		None	Visibility for discretionary left turn is good but speed of oncoming traffic can be difficult for motorists to assess.
Ramp S-E	Ramp	1		Free flow	The extension of the South Service Road into the Twin Oaks area interferes with the speed change lane for this ramp
SANDWICH SOUTH					
East-west:					
E.C. Row Expressway	Expressway	4	23,000	Traffic signal at Banwell Road	Traffic volume is for the area west of Bnwell Road. However, MTO aadt at Banwell Road (46,600) does not agree with City records.
E.C. Row Avenue	Local Rural Road	2	NA	Stop sign at Banwell Road	Gravel Road - Access to Banwell Road and Lauzon Road South
Intersection Road	Local Collector	2	NA	Stop sign at Banwell Road	Paved - rural cross section
North-south:					
Banwell Road	Class 2 Arterial	2	7,000 5,000	Traffic Signal at E.C. Row Expressway	Traffic values are north and south of the E.C. Row Expressway Road to be extended into the East Riverside area.
Lauzon Road	Rural Collector	2	Less than 1,000	See above	Planned to be closed at the CPR tracks E.C. Row Expressway in an 'around-the-block' traffic movement.

Banwell Road, a Class 2 Arterial, forms the eastern boundary of the proposed business park. The road crosses the E.C. Row Expressway at a channelized at-grade intersection. Here, Banwell Road has been widened both north and south of the Expressway to a 3-lane cross section. Lane markings allow for separate left-turn lanes and one lane in each direction for through and right-turning traffic.

The South Service Road, a Class 1 Collector Road, provides the southernmost link between Jefferson Boulevard and the Parkway and hence to the new collector access being planned for the Twin Oaks Business Park. To the west of the Parkway, the road has a 2-lane cross section widened at the Parkway to separate left and right turns.

2.1.b Railways [1]

The CPR right-of-way forms the south boundary of the Twin Oaks area. The facility includes a single track mainline with sidings established at strategic intervals where one train will 'lay by' and wait for another in the opposite direction to pass. The facility is operated by the St. Lawrence and Hudson Railway - a division of CPR. The railway carries an average of 21 trains per day all of which are for freight (eight of which operate between 7:00 a.m. and 11:00 p.m.). The track is used for shipments between Canadian and U.S. cities ranging from Montreal to Chicago. Switching for these international shipments is carried out at a yard in Detroit, Michigan. However, local pick-ups made by 'road switchers' are connected to international trains at facilities in Windsor. Speed restrictions within the City of Windsor - 55 k/hr (35 mph) - apply west of Central Avenue. To the East, in the area of the Twin Oaks development, trains are accelerating or decelerating from the rural speed limit of 60 mph (97 k/hr). There are no spur lines in the Twin Oaks Area. However, if required, a spur line can be arranged through the St. Lawrence and Hudson Railway by contacting the Commercial Development Group.

2.1.c Transit Windsor Bus Services

At present there are no Transit Windsor bus routes on Lauzon Parkway south of the Expressway.

2.1.d Bikeways and Recreationways

The only cycling route planned for the Twin Oaks area follows the Little River basin. This has been classified as a 'Secondary Recreationway' on the **Master Plan of Bikeways and Recreationways prepared for the City in February of 1995.** It is intended that, in the future, this route will link with other ones in the east end of the City to form a major part of a city-wide network for cycling - including cycling as a convenient mode for home-to-work journeys. Although there is no comparable network document for the Township of Sandwich South, the extension of the Little River cycling route is currently under study.

1. **Source:** Personal communication between E. Fearnley and Mr. Orest Rojik of C P Rail, Real Estate Group.

2.2. EXISTING TRAFFIC

City traffic records reviewed included turning movement counts at the Lauzon Parkway intersection of Forest Glade and Quality Way along with automatic traffic recorder counts at the bridge crossing the CPR, and at other locations to the north of Forest Glade Drive. The review indicated that for complete understanding of the traffic volumes and patterns, further work in the form of special traffic surveys was needed.

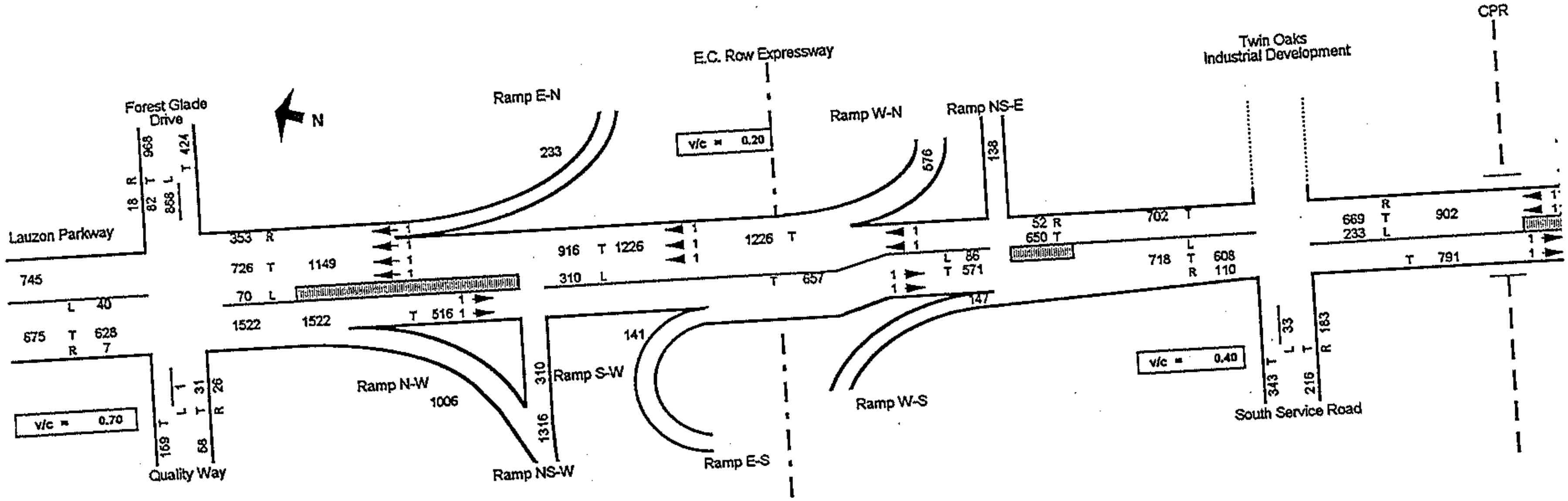
2.2.a Special Traffic Surveys

Two traffic surveys were conducted. Both were set up for counts of specific traffic movements.

First, it was necessary to note traffic volumes south of Forest Glade Drive and how they split into westbound and southbound flows. As well, because there is no traffic signal at South Service Road, all moves had to be counted there. Since some of the ramp volumes had not been up-dated from 1992, those also were counted. Loop Ramp W-N was observed to be carrying considerable traffic both in the morning and afternoon peak hours. An up-to-date count which was directly linked to traffic on the Parkway for the day of survey was felt to be desirable. Observations prior to the traffic survey taking place indicated a distinct move directly from the South Service Road, east to Ramp S-E. Since the extent of this movement was unknown, it was separated out from the normal intersection movements and counted as a special movement. Further, the right turn at Forest Glade Drive was obtained along with the number of vehicles from Ramp E-N that were turning right. For various reasons, the corresponding volume from Ramp W-N could not be assessed. These counts were undertaken on Friday October 4, 1996.

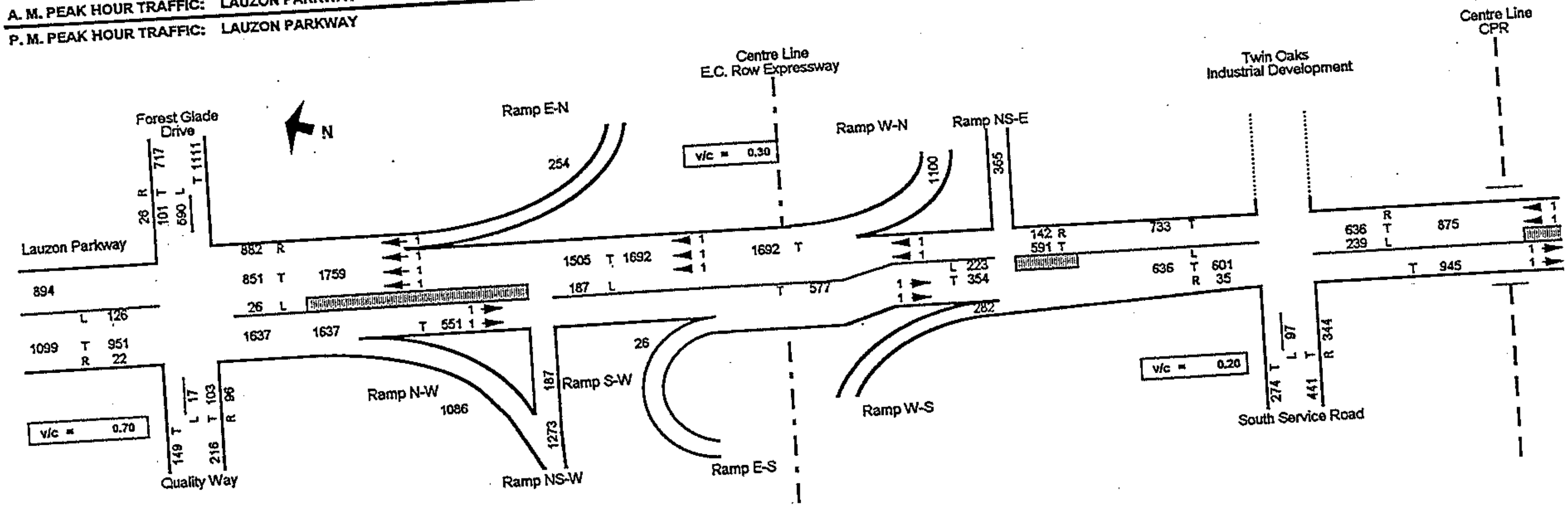
During the analysis of the available data from the City and the first special survey, it was found that certain traffic movements could not be reconciled or balanced. Hence, a second survey had to be undertaken to obtain volumes of certain through movements on Lauzon Parkway. These movements were: the northbound through traffic at the Forest Glade Drive intersection plus northbound and southbound traffic crossing the CPR tracks on the overpass south of Twin Oaks. These movements were counted on Wednesday, October 30, 1996.

All surveys tabulated traffic volumes in fifteen-minute intervals over four-hour peak periods in the morning and the afternoon. On Friday October 4, 1996, the morning time period over which traffic volumes were counted was from 6:30 to 10:30 a.m. Analysis showed that the fifteen minute volumes from 6:30 on appeared to be falling from a previous high. Thus, for the later survey on October 30, the morning time period for which counts were obtained was extended by 15 minutes to cover the interval between 6:15 a.m. and 6:30 a.m. Recorded traffic flows from City records and these two surveys are shown in Figure 2.2.



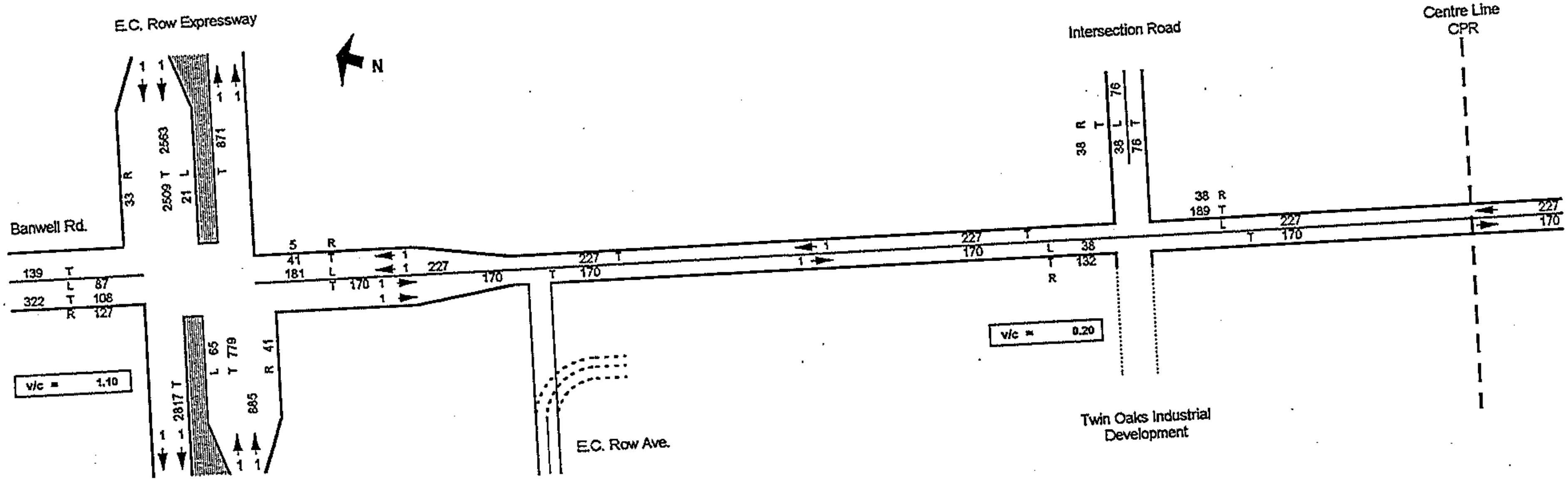
A. M. PEAK HOUR TRAFFIC: LAUZON PARKWAY

P. M. PEAK HOUR TRAFFIC: LAUZON PARKWAY



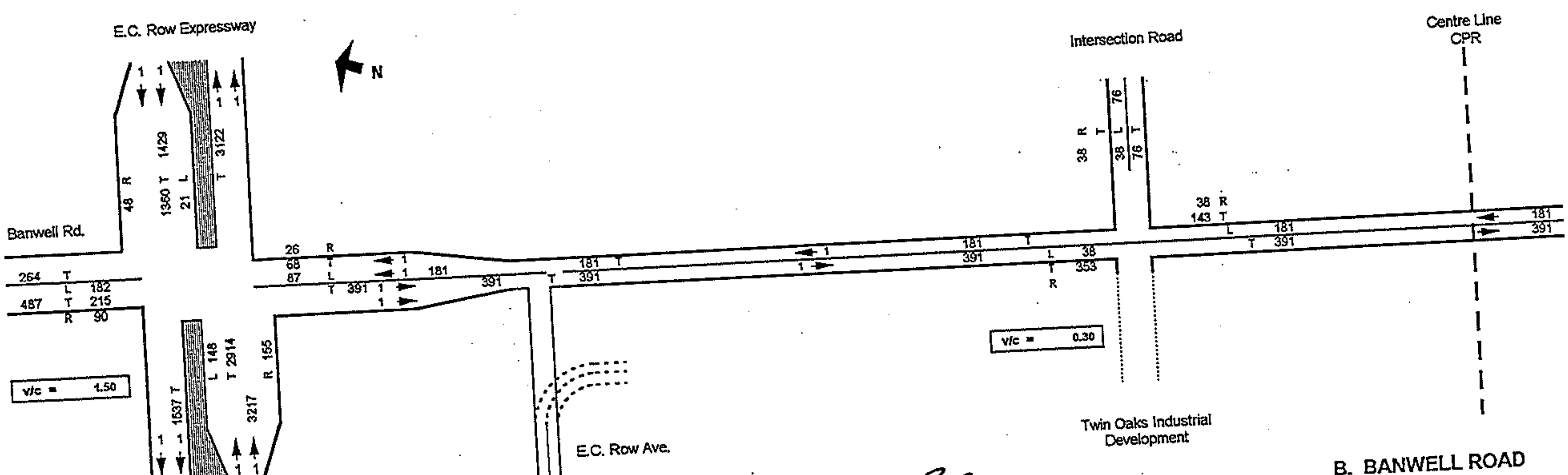
A. LAUZON PARKWAY

Source: City of Windsor traffic records and surveys by EFL and LCBA



A. M. PEAK HOUR TRAFFIC: BANWELL ROAD

P. M. PEAK HOUR TRAFFIC: BANWELL ROAD



NOTE: L = Left Turns

2.2

B. BANWELL ROAD

...PEAK HOUR TRAFFIC VOLUMES

2.2.b Traffic Volumes and Traffic Flow

Existing traffic is shown in Figure 2.2. The Forest Glade Drive / Quality Way intersection with Lauzon Parkway is the southernmost signalized intersection on the Parkway within the City. South of this point, lies the South Service Road at which traffic is controlled by stop signs. Because of the Parclo-B design for the interchange between the Expressway and the Parkway, traffic making the S-W and N-E moves must turn left across the through traffic on the Parkway. At these intersections, there are no traffic control devices. Motorists make the turns for these movements on a discretionary basis. That is by waiting for gaps in the opposing traffic flow.

2.2.c Problem Areas

At Ramps S-W and N-E motorists currently appear to be handling the discretionary left turns without difficulty. However, in the future, traffic volumes will increase. This is of particular concern for the S-W movement. This traffic volume will not only grow because of general increases in traffic but will be one of the main traffic flows as employees and others leave the Twin Oaks area.

The South Service Road intersection is hidden by the southernmost crest on the Lauzon Parkway over the CPR tracks. This is of particular concern as the crest hides the intersection from northbound drivers. However, again, as for those turning left onto Expressway ramps, at present, motorists making the W-N left turn form the South Service Road onto the Parkway appear to be coping with this situation through exercising considerable caution. Field observations note that drivers take considerable care in turning left. Unfortunately the same cannot be said for those travelling northbound over the crest. Field observations indicate that northbound motorists are generally speeding in this area and conflicts with left turning motorists are common. Since it is understood that it will be necessary to signalize the South Service Road intersection (even without assessing the actual increase in traffic created by the Twin Oaks area) the situation at the crest over the CPR is of concern. This is because after the traffic signal is in place, traffic will be stopped on the red signal and a queue will form south of the service road. This could shorten considerably the stopping sight distance for northbound motorists travelling over the crest.

Ramp S-E has a long speed-change lane which, if left in place, will cross the new Twin Oaks industrial collector on the extension of the South Service Road. The length provided is a holdover from an original rural design and will not be necessary in the more urban conditions created by the growth in the Twin Oaks industrial development. In the future this long speed-change lane will have to be shortened. Possibly replaced by a an urban free-flow design or an additional lane on the Parkway between the Twin Oaks collector and Ramp S-E.

Again, without requiring detailed traffic analyses, it is known that there would be a problem between the Expressway Ramp W-S and the new access to the Twin Oaks area. Here, motorists must weave across southbound traffic on the Parkway and position themselves in what will obviously be a long queue waiting to turn left (east) into Twin Oaks.. There is insufficient space now and for the future when Ramp W-S is carrying one of the largest volumes of traffic destined for Twin Oaks, it will be unsafe for motorists making this manoeuvre and for those travelling southbound on Lauzon Parkway.

These areas of concern are shown in Figure 2.3 and are dealt with further in Sections 3 and 4.

2.3 VEHICLE COLLISION RECORD

Lauzon Road collisions occurring over a period from January 1991 to September, 1996 - a five-and three-quarter-year period - were tabulated from City records. (See Figure 2.4.) The worst situation noted was the record of collisions on the Expressway ramp, Ramp W-N. Here there were a total of 21 accidents occurring: Immediately at the exit from the Expressway (5); Just at the introduction of the sharpest radius on the loop (5); Three-quarters of the way around the loop (2) and At the merging end on Lauzon Parkway (9). Typically for Ramp W-N the majority of accidents were 'run-off-the-road' and sideswipes involving property damage. However, loop ramps used as exits to freeways always have a much greater frequency of accidents than more conventional (that is, more direct) exit ramps. The situation here is compounded by having two lanes on the loop.

The two locations having the second-greatest total number of incidents were the Forest Glade/Quality Way and the South Service Road intersections with the Parkway. Here, each intersection showed a record of nine accidents over the analysis period. Six of the nine occurred on the northbound approach to the South Service Road and six on the northbound approach to Forest Glade Drive. It is deduced that the crest in the vertical alignment as the Parkway crosses the CPR tracks is a factor in the majority of the accidents at the South Service Road involving northbound traffic. Similarly, it is deduced that the major number of collisions occurring on the northbound approach to Forest Glade is a result of the extensive weaving, merging, and turning movements in that area.

Other common areas where accidents are occurring are at the ramp terminals - for both diverging and merging manoeuvres - a total of 21. In particular, **there were four collisions involving left turning vehicles at Ramp S-W, two of which involved injuries.** This is one of the areas where traffic will increase considerably because of the number of journeys home in the late afternoon from industries in Twin Oaks. (The majority of the population being to the west.) Thirteen other accidents have occurred where traffic from loop Ramp W-N merges with northbound Parkway traffic. In all, there were 63 accidents recorded, 51 of which occurred along the Parkway and 12 on the loop portion of Ramp W-N. This gives an approximate accident rate of 2.3 and 2.4 accidents per million vehicle miles north and south of the Expressway respectively for those collisions resulting from traffic flow on Lauzon Parkway. Both values are well below the value of 5.0 accidents per million vehicle miles frequently used by traffic engineers as a maximum allowable for arterial roads. However, the main reason for the lower rates here is that, unlike many arterial roads, there are no private driveway connections to the Parkway in this area and the directions of travel are separated by a raised median - common factors in low-rate areas. However, the accident rates are double that for other major divided road sections. Both sections have nearly the same accident rate because although there are a nearly twice the number of accidents to the north, the volume of traffic is nearly twice that for the section south of the Expressway.

TABLE 2.2

CURRENT LEFT-TURN CAPACITIES
BASED ON STORAGE CAPABILITIES OF EXISTING LEFT-TURN BAYS AND TRAFFIC SIGNAL CYCLE TIMING (a)

A. NORTH-SOUTH ROADWAYS

		From North to East Left Turn					From South to West Left Turn			
Intersections	Number of Cycles Each Hour	Storage Length In Metres	Capacity per Red Signal (Vehicles)	Hourly Capacity	Maximum Counted Traffic vph	(b) (c)	Storage Length In Metres	Capacity per Red Signal (Vehicles)	Hourly Capacity	Maximum Counted Traffic vph
Lauzon Parkway at										
1 . Forest Glade Drive	36	55	7	263	126		80	11	383	70
2 . Ramp S-W	NA	NA	NA	NA	NA		175	Unsignalized		310
3 . Ramp N-E	NA	101	Unsignalized		223		NA	NA	NA	NA
Banwell Road at										
1 . E.C. Row Expressway	36	76	10	366	172		76	10	366	171

B. EAST-WEST ROADWAYS

		From West to North Left Turn					From East To South Left Turn			
Intersections	Number of Cycles Each Hour	Storage Length In Metres	Capacity per Red Signal (Vehicles)	Hourly Capacity	Maximum Counted Traffic vph	(b) (c)	Storage Length In Metres	Capacity per Red Signal (Vehicles)	Hourly Capacity	Maximum Counted Traffic vph
Forest Glade Drive at										
1 . Lauzon Parkway	36	55	7	263	20		203	27	973	870
E.C. Row Expressway at										
1 . Banwell Road	36	165	22	793	150		127	17	610	20

Notes:

(a) Capacity per red signal = Left-turn storage length ÷ Assumed storage length per vehicle.
Assumed vehicle storage length 7.5 metres (25 feet).
Current left-turn storage length has been scaled from road survey plans.
The term 'Cycle' refers to the time required to complete a cycle of green-to-amber-to-red-to-green. Or, in other words, from the start of one green signal to the start of the next green signal.
Cycles per hour = 3600 seconds in an hour ÷ the cycle time in seconds.

(b) Left turn traffic volumes are the maximum volume recorded in either the morning or the afternoon peak hour.

(c) No existing left turning traffic volumes are greater than existing left-turn lane capacity.

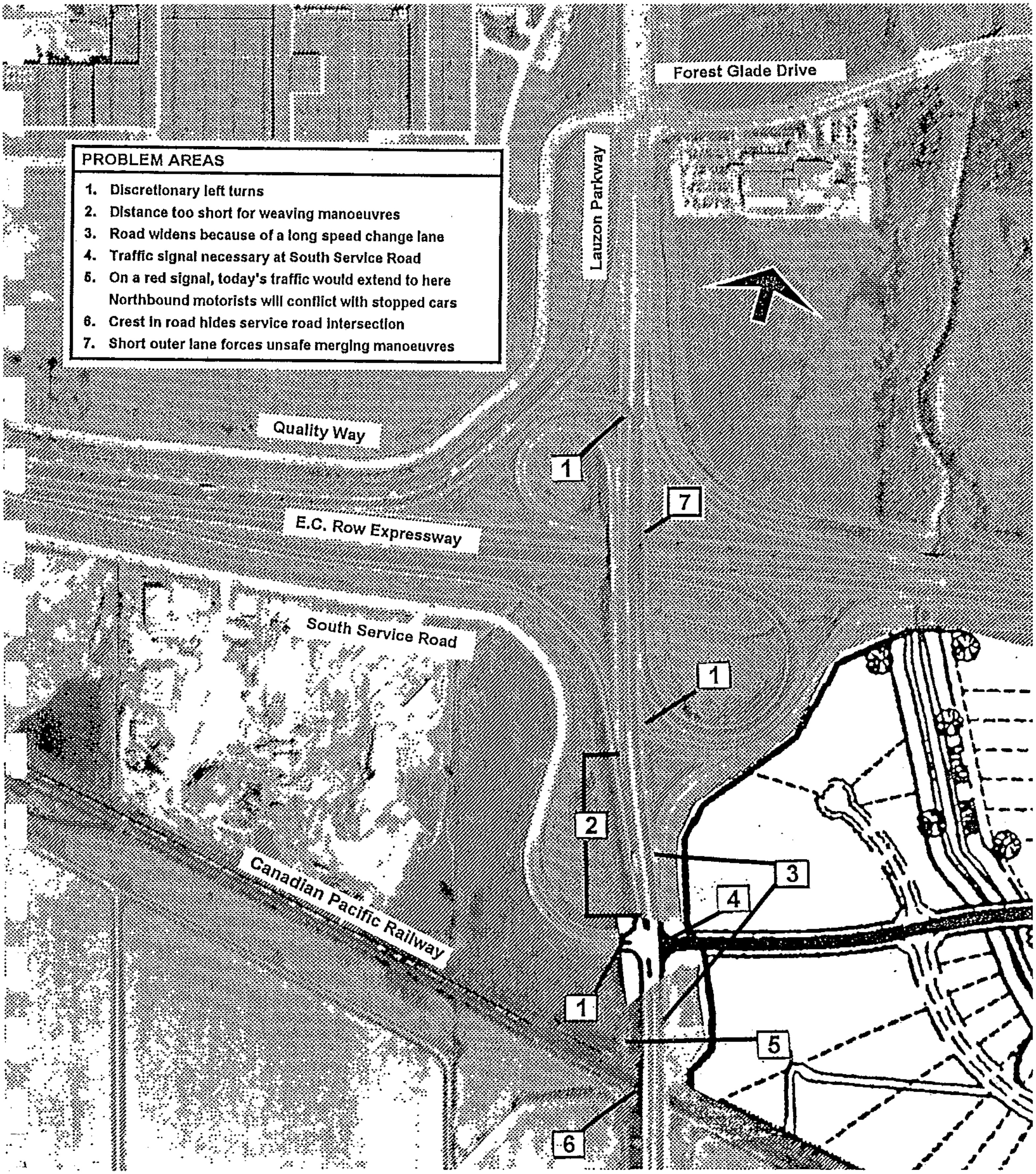
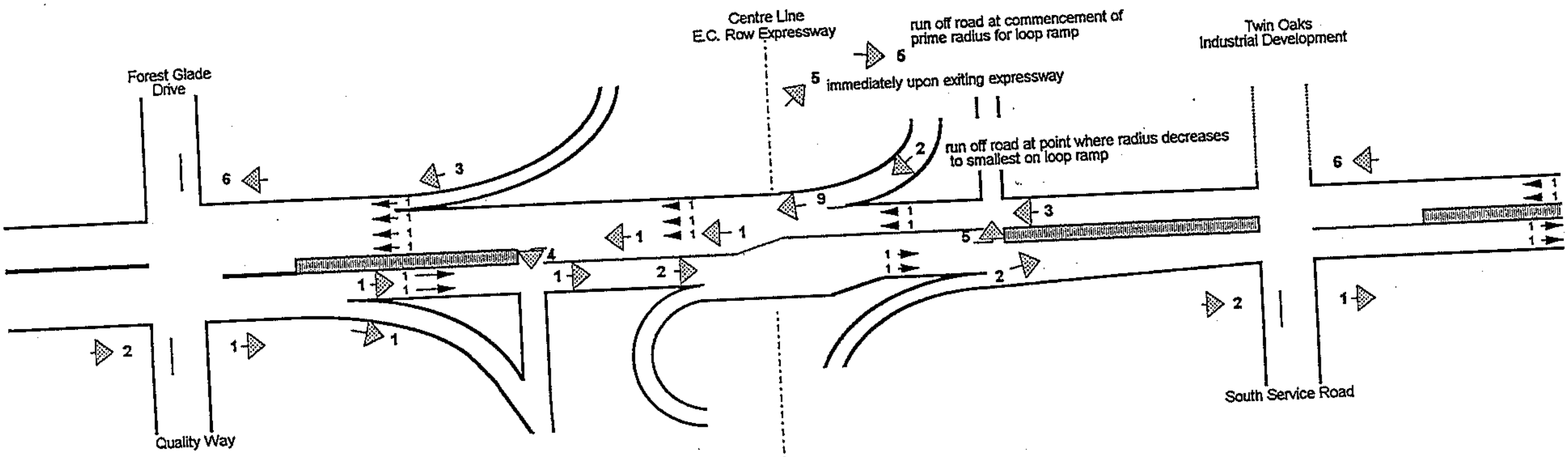


Figure 2.3 PROBLEM AREAS



Collision Record:
Lauzon Parkway Forest Glade to E.C. Row Expressway

	I	PD	O	T	NR
Left Turn	2	3		5	
Run Off R	1	5		6	
Across cL				0	
Sideswipe	2	9		11	
Rear End	3	4		7	
Other	1	3		4	
	9	24	0	33	0

Distance in Feet	1590
Distance in Miles	0.301
Average AADT	28000
Million Vehicle Miles: 4.75 yrs	14.62
Accident Rate	2.28

Collision Record:
E.C. Row Expressway to South Service Road

	I	P	O	T	NR
Left Turn	1	4		5	
Run Off R	1	5		6	
Across cL				0	
Sideswipe		2		2	
Rear End	1	3		4	
Other		2		2	
	3	16	0	19	0

Distance in Feet	1520
Distance in Miles	0.2879
Average AADT	14800
Million Vehicle Miles: 4.75 yr	7.387
Accident Rate	2.57

NOTE: I = Injury Accidents
PD = Property Damage Accidents
O = Other Accidents including those whose characteristics are Unknown
T = Total
NR = Non-reportable Accidents
(Property damage lower than minimum for reporting accident)
Tabulated but not included in total or accident rate.
MV = Million Vehicle Miles = (AADT x Days in a year x 2 Years x Distance in miles) ÷ 1,000,000
Period Accidents shown are those for east-west traffic flows (including turns) from January 1, 1992 to December 31, 1993.
Source Accident Records and Average Annual Daily Traffic Record from City of Windsor Traffic Engineering Department files.
Banwell Road: Collision record was not included.
Other work has identified the need for an interchange at this intersection within the time frame of this study.

Figure 2.4

VEHICLE COLLISION RECORD: LAUZON PARKWAY

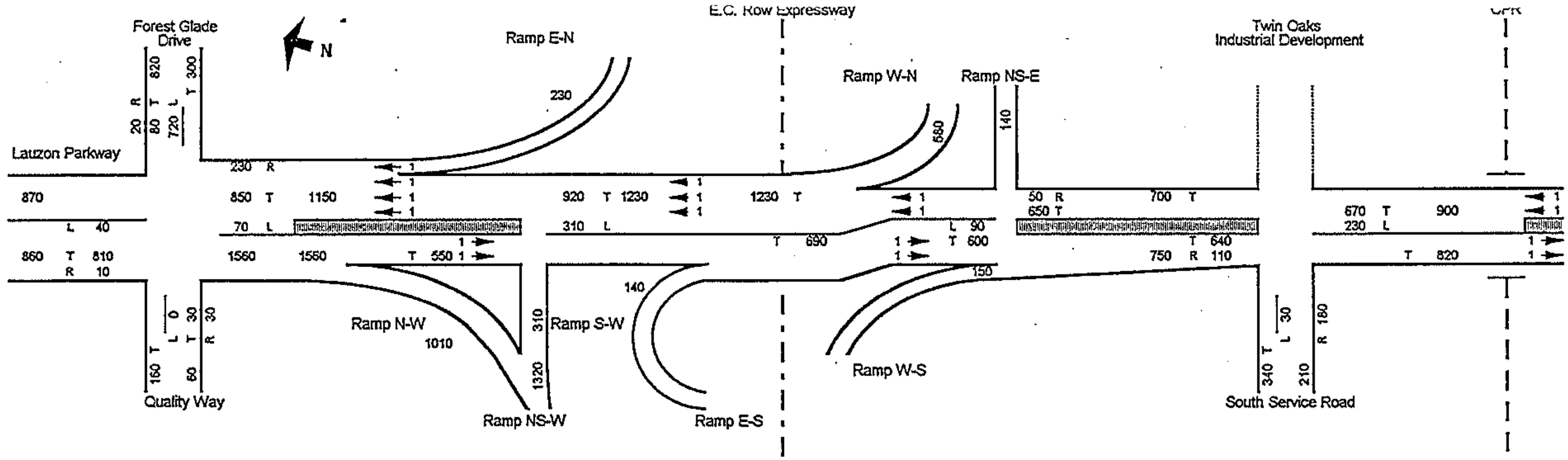
Accident rates throughout the section of the Lauzon Parkway from Forest Glade Drive to the CPR overpass average about 2.35 accidents per million vehicle miles. However, notwithstanding this, it is noted that the greater number of accidents in the southern half of the study area occur as northbound motorists approach the South Service Road intersection. This confirms the first assessment - that some form of warning will be required to alert northbound motorists, before they travel over the crest on the Parkway bridge over the Canadian Pacific Railway, that traffic is stopped at the signalized South Service Road intersection.

2.4 BACKGROUND TRAFFIC

Background traffic is a term applied to the general flow of vehicles lacking any influence from specific, anticipated development. As such, it is factored up by means of a general growth rate to obtain an estimate of future background traffic. To this is added site-generated traffic from new development to attain an estimate of future traffic volumes.

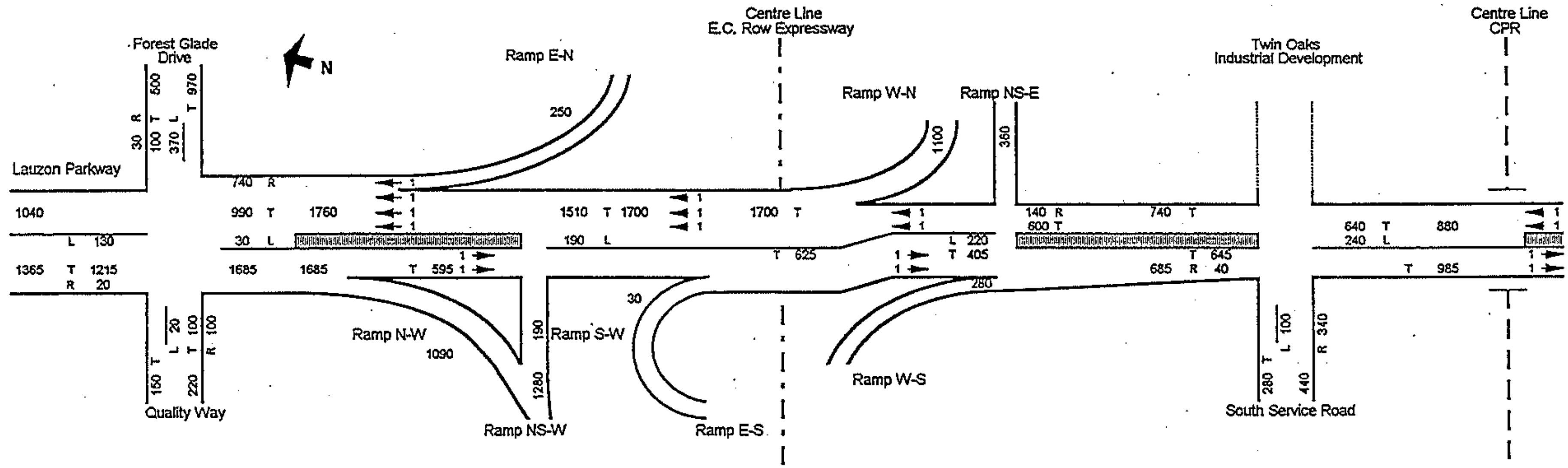
Existing background traffic volumes in terms of passenger cars per hour are illustrated in Figures 2.5.A and 2.5.B. These values have been rounded and balanced from the raw data of traffic records. In essence they compare directly to the field count data. Because there is no major redevelopment being undertaken in the study area that would add an inordinate volume of traffic to that currently on the roads, the existing volumes have been used as the 'background' traffic.

(PHOTO ?????)

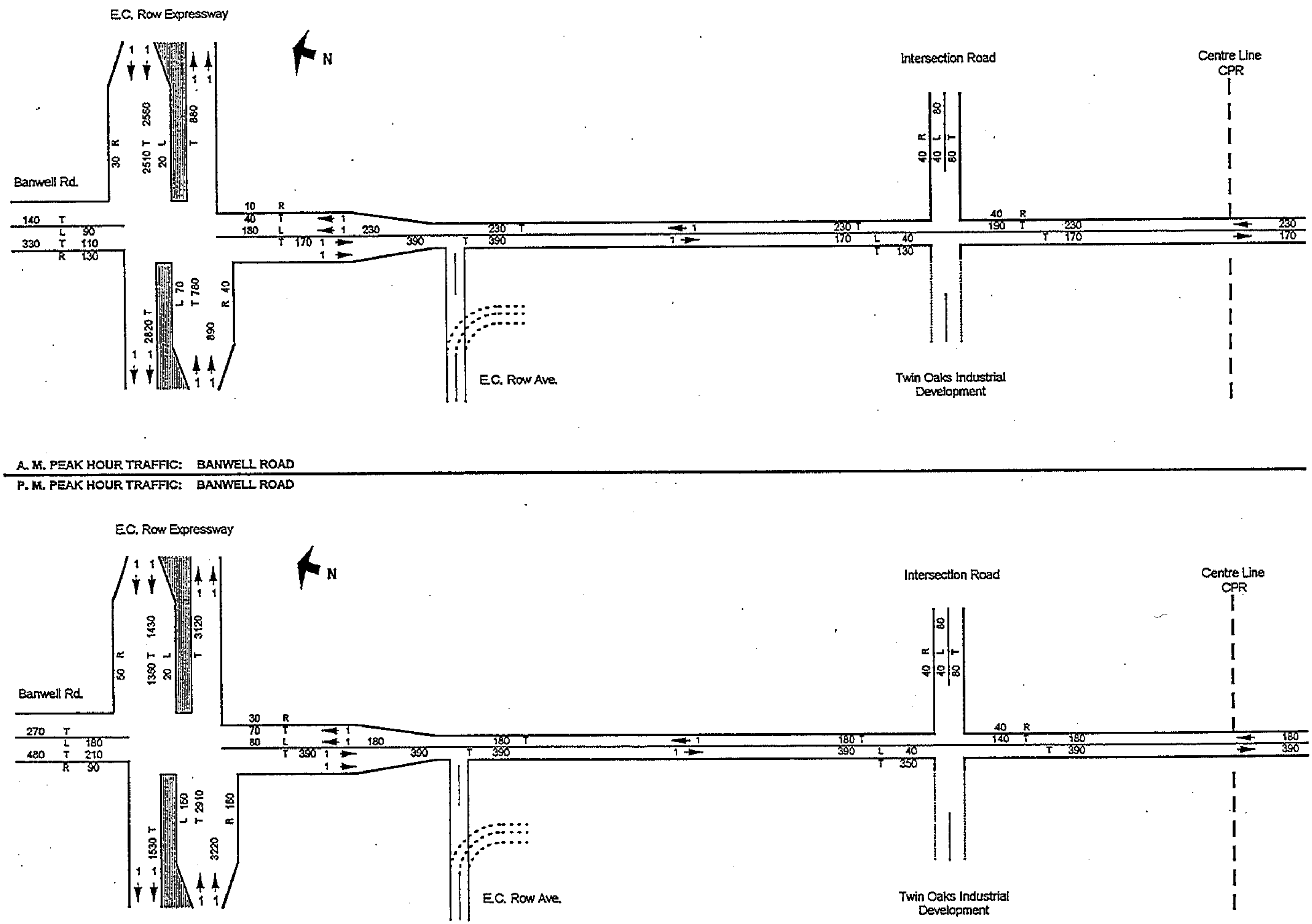


A. M. PEAK HOUR TRAFFIC: LAUZON PARKWAY

P. M. PEAK HOUR TRAFFIC: LAUZON PARKWAY



A. LAUZON PARKWAY



NOTE:
L = Left Turns
T = Through Traffic
R = Right Turns
v/c = 0.00 Existing traffic volume vs existing capacity

B. BANWELL ROAD

Figure 2.5 EXISTING (BACKGROUND) TRAFFIC

3. FUTURE CONDITIONS

After the volumes of existing background traffic have been established, several tasks are necessary to derive anticipated future traffic volumes. These are:

- Assess the full extent of future development and set a horizon year for the planning period.
- Determine a growth factor to allow for the general over-all increase in background traffic unrelated to any specific development.
- Obtain future background traffic by applying the growth factor to the existing.
- Assess site-generated traffic by using an appropriate trip generation rate.
- Determine origins of site-generated traffic. That is, obtain or derive a distribution pattern illustrating the location of residential areas where the home ends of site-generated trips would originate (to understanding the traffic flows to and from the proposed development).
- Assign site-generated traffic to transportation facilities providing access to and from the development using appropriate assumptions for the traffic patterns.
- Derive anticipated future traffic by adding site-generated traffic to future background volumes

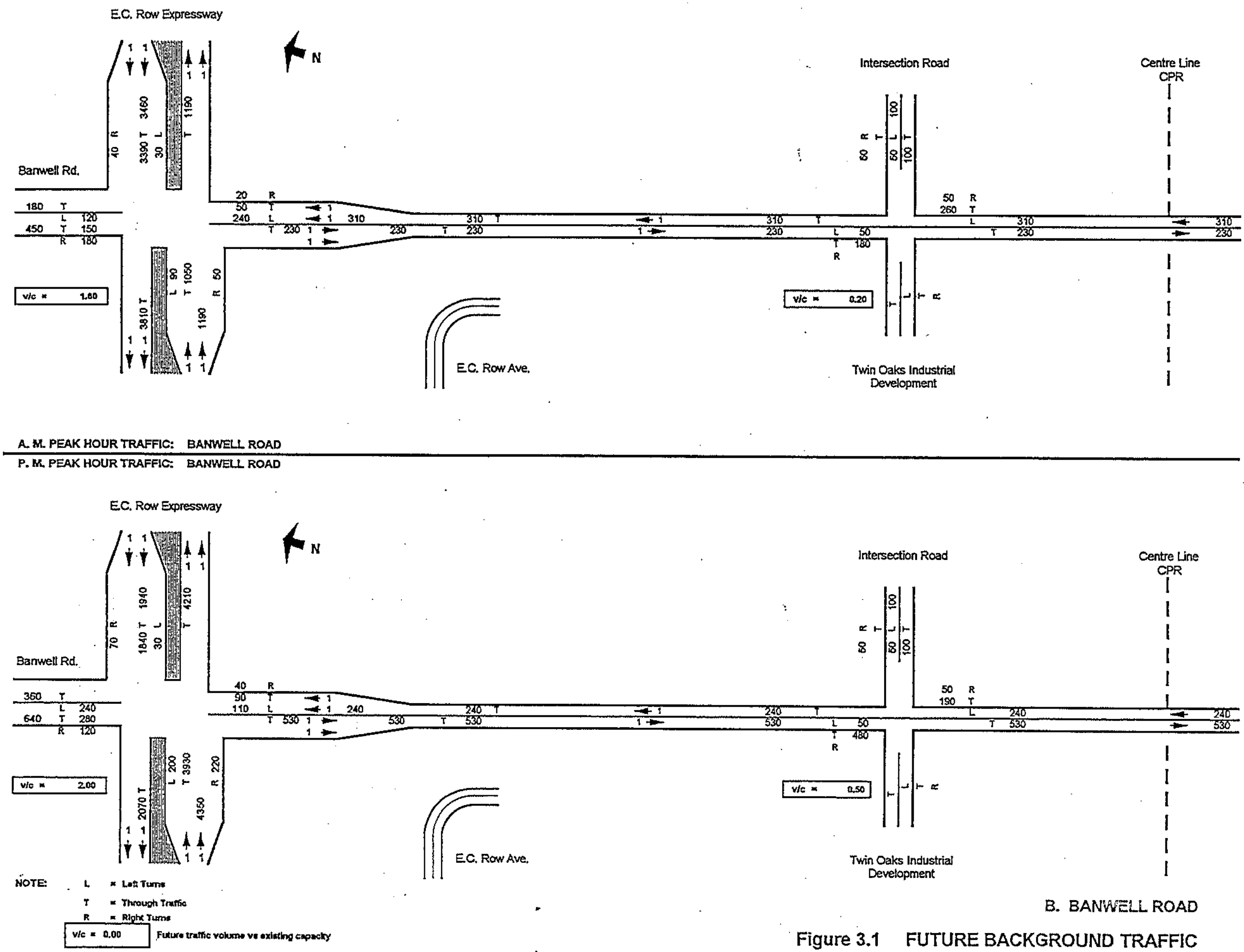
3.1 ANTICIPATED FUTURE DEVELOPMENT

The Twin Oaks Business Park encompasses 420 acres of land situated adjacent to the E.C. Row Expressway to the south. Currently, 200 acres of the whole belongs to the City of Windsor. It is anticipated that the entire 420 acres will develop as industrial uses over the planning period - assumed as the next 20 years.

For complete understanding as to the future traffic on Banwell Road, it was assumed that the area between Banwell Road and L'Esperance Road in the Township of Sandwich South would develop as residential land use. Appropriate trip generation, trip distribution, and traffic assignment factors allowed for the estimate of future traffic on Banwell Road.

3.2 FUTURE BACKGROUND TRAFFIC

Traffic records were assessed to determine if there was any over-all trend in traffic growth. It was found that growth rates so determined were too erratic and in some cases too large to be able to use them confidently for producing future background traffic. It was then decided to use 1.5% per year as a general growth rate. This produces a growth factor of 1.35 over the 20-year planning period.



B. BANWELL ROAD

Figure 3.1 FUTURE BACKGROUND TRAFFIC

The 1.5% growth rate was established in a previous study as being appropriate when traffic from anticipated future developments is being accommodated individually [1]. That is, when the greater proportion of traffic growth is being ascertained through other (traffic impact analyses) methods.

Because the Lauzon Parkway is to be extended northward for Tecumseh Road East to connect to Lauzon Road, travel patterns will change. Potential revisions to the patterns were addressed in a prior study [1] and revisions made to current traffic flow on Lauzon Road to accommodate the fact that some proportion of those currently travelling north on Lauzon Road would use the Parkway in the future when the link has been completed. The traffic volumes that were adjusted stem directly from the left-and right-turning volumes where Forest Glade Drive intersects with the Lauzon Parkway. Hence, for this study, the turning movements at Forest Glade were revised to reflect future conditions in accordance with the same flow adjustments that had been made previously at Tecumseh and Lauzon Roads.

3.2.a Traffic Volumes

For Lauzon Parkway, the adjusted traffic flows were factored up to produce the volumes for future background traffic in terms of passenger cars per hour. (See Figures 3.1.A for Lauzon Parkway and in Figure 3.1.B for Banwell Road.)

3.2.b General Findings

Future traffic volumes on the E.C. Row Expressway are extensive - even excluding the anticipated site-generated traffic from Twin Oaks. They indicate that additional lanes will be required before the 20-year planning period has elapsed. A study of required future improvements include a Parclo-A interchange on the E.C. Row Expressway at Banwell Road suggested for the year 2001 - fifteen years earlier than the assumed planning period for the full development of the Twin Oaks Business Park [2].

Future background traffic does not account for increases in traffic caused by potential revisions to the road system such as: **a.** The improvement of Lauzon Parkway and County Road 42 intersection; and, **b.** The extension of the Parkway to Highway 401. The former is a possibility within the planning period but the latter is only a long-term possibility.

3.3 TRIP GENERATION: FUTURE DEVELOPMENT

For the Twin Oaks Business Park, existing trip generation was assessed for the Walker Industrial Area (Rhodes Drive) from City traffic records and the values obtained compared to typical developments as noted in the ITE handbook on Trip Generation. As well, val-

1. Source: **Traffic Analysis and Planning Report, Tecumseh Road East Re-construction Project, Jefferson Boulevard to Banwell Road,** E. Fearnley Limited, March 1996.
2. Source: **Traffic Evaluation and Planning Study, E. C. Row Expressway,** Windsor Ontario, Final Report, M. M. Dillon Limited, February, 1993

ues obtained were compared to the outgoing volume from the GM Trim Plant on Lauzon Road by knowing the area of total property and being able to count the parked cars from an aerial photo taken just before noon in 1994. The extent of traffic leaving in one hour in the afternoon was verified by plant personnel. Of all data reviewed, the trip generation factors determined for the Walker Industrial Area were the lowest.

Appendix A shows details of this investigation. Figures 3.2.A and 3.2.B illustrate historical trends for the Walker Industrial Area indicating the growth in traffic between 1990 and 1995. Figure 3.3 shows that the actual growth of vacant area being converted into industrial use has not grown to the same extent as the traffic. This is the result of firms already in place intensifying their activity. For example, in 1994 applications for building permits indicate expansion programs for firms totalling a construction value of over $10 million without affecting the land area already owned. This indicates that the trip generation rate on a per-acre basis will increase further in the future. Hence, although the maximum two-way trip generation factor derived for the Walker Industrial Area, was 4.15 trips per acre in the morning and 4.40 trips per acre on the afternoon, it was decided that using 5.0 trips per acre for the Twin Oaks Business Park would account for such intensification for the 20-year planning period. Figure 3.4 shows the over-all trip generation in terms of vehicle trips in the peak hour along with the assumed INbound/OUTbound split of those trips.

To assess the effect of residential development to the east of Banwell Road, trip generation rates from the ITE manual for residential uses were used. (See Appendix A.)

3.4 TRIP DISTRIBUTION

To be able to assign traffic to the road system, a distribution of trip ends is necessary. Since other data was not readily available, certain assumptions were made concerning the distribution of trip ends throughout the City of Windsor. This was done for a previous study in east Windsor and that data has been used here [1]. A balance is provided since the total must equal 100%. Approximate proportions for the home end of trips generated in residential areas are shown in Appendix B. The figures represent a level of activity and as such are subject to adjustment depending upon the proximity of a generator. For example, the closer a residential area is to a major activity area, the more likely it is for travel to gravitate towards that centre. This is more particularly true for shopping or other non-work trip purposes rather than the journey to work. A transportation planner would be cognizant of this and other factors and adjust distributions (and traffic assignments) accordingly.

These distribution values are not intended to represent actual population. They are merely guides, in the absence of other data, to assist in the distribution and assignment of trips. As such, they were used for the distribution of a.m. and p.m.. peak hour home-based work trips generated by the Twin Oaks Business Park for the period when the entire 420 acres have been developed.

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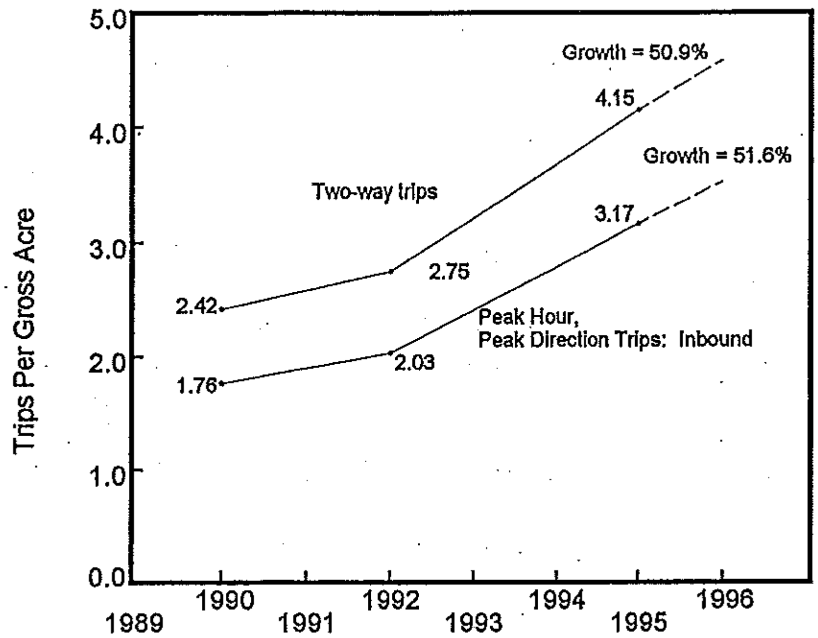
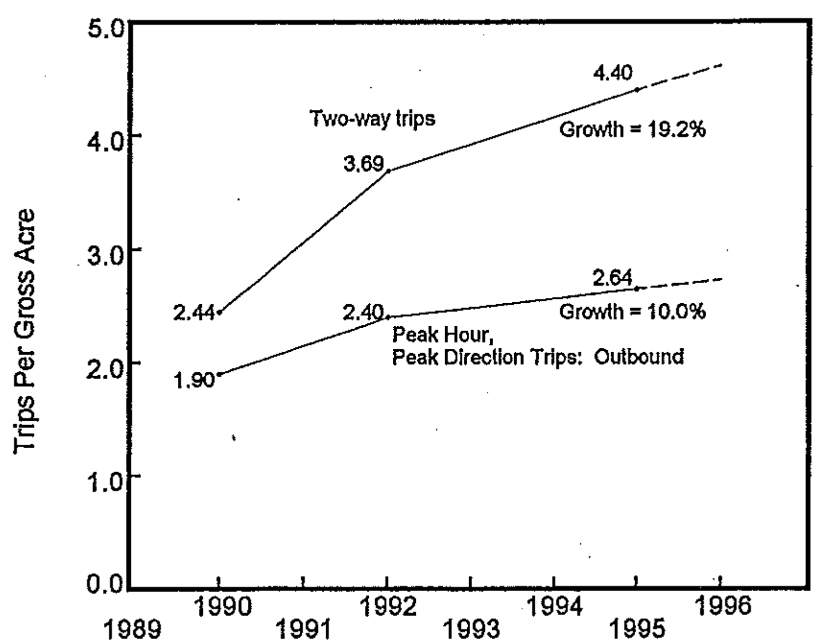
1. Source: **Traffic Analysis and Planning Report, Tecumseh Road East Re-construction Project, Jefferson Boulevard to Banwell Road, E. Fearnley Limited, March 1996.**



A. A.M. Peak Hour



B. P.M. Peak Hour

Figure 3.2 DEVELOPMENT GROWTH:
TRIP GENERATION RATES
WALKER INDUSTRIAL PARK (RHODES DRIVE)

An illustration of the use of these factors follows. For example, for every 100 trips making a trip to or from Twin Oaks, a review of the percentages indicates that most trips would originate to the west of Lauzon Parkway - the area having a greater population. In fact, the assumed distribution indicates that 50% of all trips would be to the west of Twin Oaks. The remaining 50 trips (50% for every 100 trips) originate to the north, south and east of Twin Oaks. Again, the assumed distribution indicates the greater proportion of trips will be to the north (See Figure 3.4). **Traffic was assigned to the road network accordingly.**

3.5 TRAFFIC ASSIGNMENT: SITE-GENERATED TRAFFIC

In general, the assignment process is an operation whereby total trips generated by a development are proportionately assigned to specific routes in a network. Whereas a distribution allocates trips that are likely to travel between geographical areas (an 'as the crow flies' description) the assignment is an estimate of which trips are likely to use specific links in a network (whether roads, public transit, or whatever).

To this point on this project, total trips have been generated and assumptions as to their origins or destinations have been made for areas in the City. Now all vehicle trips generated by Twin Oaks need to be assigned to specific roads in the network so that traffic volumes resulting from their accumulation can be assessed, their impact determined, and road requirements understood. The general assignment of traffic is illustrated in Figure 3.5.

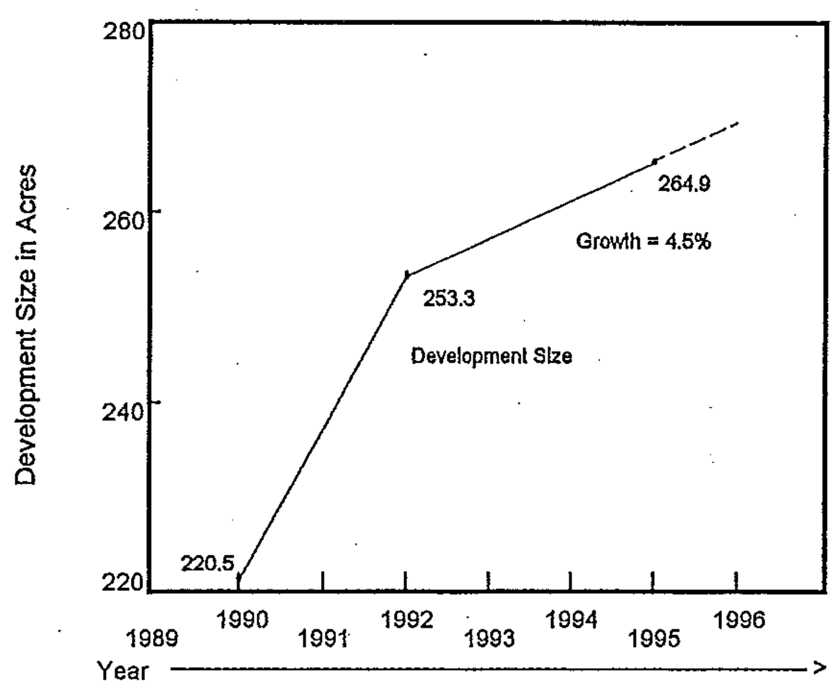


Figure 3.3 DEVELOPMENT GROWTH IN AREA
WALKER INDUSTRIAL PARK (RHODES DRIVE)

Prime access routes to and from the area are the Lauzon Parkway and Banwell Road. Although large volumes of traffic will use the E.C. Row Expressway, the total will have to leave the Expressway on either of Lauzon Parkway or Banwell Road prior to turning into the Twin Oaks area.

For the most part, the new development areas will have direct access to existing arterial roads and traffic assignment is straight forward. However, since the Twin Oaks Business Park extends to Banwell Road to the east, it is reasonable to assume that some of the trips travelling on the E.C. Row Expressway to and from areas west of Lauzon Parkway and destined for the more eastern parts of the development would use Banwell Road. It was assumed that this would approximate 10% of all trips generated when Twin Oaks has been fully developed.

Continuing with the example used to illustrate trip distribution, assigning these trips to the road network is a different matter. The distribution indicated that for every 100 trips, 50 are inbound from the west but on what facility? Again the assumed distribution percentages assist. Knowing the total all trips from west of Ouelette Avenue, and that some of the southern parts of South Walkerville, South Pillette, and Parkway South would be served by the E. C. Row Expressway. Since Jefferson Boulevard does not have interchange ramps to and from the east, it is not unlikely that some of those trips from the west could be assigned to the South Service Road as a direct access to Jefferson Boulevard (12% in accordance with the proportions of trips assumed for each residential area as shown in Appendix B). This leaves the remainder (38%) to be assigned to the Expressway. Similar reasoning allows a planner to assign the remaining trips to other facilities.

One other major assumption made for assigning traffic was that:

The Lauzon Parkway Extension would be in place prior to the full completion of development in the East Riverside Planning District.

This only affects volumes at Forest Glade Drive since, at present, a proportion of traffic destined for areas north of Tecumseh Road East travel along Forest Glade Drive and turn north at Lauzon Road. With the extension in place, this turn will no longer be necessary. All future traffic volumes reflect this condition.

When the Parkway link to Lauzon Road north of Tecumseh Road is completed, the right turn onto Forest Glade Drive from south on the Parkway will be decreased and the through movement increased accordingly.

Figures 3.6.A to 3.6.B illustrate the resulting future morning and afternoon peak hour traffic volumes for **site-generated traffic** from all residential areas affecting critical access roads serving the Twin Oaks development.

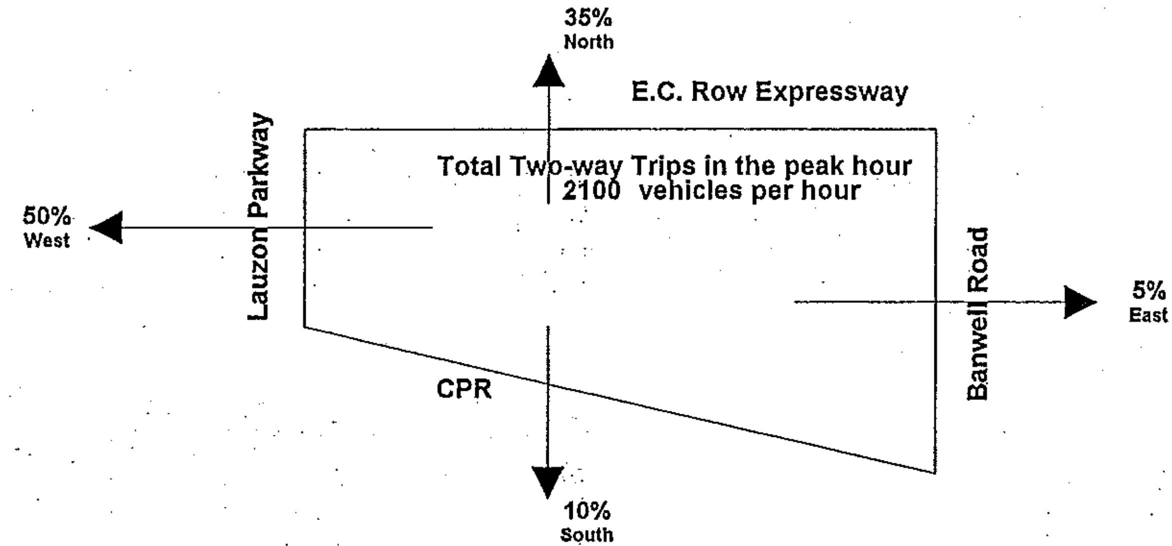


Figure 3.4 GENERAL TRIP DISTRIBUTION

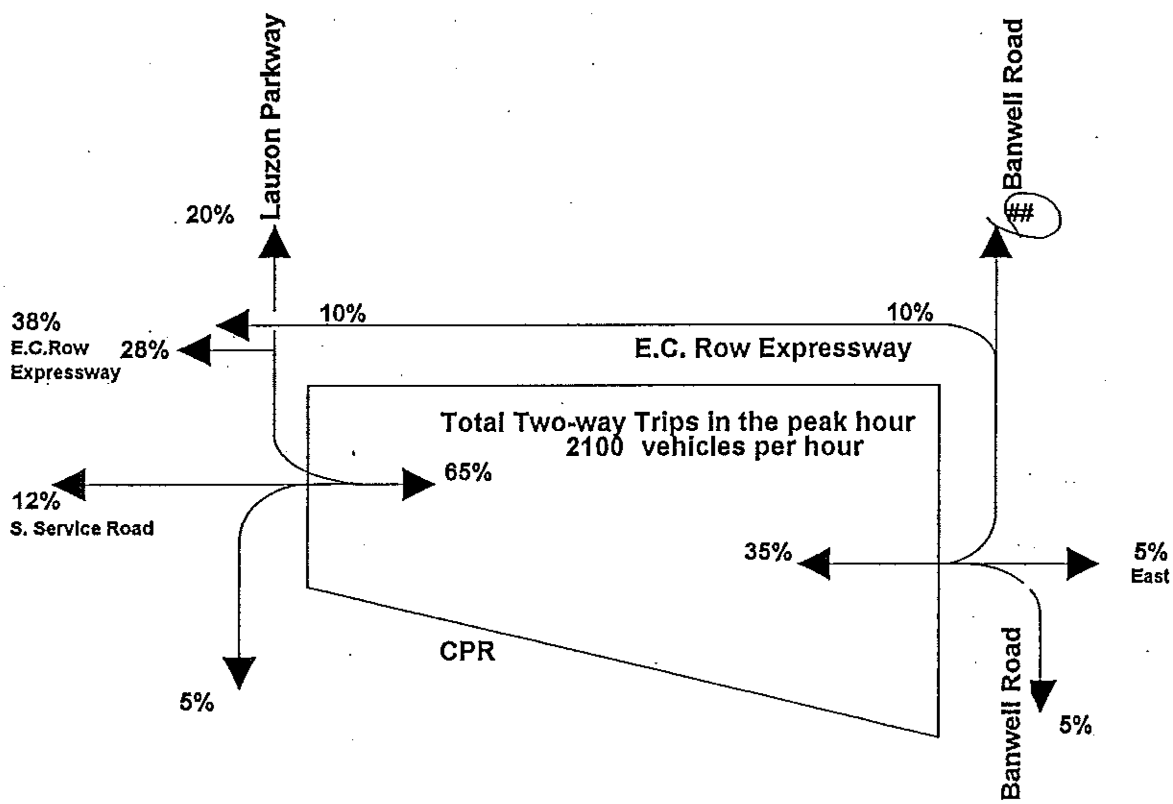
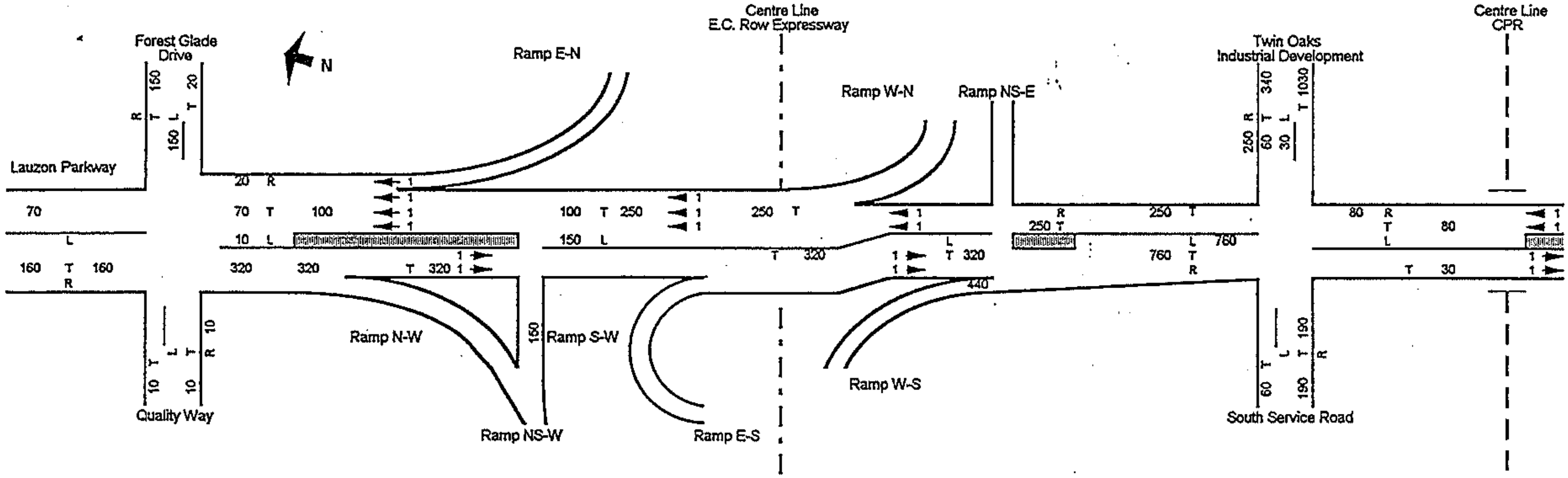
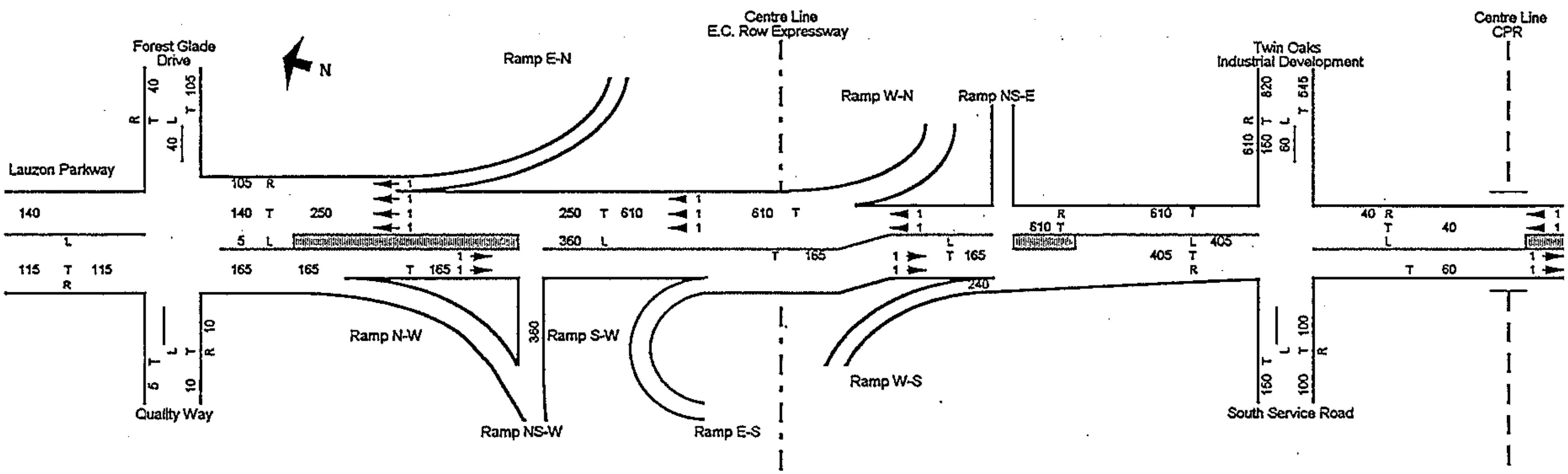


Figure 3.5 GENERAL TRAFFIC ASSIGNMENT

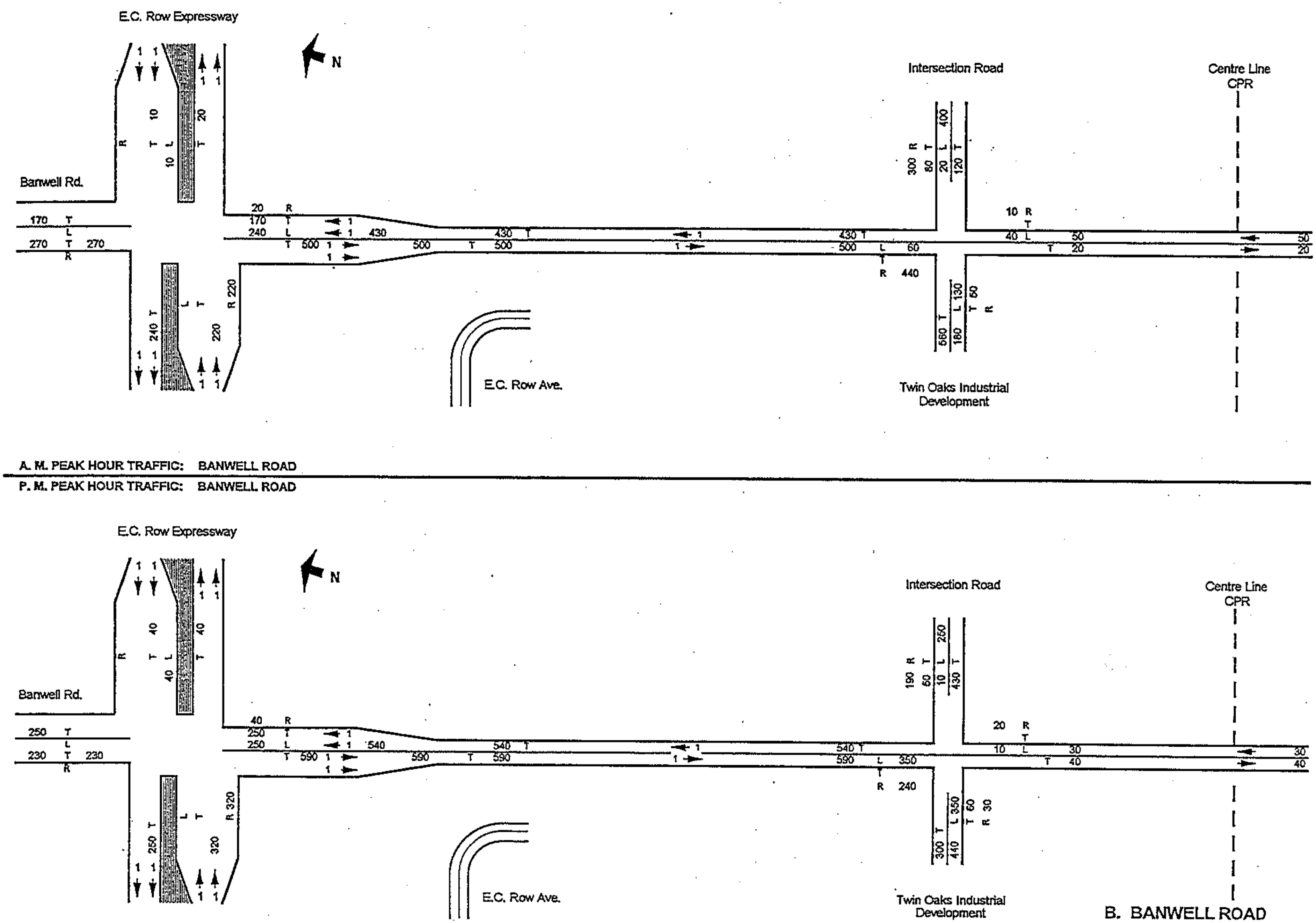


A. M. PEAK HOUR TRAFFIC: LAUZON PARKWAY

P. M. PEAK HOUR TRAFFIC: LAUZON PARKWAY



A. LAUZON PARKWAY



NOTE:
L = Left Turns
T = Through Traffic
R = Right Turns
Future traffic volume vs existing capacity

Figure 3.6 SITE-GENERATED TRAFFIC FOR THE TWIN OAKS BUSINESS PARK AND RESIDENTIAL DEVELOPMENT TO THE EAST

3.5.a Traffic Volumes

For Lauzon Parkway, the assignment shows in terms of passenger units per hour (pcuph) that traffic generated by the Twin Oaks area in the morning peak hour - **additional to the future background traffic** will be:

- 440 vph INbound from west on the E.C. Row Expressway on Ramp W-S.
- 320 vph INbound from the Lauzon Parkway corridor north of Twin Oaks.
- 190 vph INbound from the Jefferson Boulevard corridor via the South Service Road.

- 150 vph OUTbound to the west on the E.C. Row Expressway on Ramp W-S.
- 100 vph OUTbound to the Lauzon Parkway corridor to the north of Twin Oaks.
- 60 vph OUTbound to the Jefferson Boulevard corridor via the South Service Road.

Comparable figures for the afternoon peak hour will be:

- 360 vph OUTbound to the west on the E.C. Row Expressway on Ramp S-W.
- 250 vph OUTbound to the Lauzon Parkway corridor north of Twin Oaks.
- 150 vph OUTbound to the Jefferson Boulevard corridor via the South Service Road.

- 240 vph INbound from west on the E.C. Row Expressway on Ramp W-S.
- 165 vph INbound from the Lauzon Parkway corridor to the north of Twin Oaks.
- 100 vph INbound from the Jefferson Boulevard corridor via the South Service Road.

For Banwell Road, site-generated traffic flows in the morning peak hour produced the following future volumes that would be affected by the Twin Oaks development:

- 220 vph INbound on the turn W-S from west on the E.C. Row Expressway.
- 270 vph INbound (southbound) just north of the E.C. Row Expressway.

- 240 vph OUTbound on the left turn S-W to the west on the E.C. Row Expressway.
- 170 vph OUTbound (northbound) just south of the E.C. Row Expressway.

Comparable figures for the afternoon peak hour will be:

- 280 vph INbound on the turn W-S from west on the E.C. Row Expressway.
- 180 vph INbound (southbound) just south of the E.C. Row Expressway.

- 190 vph OUTbound on the left turn S-W to the west on the E.C. Row Expressway.
- 160 vph OUTbound (northbound) just south of the E.C. Row Expressway.

3.5.b General Findings

The major traffic movement either to or from Twin Oaks is from the west on the E.C. Row Expressway. This means that Expressway Ramp W-S will be heavily travelled in the future. Combined with the 320 vehicles southbound on Lauzon Parkway destined for Twin Oaks will result in a demand for 760 vehicles to turn left into the new industrial development. (See Figure 6 and Appendix C.) It has been determined that, assuming 110-second traffic signal cycles, the length of storage required for this left turn would be 575 feet (175 metres) with only 540 feet (165 metres) available. (See also Table 3.1.) **This <u>excludes</u> any distance required for motorists to weave from the merging end of Ramp W-S across southbound traffic on the Parkway so that they can position themselves in the left-turn lane at the Twin Oaks Collector.** This situation is unsafe at any speed and the design of access to Twin Oaks must avoid this condition.

In the afternoon, the return movement (S-W) of 360 site-generated vph combined with the 250 vph northbound on Lauzon Parkway results in a large right-turn traffic volume at the Twin Oaks collector (610 vph). (See Figure 3.6.A and 3.6.B.) The S-W movement when combined with future background traffic results in a large left turn which will require signalization.

Anticipated future traffic - the combination of the site-generated volumes and the future background traffic volumes - are illustrated in Figures 3.7.A and 3.7.B.

3.6 FUTURE TRAFFIC

Design Hour Volumes were determined as the sum of future background traffic and site-generated traffic. The volumes are shown for a.m. and p.m. peak hours in Figure 3.7.A for Lauzon Parkway and 3.7.B for Banwell Road.

3.6.a Design Hour Volumes

Based on the previous assumptions, Figure 3.7.A and 3.7.B illustrate anticipated traffic in future p.m. peak hours. Volumes shown are the result of assigning traffic to critical points on roads in the Study Area. Again noting that values given are totals for: **a.** Future background traffic (Figures 3.1.A and B) and **b.** The corresponding values for new development traffic (Figures 3.6.A and B. See also Appendix C.)

Design hour traffic volumes and future turning movements for Lauzon Parkway and Banwell Road resulting from this assignment are illustrated in Figure 3.7.A and 3.7.B respectively.

In the Lauzon Parkway corridor, the assignment shows that traffic entering the Twin Oaks area in the morning peak hour is the major traffic movement either to or from Twin Oaks. This means that Expressway Ramp W-S will be heavily travelled in the future. Total traffic on the ramp will amount to 640 pcu of which 440 pcuph are destined for the Twin Oaks Business Park. The 440 pcuph combined with the 320 from the north on Lauzon Parkway results in a total of 760 pcuph that will turn left into the new industrial development. (See Figures 3.6 and 3.7) Equivalent afternoon peak volumes would be 240 pcu on Ramp W-S and 165 from the north on Lauzon Parkway for a total left turn of 405 pcuph. A further 190 pcu in the morning peak and 100 vehicles in the afternoon peak will be inbound from the South Service Road. In all, there will be 1030 vehicles in the morning peak hour inbound to Twin Oaks from the Lauzon Parkway corridor and 340 outbound. Comparable values for the p.m. peak are 545 inbound and 820 outbound. Of the 820 outbound, 610 are destined to turn right and travel northbound on the Parkway - 360 of these will turn left onto Ramp S-W with the remainder will proceed north.

In the Banwell Road corridor, the morning peak is expected to produce 560 pcu inbound and 180 outbound. Corresponding values for the afternoon peak are: 300 inbound and 440 outbound.

The makeup of sample traffic volumes giving the future background traffic and new development are shown in Tables 3.1 and 3.2 for the morning and afternoon peak hours respectively. Sample volumes for the Lauzon Parkway corridor are shown as Part A and those for Banwell Road are listed in Part B of each table.

For the Lauzon Parkway corridor, site-generated trips are only those from the Twin Oaks Business Park. However, site-generated trips for the Banwell Road corridor include a residential component for the vacant lands to the east of Banwell Road. It was assumed that such residential development would be in place by the end of the planning period used for this study.

3.6.b General Road Requirements

Lauzon Parkway will require traffic signals at Ramp S-W and at the South Service Road. In addition, it is recommended that typical warning devices be installed south of the CPR to warn northbound motorists approaching the crest in alignment where the Parkway crosses the railway, that traffic is stopped at the South Service Road signal. A major problem that needs to be corrected is that there is not sufficient space for traffic from Ramp W-S to manoeuvre into the left-turn bay at the Twin Oaks collector. Hence, access from the west needs to be re-designed.

In essence, the derivation of anticipated design hour traffic volumes found that travel to and from the west will account for the largest individual flows of all those directly related to the Twin Oaks Business Park. In either peak hour, these traffic volumes are too great to be accommodated by the existing configuration of the Expressway Ramp W-S at Lauzon Parkway and its location with respect to the Parkway / South Service Road intersection.

The entire flow from Ramp W-S must weave across the major southbound flow on Lauzon Parkway and turn left into Twin Oaks from a new signalized intersection at the South Service Road.. Weaving manoeuvres usually take place over extended distances (depending upon vehicle speeds). For arterial roads (in contrast to freeways or expressways) the total weaving distance is the sum of three dimensions: the distance required to perform the actual weaving manoeuvre, and the distances required in slowing to a stop behind a queue of vehicles at a traffic sigal and that required to store the demand volume. Generally, weaving manoeuvres are categorized as occurring at different levels of service related to road conditions

Level A	Out of the realm of weaving where there are normal lane changing manoeuvres unaffected by traffic flows.
Level B	72 to 80 " " " (45 to 50 mph)
Level C	65 to 72 " " " (40 to 45 mph)
Level D	55 to 65 " " " (35 to 40 mph)
Level E	40 to 55 kilometres per hour (25 to 35 mph)
Level F	(Failure) Stop and go conditions

For the current road configuration on Lauzon Road the available distance in the median is just barely sufficient to accommodate the anticipated left-turning volume. Thus, the weaving and stopping distances for future traffic would be reduced to nil resulting in near-direct crossings of southbound traffic. This would be very unsafe[1]. Hence, alternative access arrangements had to be investigated for this particular traffic flow. Because of restricted conditions in the southwest quadrant of the Expressway/Lauzon interchange, several alternatives had to be assessed and they are outlined here. These have been titled alphabetically in accordance with their function. Althought all would maintain a high standard of pavement widths etc., conforming to standards given in Table 3.4, each alternative is quite different from its counterparts in terms of road functions.

Because Lauzon Parkway provides the west-side access to Twin Oaks, and because the greater traffic volume enters and leaves the Parkway corridor via the E.C.Row Expressway ramps, resolving the west-side access problem dealt with alternative ramp arrangements.

Banwell Road: An interchange is planned for traffic to transfer between Banwell Road and E.C. Row Expressway along with pavement widening on the Expressway. Proposed timing for the interchange is within the planning period studied here.

3.7 TRAFFIC ISSUES

There are several issues concerning traffic and the access roads. These are dealt with separately for the two major access roads and under a general heading of Other Considerations.

1. Even for small volumes of traffic making the weaving manoeuvre to the Twin Oaks collector, the distances required for weaving would be substantial. The 166 metres or so available (543 feet)would allow 100 vph to weave across current Lauzon Parkway traffic speeds in the range of about 60 kilometres per hour. At 130 vph, the traffic speed would be reduced to 50 k/hr. Considering that the speed of traffic observed in this area is 80 k/h, slowing the flow to 50 or 60 k/hr increases the potential for accidents to occur. At greater volumes weaving conditions would be exponentially worse - as would be the accident potential.

3.7.a Lauzon Parkway

On Lauzon Parkway it is understood that, with the extension of the South Service Road into Twin Oaks, a left-turn bay will need to be constructed for traffic turning to the east. Other issues concerning future traffic on the Lauzon Parkway are noted below.

What does the past record of vehicle collisions indicate with regard to the following:

- Does The pattern of collisions in the past indicate special concerns that can be overcome with the design of future road needs?
- Have there been an inordinate number of accidents on the roads in the study area?

Given the anticipated increase in traffic and the existing road configurations, what operational improvements would be necessary to accommodate the anticipated traffic volumes? For example:

- Does the access to Twin Oaks at the South Service Road need to be signalized?
- Would advance warning of a red signal at the South Service Road be needed for northbound traffic to prevent collisions with vehicles at the rear of a queue of stopped traffic?
- Will those exiting Twin Oaks destined for areas to the west via the E.C. Row Expressway require a traffic signal to negotiate the left turn from Lauzon Parkway to Ramp S-W?
- If the left turn for northbound traffic heading west (movement S-W) needs to be signalized, how will this affect traffic from loop Ramp W-N in the through lanes for northbound traffic on the Parkway?

Given the anticipated increase in traffic and the existing road configurations, what road improvements would be necessary to accommodate the anticipated traffic volumes? For example:

- Is there space to construct a left-turn bay at the South Service Road intersection sufficient to accommodate the total traffic demand turning into the Twin Oaks area from Lauzon Parkway?
- Is there sufficient space to allow drivers from E.C. Row Expressway Ramp W-S to weave across southbound traffic on Lauzon Parkway and position their vehicles in the queue that will be waiting to turn left into Twin Oaks at the intersection of the South Service Road?
- Will those exiting the Twin Oaks development destined for areas to the west via the E.C. Row Expressway have sufficient storage space to make the left turn onto Ramp S-W without affecting the flow of northbound through traffic?
- If there is neither sufficient space along Lauzon Parkway to allow for weaving manoeuvres nor adequate space for the construction of a left-turn at the intersection of

the South Service Road, what other access possibilities are there? What form would they take and how could they be programmed to minimize the City's start-up costs?

- What would be the timing for any road construction needed to accommodate future traffic?
- Given the recommendations for the two construction stages, is it possible, for economy, to break down the stages of construction into smaller elements?
- Are there other road geometry improvements intimately related to the Twin Oaks project?

3.7.b Banwell Road

Issues that need to be addressed concerning Banwell Road are:

- Have there been an inordinate number of accidents on the Banwell Road?
- Given the anticipated increase in traffic, would operational improvements accommodate the anticipated traffic volumes?
- Would there be any need for road widenings or other road construction to accommodate the travel demand form the Twin Oaks Business Park?

Further discussion on these issues follows under access alternatives and each is addressed specifically in Section 4, Conclusions.

3.7.c Other Considerations

Issues under the heading 'Other Considerations' include consideration of items of concern to the City and to some special interest groups. Issues are:

- Are there other improvements indicated from the study findings that are not directly related to the Twin Oaks project?
- Can Public Transit reduce the need for automobile travel to the extent that traffic volumes would be reduced substantially?
- To what extent will pedestrians and cyclists be affected given anticipated traffic and the road proposals?
- What is the impact of the Province transferring responsibility for roads to municipal governments?

TABLE 3.1

MAKEUP OF DESIGN HOUR TRAFFIC VOLUMES AT SAMPLE LOCATIONS - A.M. PEAK HOUR

A. LAUZON PARKWAY

Location	Future Background	Site - Generated	(a)	Total Design Hour Volumes	Traffic Flow
Ramp W-S	200	440	(b)	640	From west on the E.C. Row Expressway
Lauzon Parkway	810	320	(b)	1130	Southbound on Lauzon Parkway just north of Ramp W-S
Lauzon Parkway	1210	80		1290	Northbound on Lauzon Parkway just south of the South Service Rd.
S. Service Rd.	280	190		470	Eastbound on the west approach to the Lauzon Parkway
Ramp S-W	420	150		570	To the west on the E.C. Row Expressway from the Parkway
Lauzon Parkway	870	250		1120	Northbound on Lauzon Parkway just north of Ramp NS-E
S. Service Rd.	460	60		520	Westbound from the Lauzon Parkway

B. BANWELL ROAD

Location	Future Background	Generated by New Development	(a)	Total Design Hour Volumes	Remarks
Turn W-S	50	220	(c)	270	From west on the E.C. Row Expressway
Banwell Road	450	270	(c)	·720	Southbound on Banwell Rd. just north of the E.C. Row Exp'y.
E.C. Row Exp'y	3460	10	(c)	3470	Westbound approach volume just east of Banwell Rd.
E.C. Row Exp'y	1190	220		1410	Eastbound on the west approach to Banwell Road
Turn S-W	240	240		480	To the west on the E.C. Row Expressway from Banwell Rd.
Banwell Road	310	430		740	Northbound approach volume just south of the E.C. Row Exp'y.

Note: (a) Site-generated trips in Lauzon Parkway corridor are Twin Oaks generated only. Site-generated trips on Banwell Road include those generated by an assumed increase in residential population along the east side of of Banwell Road.
Total Twin Oaks trips in Banwell Corridor = pcuph Total for Residential area = pcuph.

(b) Total volume is the 405 passenger car units per hour (pcuph) of site-generated traffic that would be turning left from the Parkway at the proposed Twin Oaks collector.

(c) Total volume is the 500 passenger car units per hour (pcuph) of site-generated traffic that would be turning right at the proposed Twin Oaks collector and left at Intersection Road..

TABLE 3.2

MAKEUP OF DESIGN HOUR TRAFFIC VOLUMES AT SAMPLE LOCATIONS - P.M. PEAK HOUR

A. LAUZON PARKWAY

Location	Future Background	Site - Generated	(a)	Total Design Hour Volumes	Traffic Flow
Ramp W-S	380	240	(b)	620	From west on the E.C. Row Expressway
Lauzon Parkway	540	165	(b)	705	Southbound on Lauzon Parkway just north of Ramp W-S
" "	1180	40		1220	Northbound on Lauzon Parkway just south of the South Service Rd.
" "	1000	610		1610	Northbound on Lauzon Parkway just north of the South Service Rd.
S. Service Rd.	600	100		700	Eastbound on the west approach to the Lauzon Parkway
Ramp S-W	260	360		620	To the west on the E.C. Row Expressway from the Parkway
Lauzon Parkway	810	610		1420	Northbound on Lauzon Parkway just north of Ramp NS-E
S. Service Rd.	370	150		520	Westbound from the Lauzon Parkway

B. BANWELL ROAD

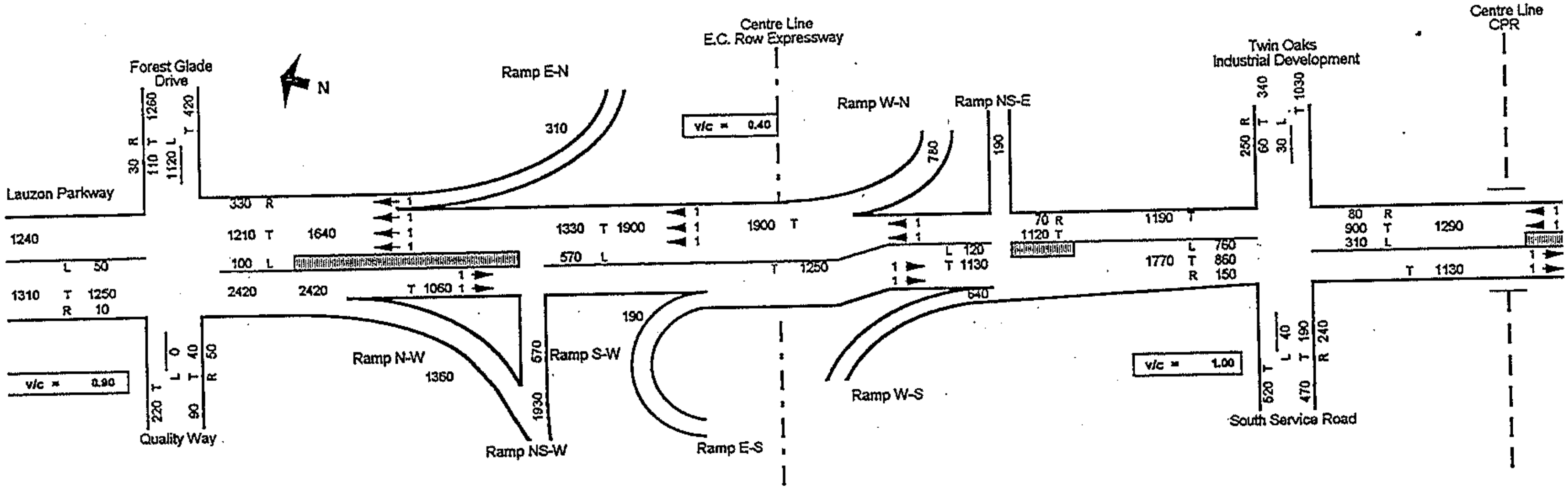
Location	Future Background	Generated by New Development	(a)	Total Design Hour Volumes	Remarks
Turn W-S	220	320	(c)	540	From west on the E.C. Row Expressway
Banwell Road	640	230	(c)	870	Southbound on Banwell Rd. just north of the E.C. Row Exp'y.
E.C. Row Exp'y	1940	40	(c)	1980	Westbound approach volume just east of Banwell Rd.
E.C. Row Exp'y	4350	320		4670	Eastbound on the west approach to Banwell Road
Turn S-W	110	250		360	To the west on the E.C. Row Expressway from Banwell Rd.
Banwell Road	240	540		780	Northbound approach volume just south of the E.C. Row Exp'y.

Note: (a) Site-generated trips in Lauzon Parkway corridor are Twin Oaks generated only. Site-generated trips on Banwell Road include those generated by an assumed increase in residential population along the east side of Banwell Road.
Total Twin Oaks trips in Banwell Corridor = pcuph Total for Residential area = pcuph.

(b) Total volume is the 405 passenger car units per hour (pcuph) of site-generated traffic that would be turning left from the Parkway at the proposed Twin Oaks collector.

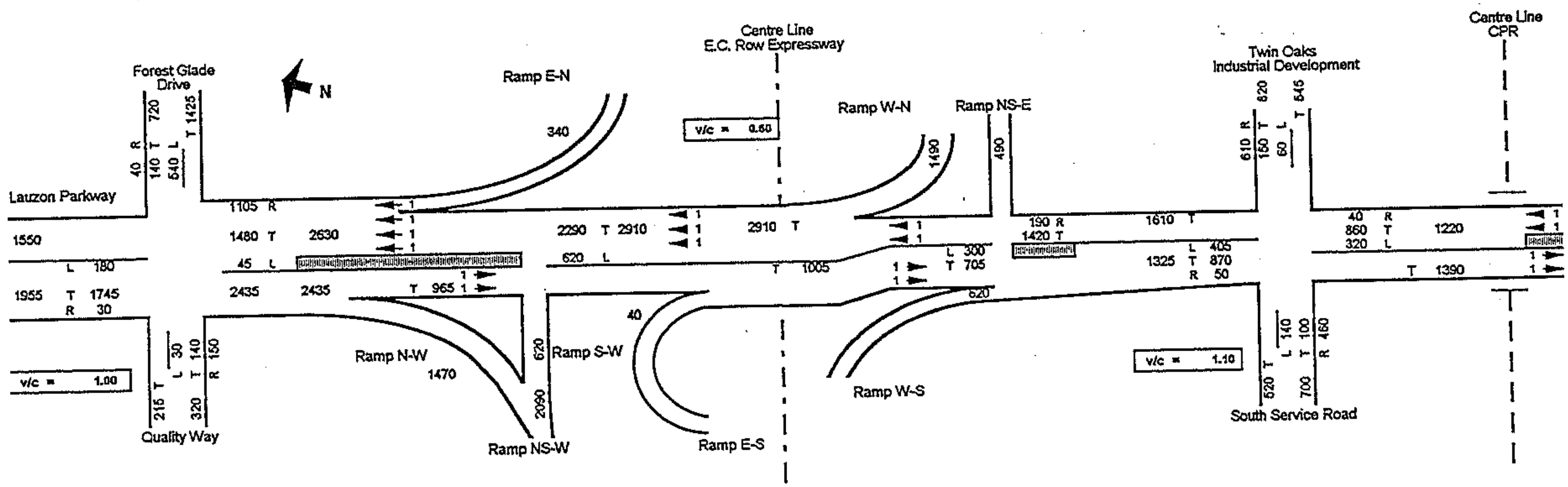
(c) Total volume is the 500 passenger car units per hour (pcuph) of site-generated traffic that would be turning right at the proposed Twin Oaks collector and left at Intersection Road..

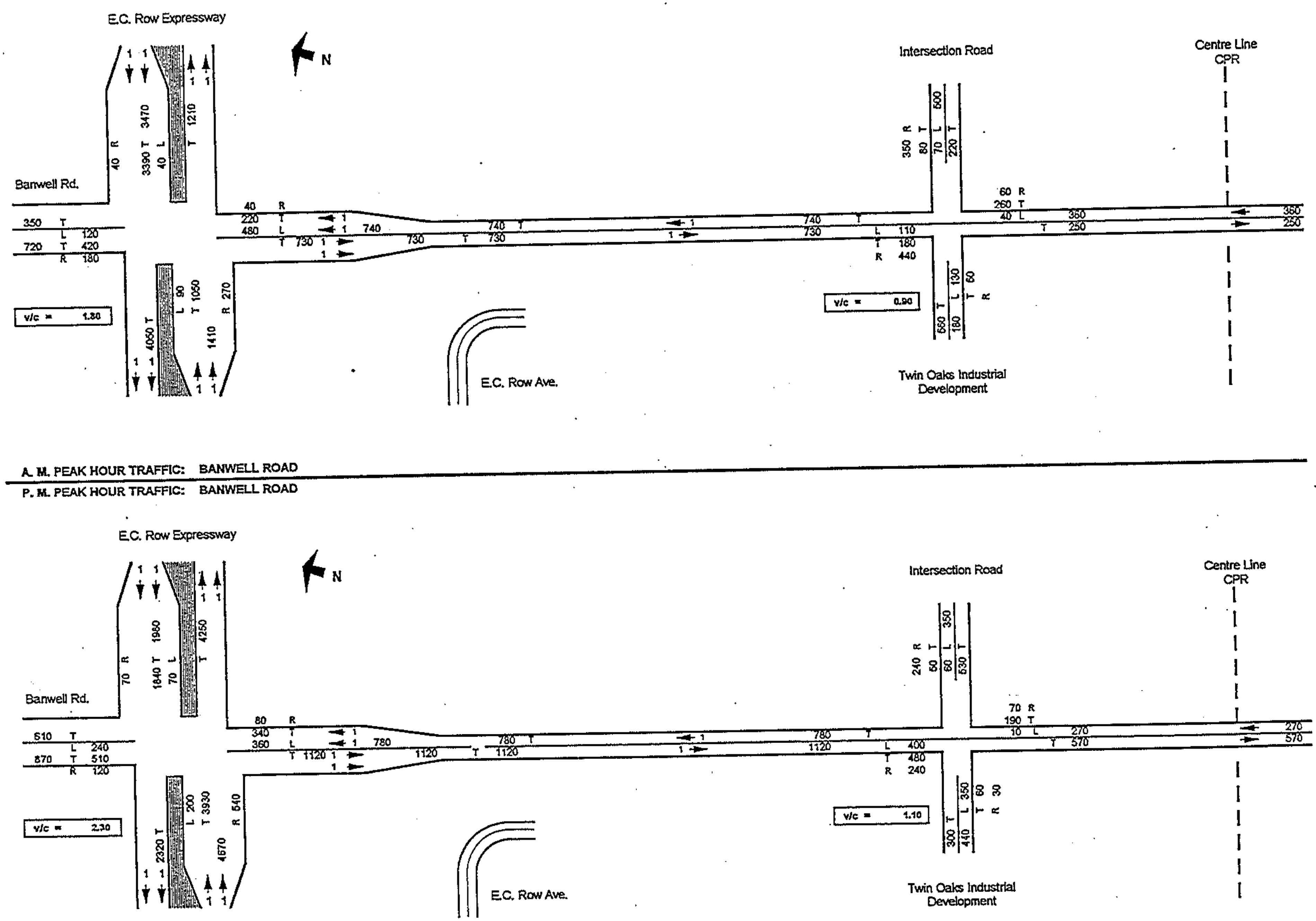
A. LAUZON PARKWAY



A. M. PEAK HOUR TRAFFIC: LAUZON PARKWAY

P. M. PEAK HOUR TRAFFIC: LAUZON PARKWAY





NOTE: L = Left Turns
T = Through Traffic
R = Right Turns
v/c = 0.00 Future traffic volume vs existing capacity

B. BANWELL ROAD

Figure 3.7 ANTICIPATED FUTURE TRAFFIC: DESIGN HOUR VOLUMES

TABLE 3.4 (a)

FUTURE LEFT-TURN TRAFFIC VOLUMES COMPARED TO STORAGE CAPACITY OF EXISTING LEFT-TURN BAYS

A. NORTH-SOUTH ROADWAYS

Intersections	Number of Cycles Each Hour	From North to East Left Turn: Storage Length in Metres	Capacity per Red Signal (Vehicles)	Maximum Future Traffic Volume: vph	Peak	Chance of Overflow	(b)	From South to West Left Turn: Storage Length in Metres	Capacity per Red Signal (Vehicles)	Maximum Future Traffic Volume: vph	Peak	Chance of Overflow
Lauzon Parkway at												
1 . Forest Glade Drive	38	175	23	180	P.M.	NIL		80	11	100	A.M.	NIL
2 . Ramp S-W	38	NA	—	—	—	NA		175	23	620	P.M.	$\boxed{8\%}$
3 . Ramp N-E (c)	38	97	13	300	P.M.	6%		NA	—	—	—	NA
4 . South Service Road	38	180	24	760	A.M.	$\boxed{29\%}$ (d)		213	28	320	P.M.	NIL
Banwell Road at												
1 . E.C. Row Expressway	38	76	10	240	P.M.	2%		90	12	(e) 480	A.M.	$\boxed{80\%}$

B. EAST-WEST ROADWAYS

Intersections	Number of Cycles Each Hour	From West to North Left Turn: Storage Length in Metres	Capacity per Red Signal (Vehicles)	Maximum Future Traffic Volume: vph	Peak	Chance of Overflow	(b)	From East To South Left Turn: Storage Length in Metres	Capacity per Red Signal (Vehicles)	Maximum Future Traffic Volume: vph	Peak	Chance of Overflow
Forest Glade Drive at												
1 . Lauzon Parkway	36	55	7	30	P.M.	NIL		200	27	(f) 1120	A.M.	$\boxed{42\%}$
E.C. Row Expressway at												
1 . Banwell Road	36	165	22	200	P.M.	NIL		127	17	70	P.M.	NIL

Notes:

(a) Capacity per red signal = Left-turn storage length + Assumed storage length per vehicle.
Assumed vehicle storag 7.5 metres (25 feet).
Current left-turn storage length has been scaled from road survey plans.
The term 'Cycle' refers to the time required to complete a cycle of green-to-amber-to-red-to-green. Or, in other words, from the start of one green signal to the start of the next green signal.
Cycles per hour = 3600 seconds in an hour + the cycle time in seconds.

(b) Probability of the left-turn queue backing up into the through lanes and interfering with through traffic

(c) 166-metre dimension shown is the distance between the merging end for Ramp W-S and the south end of the raised median at the South Service Road. Hence there is no space for traffic destined for Twin Oaks to weave across southbound traffic on the Parkway and enter the left-turn bay at the end of a traffic queue.

(d) Future left turning traffic volumes will back up and block one through lane for 11 cycles of the 38 in a peak hour.

(e) A Parclo-A Interchange is proposed for the future at Banwell Road. A loop ramp will accommodate the anticipated traffic.

(f) At Forest Glade, the queue for left turning traffic will back up farther to the east in the continuous left lane of the collector.

3.8 ACCESS ALTERNATIVES

In essence, the analysis found that for Lauzon Parkway The existing roads can accommodate most of the future traffic with operational improvements. However, the traffic destined for the Twin Oaks Business Park from west of Lauzon Parkway is considerable and too great to be accommodated by the existing road configuration between Ramp W-S and the South Service Road.

The access to and from the west is a major problem. Traffic flows indicate that this is the largest traffic volume of all those directly related to Twin Oaks industry. The traffic volume that is the most difficult to accommodate is the morning peak travel between the E.C. Row Expressway and Twin Oaks. With the existing ramp arrangement, the entire flow must weave across the major southbound flow on Lauzon Parkway and turn left into Twin Oaks from a new signalized intersection at the South Service Road. Since the available distance in the median is just barely able to accommodate the anticipated left-turning volume, the weaving manoeuvre to the end of the waiting queue cannot be made in safety. Weaving manoeuvres usually take place over extended distances (depending upon vehicle speeds), and here, it is reduced to a near-direct crossing of southbound traffic. This could be very unsafe. Hence, alternative access arrangements had to be investigated for this particular traffic flow. Because of restricted conditions in the southwest quadrant of the Expressway/Lauzon interchange, several alternatives had to be assessed and they are outlined here. These have been titled alphabetically in accordance with their function. Although all would maintain a high standard of pavement widths etc., conforming to the standards given in Table 3.3, there are differences between each in road function, traffic operation, and safety.

TABLE 3.3

ROAD PLANNING CRITERIA

Item	Description	Remarks
1. Basic Number of Lanes	Not Affected	
2. Lane widths		
a. Through Lanes b. Left-turn Lanes c. Auxiliary Lanes	12 feet (3.65 m)	Left-turn bays should be at all signalized intersections on arterial streets
d. Expressway Ramps	16 feet (5.00 m)	
3. Median Width		
a. Minimum for Raised Area	7 feet (2.00 m)	Including two one-foot gutter pans
b. Full width	19 feet (5.75 m)	Including gutter pans
4. Sidewalk width	5 feet (1.50 m)	Or, adequate for volume of pedestrians
5. Outer Separation (Boulevard)	Varies	Sufficient for snow clearing

The alternative concepts studied have been grouped according to particular characteristics and each has been given a 'nom de plume' to ease understanding of each alternative and their differences.. Certain traditional terms have been used to describe ramp configurations such as:

Do Nothing	The Null alternative
Minimal	Meaning a minimum amount of roadwork.
Direct Access	A straight-through alignment connecting a ramp and a collector on a continuous alignment.
Parclo-A	A partial cloverleaf design in which loop ramps take traffic from the arterial road to an expressway or freeway. (In contrast to a Parclo-B where the loop ramps are exits from the freeway such as at Lauzon Parkway.
Braid	Road alignments where the lesser road meets a ramp at a stop condition or traffic signal to allow traffic flows to cross at grade. The road with the lesser volume is swung through a series of curves to provide an intersection with the ramp that would be as close to a right angle as possible.
Basketweave	Similar to a Braid but with one of the crossing traffic flows on a bridge grade-separated from the other flow.
Buttonhook	A configuration whereby traffic exits an expressway or freeway, on a ramp that curves through about ninety degrees to meet a parallel service road.

The investigative process for access alternatives began with sketching, to scale, likely road arrangements that would function insofar as being able to accommodate traffic is concerned. Later, each alternative was assessed on its capability to perform the necessary functions at a reasonable level of service and safety. A two-stage evaluation process narrowed the field to the most likely candidates and a final evaluation on more detailed requirements reduced the probable alternatives to one preferred. All those reviewed are outlined here. Comparative sketches can be found in Figure 3.8 and details of the first stage in the evaluation procedure can be found in Appendix E.

The Null Alternative

This alternative was reviewed primarily in the lead-up to assessing other options. It was because this concept would be so inadequate and "unsafe at any speed" that other scenarios had to be assessed.

Alternative A: Minimal

This alternative deals with minimal modifications to the terminus of Ramp W-S at Lauzon Parkway. Two different concepts - Alternative A.1 and Alternative A.2 were studied.

Alternative A.1 - Minimal / Free-flow: This was an attempt to increase the available weaving distance along Lauzon Parkway while maintaining a free flowing exit from Ramp W-S. To do this it was necessary to lower the geometric standards for the controlling curve. Thus. the terminus of Ramp W-S would be re-constructed with a curve of smaller radius to merge with Lauzon Parkway farther north from the South Service Road intersection.

Alternative A.2 - Minimal with Signal: This concept presents an attempt to interrupt the weaving manoeuvre by signalizing the intersection between Lauzon Parkway and the ramp terminus. By prohibiting those on the ramp from turning right on a red signal, the weaving vehicles would be split into two separate moves - southbound on the Parkway during the first phase of the traffic signal, and ramp traffic on a separate phase. For this to be efficient, the traffic signal could not interrupt the major southbound traffic flows. The alignment for the new Ramp W-S would follow that for the existing ramp where it runs parallel to the Expressway. This route would be extended right to its intersection with the Parkway. Implementation would include construction of a long left-turn bay on the north side of the intersection at the South Service Road to serve left turns into the Twin Oaks Business Park.

Alternative B: Direct Access

The prime feature for alternatives in this group is the direct access into Twin Oaks via a new Ramp W-S (which would be referred to as Ramp W-NSE). The ramp would intersect with Lauzon Parkway and continue on into the Twin Oaks area as the prime collector road. Implementation would include appropriate improvements on Lauzon Parkway. Three concepts were studied.

Alternative B.1 - Direct Access had Ramp W-S in a similar position as the alignment in Alternative A.2. The ramp would be designated Ramp W-NSE since all three directions would be served by the new ramp. The eastward extension of the ramp would become the new Twin Oaks collector. After intersecting with the Parkway, the roadway would continue on into the Twin Oaks area eventually linking up with the initial location of the main collector just east of Little River. This would require shifting the fill from its existing position on the extension of the South Service Road but would have reduced the weaving manoeuvre to a straight through movement. Traffic from the loop Ramp W-N would turn left at the signalized intersection. The South Service Road would be built to meet Ramp NS-E where that ramp crosses the new collector road. The north-to east movements would have to turn left at the new collector road to use Ramp NS-E where it would intersect the new collector road.

Alternative B.2 - Direct Access with Loop was an extension of the principles involve in Alternative B.1 except that the major left turn at Ramp S-W would be accommodated by a loop ramp in the north-east quadrant. As well, the east-to-south move (with minimal volumes) would be made at a left turn to the Parkway from a new ramp - Ramp E-NS rebuilt around the proposed loop, Ramp S-W. One advantage with this road configuration was that, if it compared well to other alternatives, Alternative B.1 added about three hectares (seven acres) to the Twin Oaks Business Park Ramp NS-E

Alternative B.3 - Direct Access / Parclo-A continued in revising the configuration of the interchange between the Expressway and Lauzon Parkway by adding a loop ramp in the south-west quadrant to accommodate the north-to-east movement. To do this the direct access ramp (Ramp W-NSE) had to be shifted south from that as located in Alternatives B.1 and B.2 crossing the Parkway near the existing intersection with Ramp N-E. As well, a new ramp S-E would be built in the South-east quadrant from the main intersection of the direct access and the Parkway.

Alternative C: Loop

Alternative C is in a separate class. The prime feature of this alternative is that Ramp W-S is removed and the traffic that would have been on that ramp would access Lauzon Parkway from the existing two-lane loop: Ramp W-N (which with this alternative would then be known as Ramp W-NS. The southbound movement would be handled by gradually widening the loop on the outside to the point where left turning vehicles could be stored on a two-lane approach to the east side of the Parkway. However, motorists destined for Twin Oaks would have to make an extremely sharp entry into the left turn bay since its terminus is very close to the proposed intersection where the double left turn manoeuvre would be made. Implementation would include construction of a long left-turn bay on the north side of the intersection at the South Service Road to serve left turns into the Twin Oaks Business Park.

Alternative D

This concept involves re-directing Ramp W-S to meet the South Service Road west of the Parkway. Essentially, this alternative attempts to achieve the same result as Alternatives in class B. That is, to provide a straight-through movement for the traffic volume that, for other alternatives, would be forced to weave with Parkway traffic (as with the use of the existing road configuration). Two similar concepts were assessed and were labelled Alternatives D.1 and D.2. These alternatives would provide access to both the Parkway and Twin Oaks solely via the South Service Road. The most critical problem with the D alternatives is that there is no way that access to the westbound service road can be provided safely without considerably expanding the area for the various roadways thereby requiring extensive property takings. For alternatives categorized as D, the service road would require widening to accommodate the anticipated traffic. Implementation would include construction of a left-turn bay on the north side of the intersection at the South Service Road sufficient to serve left turns turning into the Twin Oaks Business Park from north on the Parkway.

Alternative D.1 - Braid from Expressway: As noted in the 'sub-title' the ramp arrangement would be a 'Braid' with the W-S move being accommodated by a reconstructed Ramp W-S. Westbound service road traffic on a new alignment would cross the ramp at an at-grade crossing either as a stop condition or preferably with a demand-actuated traffic signal which would give priority to the ramp traffic. (The traffic travelling at the higher speed). Eastbound traffic on a realigned South Service Road would merge with that from the Expressway on the new Ramp W-S prior to reaching the Parkway. Access to Twin Oaks would be straight through the service road intersection. Although ostensibly and attempt to avoid one difficult weaving manoeuvre, this alternative introduces another on the service road - made difficult by the nature of the road geometry necessary for minimizing the acquisition of property.

Alternative D.2 - Basketweave from Expressway: As noted in the 'sub-title' the ramp arrangement avoids the at-grade intersection on Alternative D.1 (the Braid). By running the westbound service road lane as a one-lane roadway on a bridge over Ramp W-S, all traffic is moves freely - that is, until the ramp traffic and the service road traffic attempt to weave over the section on a necessary small-radius curve as traffic approaches the Parkway.

Alternative E: Braid from Ramp W-S

The only feature distinguishing this alternative from Alternative D.1 is that in this case the new ramp is constructed <u>from the existing Ramp W-S and the current alignment of Ramp W-S is maintained to the Parkway.</u> This allows southbound motorists to access the Parkway while those destined for Twin Oaks would be on the straight-through movement from the South Service Road. The splitting of the southbound and eastbound movements from Ramp W-S lessens the weaving volume on the service road and the number of vehicles crossing at the Braid. However, maintaining Ramp W-S leaves open the option for motorists to weave through Parkway traffic and what could be seen as a double option for motorists has, in the past, created confusion and erratic driver manoeuvres. Implementation includes construction of a long left-turn bay on the north side of the intersection at the South Service Road to serve left turns into the Twin Oaks Business Park. Implementation would include construction of a left-turn bay on the north side of the intersection at the South Service Road sufficient to serve left turns turning into the Twin Oaks Business Park from north on the Parkway.

Technically, an alternative E.2 could have been assessed but the cost of the structure as determined for Alternative D.2 indicated that there was no need to review such a concept.

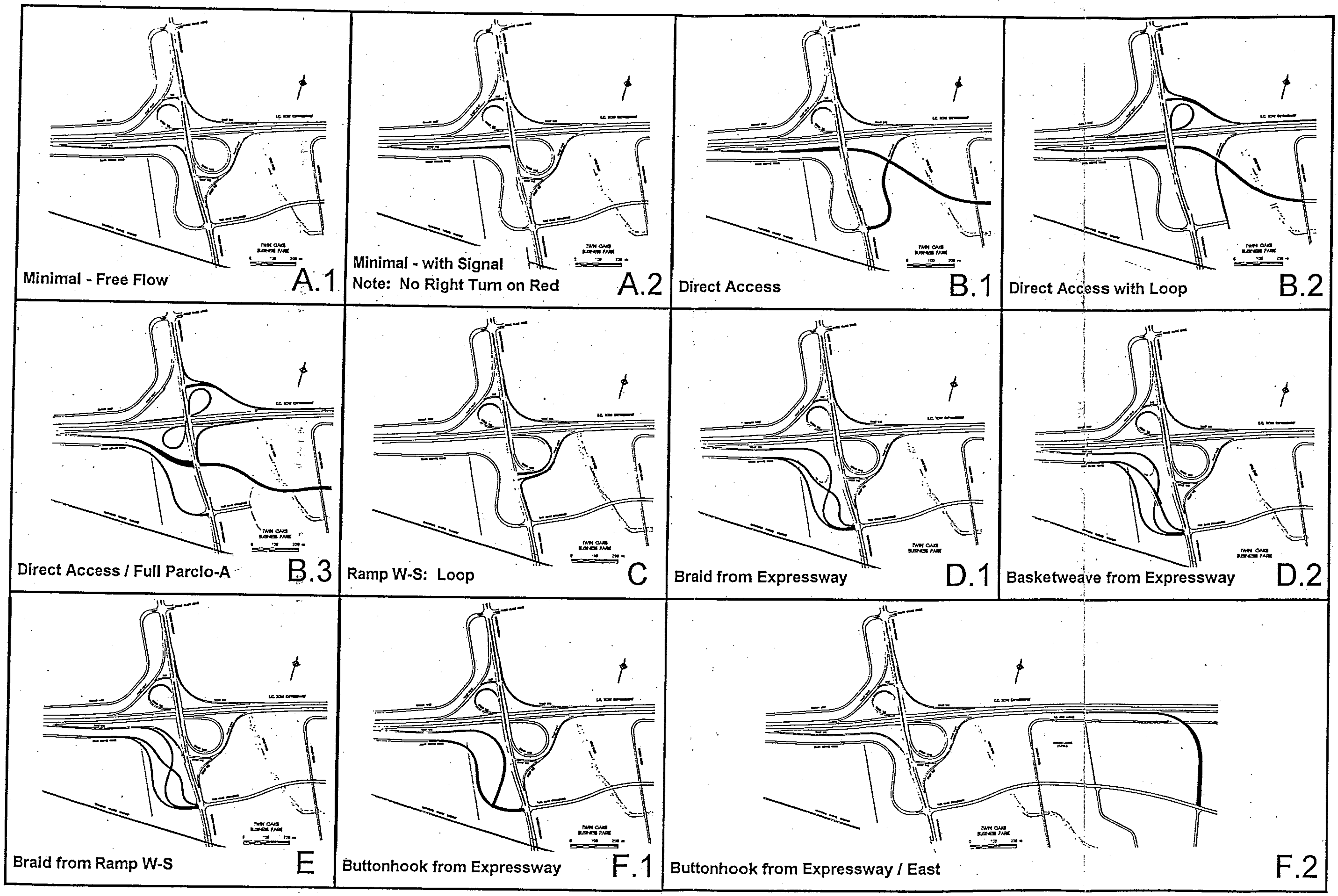
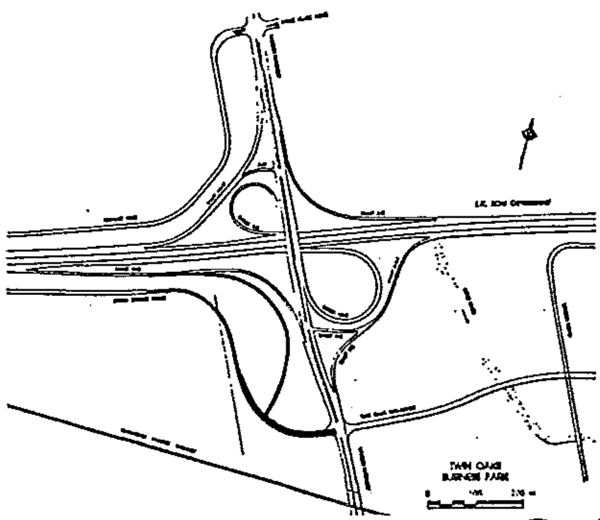
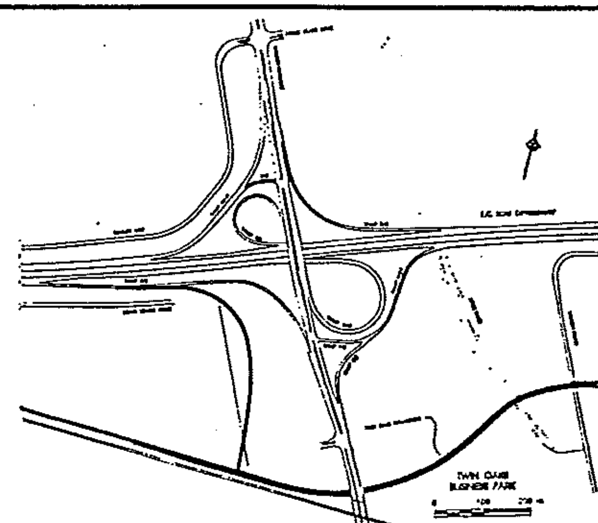


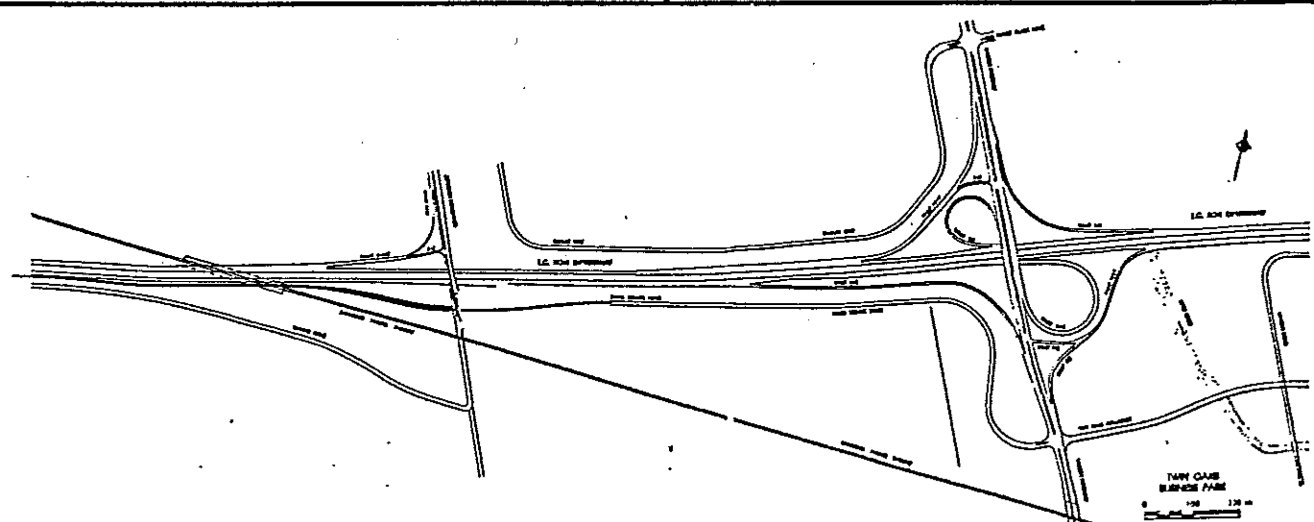
Figure 3.8 TWIN OAKS ACCESS FROM THE WEST: ALTERNATIVES STUDIED



Buttonhook from Ramp W-S G.1



Buttonhook from Ramp W-S / CPR G.2



Jefferson H

Alternative F: Buttonhook from Expressway

To avoid weaving problems inherent with alternatives D and E, Alternative F introduces the concept of constructing a ramp from the expressway to meet the South Service Road at a signalized 'T' intersection. As with Alternative A.2, the alternating phases of green and red break up traffic flows into manageable units which can avoid weaving through other traffic. Two somewhat different alternatives were developed. The Buttonhook design has been used in Ontario on Highway 401 and the QEW (See Appendix G) and in Kitchener where space for the usual ramp configurations is limited yet the need for access is essential. Implementation would include construction of a left-turn bay on the north side of the intersection at the South Service Road sufficient to serve left turns turning into the Twin Oaks Business Park from north on the Parkway.

Alternative F.1 - Buttonhook from Expressway / West: Because this alternative, has ramps in the south-west quadrant, curve geometry is restricted by property considerations and the controlling curve has a radius only slightly larger than that for the Braid alternatives. Because the area is free of other roads such as for the Braid or Basketweave concepts, the ramp approach to the service road can be straight. However, the intersection still must connect to the service road west of the Parkway where the service road is on a small radius curve. As for Alternatives D.1 and D.2, access to both Twin Oaks and Lauzon Parkway is provided solely via the South Service Road. The Service Road would require widening to two lanes (westbound) to ensure that traffic would not backup onto the ramp.

Alternative F.2 - Buttonhook from Expressway / East: This alternative is one of only two studied that are removed from the Parkway corridor. Here, the buttonhook ramp, Ramp W-TO, (for the west-to-Twin-Oaks movement) can be placed far enough east to avoid interfering with traffic entering the Expressway from Ramp NS-E whose merging end is located at about the Little River crossing. Prime advantages are a nearly level area so sight distances are not restricted and the collector road is far enough away to allow for much larger radii than usual. Implementation would include construction of a left-turn bay on the north side of the intersection at the South Service Road sufficient to serve left turns turning into the Twin Oaks Business Park from north on the Parkway. As well, to maintain a reasonable level of service on the Parkway, some manner of metering traffic frrom Ramp W-S is required so that motorists do not simply force weaving to occur on the Parkway.

Alternative G: Buttonhook from Ramp W-S

This alternative is similar to those in class F. As for Alternatives F.1 and F.2, the buttonhook ramp would meet the South Service Road at a signalized 'T' intersection. However, as noted in the sub-title, the buttonhook is designed from the existing Ramp W-S. This allows Ramp W-S to remain open for traffic destined south on the Parkway thereby decreasing demand on the service road and lessening queue lengths as vehicles are stopped at the red signal phase. Implementation would include construction of a left-turn bay on the north side of the intersection at the South Service Road sufficient to serve left turns turning into the Twin Oaks Business Park from north on the Parkway.

Alternative G.1 - Buttonhook from Ramp W-S: This alternative has, essentially, the same geometry as Alternative D.1. but because it diverges form Ramp W-S, keeping the same radius for the curve as on Alternative D.1, the tangent distance before the 'T' intersection on the service road is shorter. This would lead to shorter distances from the end of curve to the end of a queue of vehicles waiting for a green signal. As for Alternatives D.1 and D.2, the service road would require widening to accommodate traffic on the wet approaches to the Parkway.

Alternative G.2 - Buttonhook from Ramp W-S / CPR: This alternative breaks away from the patterns established for the previous concepts. For this scheme, the service road is relocated from the Expressway alignment to one parallelling and adjacent to the CPR railway (hence the designation). Although there are distinct advantages for accommodating traffic, an overriding issue is that industrial properties between the Parkway and Jefferson Boulevard would be denied access by rail . Losing this distinct advantage would lower property values and could revert what might have been negotiations for right-of-way into bargaining for buyouts.

Alternative H: Jefferson

As suggested by the sub-title, this alternative has the prime access through an interchange at Jefferson Boulevard. This is somewhat remote from Twin Oaks and it is suspected that forceful drivers would use Ramp W-S at the Parkway and attempt to enter Twin Oaks via the left turn at the South Service Road intersection. Implementation would include construction of a left-turn bay on the north side of the intersection at the South Service Road sufficient to serve left turns turning into the Twin Oaks Business Park from north on the Parkway.

3.9 FUNCTIONAL PLANNING ANALYSIS OF ALTERNATIVES

A functional planning analysis can include calculations concerning weaving manoeuvres, intersection capacities, and traffic operations and traffic flow and signing. Any alternative could require analysis on all items or may only need a critical problem in one category to obviate the need for any further analysis.

To establish a basis for comparison certain conditions were seen to be essential. For example, it is recommended that new traffic signals be installed on Lauzon Parkway at Ramp S-W, Ramp N-E and the South Service Road intersections. These locations could be held common to all alternatives which, in some instances required an additional traffic signal at the terminus of a ramp. Traffic flow was tested for the section starting at the signalized Forest Glade intersection through to the South Service Road.

Discussions with City Traffic personnel indicated that at Ramp S-W it would be preferable to install a separate signal head for northbound traffic to indicate a continuous green signal for that large volume of traffic. This is because there is a very heavy movement of traffic to the north from loop Ramp W-N at this location and the additional signal head will prevent norhtbound drivers being confused by a stop signal for drivers at the ramp intersection waiting to make a left turn.

The following outlines the results of the weaving, intersection capacity and traffic flow analyses. These analyses are recorded for each alternative studied. In some instances, one or another will not apply. For example, if the weaving problem was severe enough to reject an alternative, there was no point in carrying out a detailed analysis of an intersection's capacity. In general, intersection analyses indicates that all movements other than the 'west access' can be accommodated by operational improvements: Albeit at different levels of service. Fourteen alternatives were studied. They were catalogued and a subtitle given each for easy reference. The alternatives that will be addressed here are: A Null Alternative, Alternatives A.1 and A.2; Alternatives B.1, B.2, and B.3; Alternative C; Alternatives D.1 and D.2; Alternative E; Alternatives F.1 and F.2, G.1 and G.2, and H.

For arterial roads (in contrast to freeways or expressways) the total weaving distance required is the sum of three dimensions: the distance required to perform the actual weaving manoeuvre, and the distances required in slowing to a stop behind a queue of vehicles at a traffic signal and that required to store the demand volume. As noted in Section 3.6.b, weaving manoeuvres are categorized as occurring at different levels of service from level A to level F related to the speed at which the volume of vehicles can complete the weaving manoeuvre.

Intersection and traffic flow analysis was carried out using the City's Passer 2 and time/space computer programs. Forest Glade and the South Service Road intersections at the northern and southern limits of the section of Lauzon Parkway under study established controlling conditions. For example, the major traffic volumes (the left turn move E-S) at Forest Glade operate at a level of service of D or E. At the South Service Road two conditions were limiting: one, the southbound left turn (S-E); and the other where the service road was used as a direct access into Twin Oaks.

Traffic flow in terms of 'green band time' was generally in the range of 30 seconds. This means that motorists travelling 30 seconds apart could both traverse the distance to and beyond the South Service Road travelling continuously from the Forest Glade intersection. Since the total green time allotted to north-south flows at Forest Glade was about 40 seconds, this means that three quarters of the vehicles queued at the time the signal turned green would be able to travel that section of the Parkway without stopping.

The Null Alternative (the 'do nothing' scenario) was tested first for its ability to accommodate the weaving traffic between Ramp W-S and the South Service Road intersection.. It was found that, for the current road configuration on Lauzon Parkway, the available distance along the median is just barely sufficient to accommodate the anticipated left-turning volume. Thus, the weaving and stopping distances for future traffic would be reduced to nil resulting in near-direct crossings of southbound traffic - an unsafe condition...

Alternative A.1 (Minimal - Free Flow) was an attempt to increase the weaving distance by using a curve with a radius much smaller than currently on Ramp W-S. The weaving distance attained was only nominally better than that for the existing merging conditions. In addition, the small-radius curve could be difficult for motorists to negotiate after a long, straight (high speed) approach. **The lengthening of the weaving distance under this alternative is insufficient to improve motorist's safety or to warrant the small-radius curve.**

Alternative A.2 (Minimal with Signal) is effectively a 'diamond interchange ramp with traffic controlled by a traffic signal where the ramp intersects Lauzon Parkway. The recommendation is to have a 'no-right-turn-on-red' condition so that there would not be a weaving situation. The traffic signal effectively monitoring alternate flows of southbound traffic on the Parkway and ramp traffic from the Expressway. This ramp would be constructed so that motorists would have a direct line of vision to the traffic signal at Lauzon Parkway.

This intersection was added to the base four and its effect noted. Analysis showed that the intersection operated at a high level of service and that a solid green band of 30 seconds or a little more could be achieved for traffic in both peak hours.

Alternative B.1 (Direct Access) was found to be deficient in space for the back-to-back left turns at Ramps S-W and N-E. Although motorists turning to the east to use the Expressway could have been signed to the South Service Road, that condition would have been unnatural and forceful drivers would probably forced a left turn at the direct access. This could result in unsafe conditions at the Parkway intersection with the direct access ramp/collector connection.

Alternative B.2 (Direct Access with Loop)was tested because the S-W left turn was removed from left-turn storage needs so the space could have been used for the north-to-east left turn. It was felt to be worthwhile to test this alternative since if the capacity problems could have been resolved, there would have been more land for development (about 3.0 ha). Although there was no weaving to analyze because of the direct access the intersection would operate at a very low level of service in the afternoon peak hour - primarily because of the large volume of left turns for the W-N move (1490 from the traffic projections).

Alternative B.3 (Direct Access /Full PArclo-A) was not tested since there was no weaving manoeuvres and the ramp intersection was similar to that already tested and found wanting in Alternative B.2.

Alternative C (Ramp W-S Loop) utilizes the existing two-lane ramp W-N for the added volume of southbound vehicles. Since the accident record indicates a number of accidents on the loop and all seem to be run-off-the road to the outside of the ramp - just where a queue of vehicles would be waiting for a green signal, there would be a high incidence of accidents especially since the total volume would be double that at present.

Alternative D.1 (Braid from Expressway) was not tested since the addition of a turn to allow traffic onto the westbound service road cold not be condoned. The access could only be constructed with a very small radius for a turn that would require vehicles to negotiate a 180 degree sweep. Compounding this was the fact that the sight distance to the turn would have been very short because of the curvature of the ramp. Signs on the Expressway would direct motorists to the South Service Road. The Ramp / Service Rd. intersection is on a curve. There is a potential for accidents at the rear of queues at the ramp / service road intersection since sight distances are short for motorists negotiating curves on either road. Service road and ramp must be reconstructed. **The weaving** distance on the South Service Road between the ramp intersection and the Parkway is insufficient for the traffic volumes

Alternative D.2 Basketweave from Expressway) has problems is similar to those of Alternative D.1. However, the condition is worse because of the grade separation.

Alternative E (Braid from Ramp W-S) is one of the alternatives that traded weaving on the Parkway for weaving on the service road. The distance available on the service road was found to be insufficient for the weaving traffic by a large margin. The concept was initially considered valid because by keeping Ramp W-S open, it provided access to the westbound lanes of the service road - unlike alternatives D.1 and D.2. Signing on the E.C. Row Expressway for both Lauzon Parkway south AND Twin Oaks could be confusing for motorists leading to erratic manoeuvres as they try to recover from driving errors. There is a potential for rear-end accidents at the rear of queues at the ramp / service road intersection since sight distances are short for motorists negotiating curves on either road. Service road and ramp must be reconstructed. As for Alternative D.1, the weaving distance on the South Service Road between the ramp intersection and the Parkway is insufficient for the anticipated traffic volumes.

Alternative F.1 (Buttonhook from Expressway / West) incorporates a signalized 'T' intersection on the South Service Road and as such breaks up the weaving traffic into two separate moves. One drawback is the curve on which the 'T' intersection must be located. This restricts the sight distance to the west for vehicles approaching the intersection along the ramp. It was felt to be worthwhile to carry this alternative forward for an analysis of costs. An advantage of this alternative is that the weaving manoeuvre between Ramp W-S and the Twin Oaks collector would be replaced by a straight through movement at the

South Service Road intersection. A disadvantage is that the extra traffic at the South Service Road intersection decreases the level of service.

Alternative F.2 (Buttonhook from Expressway / East) was designed to be far enough away from Ramp NS-E so as to have a weaving section operate at a level of service B+ - very nearly outside the realm of weaving altogether[1] At the same time the ramp W-TO (Twin Oaks) would provide excellent service to the development but would not be as efficient in serving the South Service Road west of the Parkway. For the most part, interchange ramps and the South Service Road remain untouched. However, to leave Ramp W-S in place invites weaving manoeuvres along the Parkway.

Alternative G.1 (Buttonhook from Ramp W-S) is somewhat similar to similar to Alternative F.1 in that Ramp W-SSR (from west to the South Service Road) intersects the South Service Road at a 'T' intersection. However, because Ramp W-S would remain in place, traffic would be less on the service road (200 pcuph would travel to the Parkway for travel south of the CPR). This lessens the west-to-south right turn on the service road by about 20%. An advantage of this alternative is that the weaving manoeuvre between Ramp W-S and the Twin Oaks collector would be replaced by a straight through movement at the South Service Road intersection. However, because the configuration of Alternative G.1 still allows access to Lauzon Parkway via Ramp W-S, and because some motorists would still weave across Lauzon Parkway, it does not provide the same safety features as Alternative F.1. Signing on the E.C. Row Expressway for both Lauzon Parkway south and Twin Oaks could be confusing for motorists leading to erratic manoeuvres as a few try to recover from driving errors. There is a potential for rear-end accidents at the rear of queues at the ramp / service road intersection since sight distances are short for motorists negotiating curves on either road. The service road and ramp must be reconstructed

Alternative G.2 (Buttonhook from Ramp W-S / CPR) is the best of the west-side access concepts. The ramp is long enough to provide a considerable stopping sight distance and the distance from the 'T' intersection to the Parkway is considerable. There is considerable space for vehicle storage so that there would be a one of the lowest potential for accidents.

Alternative H - Jefferson initially appears to be a reasonable location for an interchange ramp. However, preliminary profile design indicates that the downgrade to Jefferson Boulevard would have to be about seven percent (7%). As well, for safety, the bullnose at the ramp exit from the E. C. Row Expressway needs to be on the upward sloping grade West of the crest over the CPR railway lines extending the ramp's length farther than normal. As well, to accommodate the added width on the the heavily skewed CPR overpass the bridge would have to be extended by at least 140 feet in length. This would add considerable expense to implement this alternative.

1. The weaving distance is measured from a point where the distance between the adjacent edges of merging roadways is 2.0 feet (0.6 metres) to the point where the adjacent edges of the diverging roadways at the end of the weaving section is 12 feet (3.75 metres). For Alternative F.2, analysis shows that future weaving volumes would be out of the realm of weaving at 746 metres (2450 feet). Procedure used: As outlined in Ministry of Transportation manual.

TABLE 3.5 SUMMARY: EVALUATION OF ALTERNATIVES FOR PROVIDING ACCESS TO TWIN OAKS BUSINESS PARK FROM THE WEST

POSSIBLE OPTIONS	FIRST PHASE EVALUATION	ACTION
<u>DO NOTHING</u> The Null Alternative	▪ Available weaving distance is INSUFFICIENT. ▪ Traffic access could not sustain proposed level of development	NOT RECOMMENDED
<u>ALTERNATIVE A.1</u> Minimal/ Free Flow Ramp W-S	▪ Available weaving distance is INSUFFICIENT.	NOT RECOMMENDED FOR FURTHER STUDY
<u>ALTERNATIVE A.2</u> Minimal/ Traffic Signal	▪ Traffic signal at Ramp W-S and Parkway Intersection ▪ No right turn on red prevents traffic from weaving	RECOMMENDED FOR FURTHER STUDY
<u>ALTERNATIVE B.1</u> Direct Access	▪ INSUFFICIENT Space for back-to-back left turns at Ramp S-W and new Ramp W-NSE.	NOT RECOMMENDED FOR FURTHER STUDY
<u>ALTERNATIVE B.2</u> Direct Access/ with Loop	▪ Intersection requires capacity test ▪ Development area increased by 3.0 ha (7.0 acres)	RECOMMENDED FOR FURTHER STUDY
<u>ALTERNATIVE B.3</u> Direct Access/ Full Parclo-A	▪ Expensive, Substantial property requirements.	NOT RECOMMENDED FOR FURTHER STUDY
<u>ALTERNATIVE C</u> Ramp W-S as Loop	▪ A high potential for accidents.	NOT RECOMMENDED FOR FURTHER STUDY
<u>ALTERNATIVE D.1</u> Braid from Expressway	▪ No Access to westbound South Service Road ▪ Available weaving distance is INSUFFICIENT on west approach to the Parkway.	NOT RECOMMENDED FOR FURTHER STUDY
<u>ALTERNATIVE D.2</u> Basketweave from Expressway	▪ No Access to westbound South Service Road ▪ Available weaving distance is INSUFFICIENT on west approach to the Parkway.	NOT RECOMMENDED FOR FURTHER STUDY
<u>ALTERNATIVE E</u> Braid from Ramp W-S	▪ Available weaving distance is INSUFFICIENT on west approach to the Parkway.	NOT RECOMMENDED FOR FURTHER STUDY
<u>ALTERNATIVE F.1</u> Buttonhook from Expressway/ West	▪ Property requirements greater than for Alternative F.2	RECOMMENDED FOR FURTHER STUDY
<u>ALTERNATIVE F.2</u> Buttonhook from Expressway/ East	▪ Grading and Drainage requirements are minimal. ▪ Neither structures nor property are required.	RECOMMENDED FOR FURTHER STUDY
<u>ALTERNATIVE G.1</u> Buttonhook from Ramp W-S	▪ Only a minor functional advantage over some alternatives ▪ Property required.	RECOMMENDED FOR FURTHER STUDY
<u>ALTERNATIVE G.2</u> Buttonhook from Ramp W-S/ CPR	▪ The South Service Road along the CPR right-of-way would diminish future property values in this area and negate any potential for service by rail.	NOT RECOMMENDED FOR FURTHER STUDY
<u>ALTERNATIVE H</u> Jefferson	▪ Structure costs over $1M ▪ Seven percent grade required on ramp.	NOT RECOMMENDED FOR FURTHER STUDY

Grading	Drainage Costs	Structure Costs	Pavement Area	Property Acquisition	Capacity
Fill material shifted from existing ramp Minimal	$150,000 Moderate	None Nil	1180 Sq M Minimal	None Nil	CANNOT accommodate full development up to 66 to 82 ha (162 to 203 acres) ONLY RECOMMENDED FOR STAGE 2 DEVELOPMENT

Grading	Drainage Costs	Structure Costs	Pavement Area	Property Acquisition	Capacity
Fill material required for all new roads **Extensive**	$375,000 **Extensive**	None **Nil**	13,460 Sq M **Extensive**	North-east Quadrant **Moderate**	Direct access intersection would operate at a very low level of service **UNACCEPTABLE: NOT RECOMMENDED**

Grading	Drainage Costs	Structure Costs	Pavement Area	Property Acquisition	Capacity
Ramp W-S and service road re-aligned **Moderate**	Little **Moderate**	None **Nil**	8980 Sq M **Moderate**	Two properties affected **Substantial**	Can accommodate full development but Low level of service at Parkway and S. Service Rd. **UNACCEPTABLE: NOT RECOMMENDED**

Grading	Drainage Costs	Structure Costs	Pavement Area	Property Acquisition	Capacity
Road bed only Minimal	ditches only Minimal	None Nil	8730 Sq M Moderate	None Nil	Can accommodate full development High level of service at Parkway and S. Service Rd. RECOMMENDED

Grading	Drainage Costs	Structure Costs	Pavement Area	Property Acquisition	Capacity
Ebd / Wbd lanes of Service Road plus new ramp W-SSR **Extensive**	$350,000 **Severe**	None **Nil**	9426 Sq M **Substantial**	Two properties affected **Substantial**	Can accommodate full development but Low level of service at Parkway and S. Service Rd. **UNACCEPTABLE: NOT RECOMMENDED**

Note: For further details regarding the first phase of the evaluation process, see Appendix E.

3.10 EVALUATION OF ALTERNATIVES AND RECOMMENDATIONS

Since it was determined that the large volumes of weaving traffic between Ramp W-S and the South Service Road traffic cannot be accommodated on the Parkway. **Fourteen alternatives were studied** for access to the Twin Oaks area from the west. Of these, two are recommended - one as a first stage for the other.

Table 3.5 outlines the evaluation of all alternatives for the 'inbound west access' and notes the most salient features. The major reasons for accepting an alternative for further study or for rejecting one is listed in the table. As well, certain construction needs are noted and these are listed along with an evaluation for each ranging on a five-point scale from Nil to Severe. Those with the least impact are shown shaded and these concepts were selected. For greater detail on the first phase of evaluation, refer to Appendix E where each alternative is laid out along with traffic volumes, comments on each alternative's prime features, critical traffic operation considerations and if warranted, construction requirements.

3.10.a Road Improvements and Construction Staging

Of the five alternatives brought forward for further evaluation, two are recommended for construction: **Alternative A.2 (Minimal with Traffic Signal)** and **Alternative F.2 (Buttonhook Ramp from Expressway / East).** These two will act in concert. **Alternative A.2**, at first, providing a necessary first stage of construction. Later, conveniently, through its limitation on traffic from the Expressway (by the continuing prohibition of right turns on the red signal), it will help to maintain a reasonable level of service farther south on the Parkway at the intersection the South Service Road while the buttonhook ramp W-TO services the continuing development in Twin Oaks. That is, **Alternative F.2.**

Still later, when development spurs improvements on Banwell Road, traffic formerly using Lauzon Parkway as the **sole entrance to Twin Oaks from any direction** would now have alternative opportunities for access and as traffic levels balance out over all three facilities reasonable levels of service will still be maintained on Ramp W-TO, the Parkway and at the South Service Road intersection.

These improvements involve constructing a new Expressway ramp east of Lauzon Parkway to connect the lanes for eastbound traffic directly to the new Twin Oaks collector road (Ramp W-TO). This will decrease the amount of traffic having to make a left turn at the South Service Road by about sixty percent (440 pcuph).

Further to this, **Alternative A.2**, one of the other 13 concepts reviewed, while not able to accommodate all traffic from the entire development, can be used as a first stage of road improvements - **provided right turns on a red signal are prohibited. This prohibition is extremely important because the entire purpose for using Alternative A.2 is to eliminate the weaving manoeuvres north of the South Service Road intersection and to provide safe passage.**

These improvements involve extending that part of Ramp W-S paralleling the Expressway straight through to a signalized intersection at Lauzon Parkway. Here, motorists on the ramp will be provided with sufficient green time to prevent the need to turn right on the red signal. In fact, **the 'right turn on red' movement must be expressly prohibited. This is essential since the entire purpose of reconstructing this ramp is to break the north-south traffic flow so that it is not necessary for weaving manoeuvres to take place along the Parkway.** An added benefit is that the interruption in the traffic flow allows the left-turn bay at the South Service Road to be used alternately by the traffic demand from north on the Parkway and then by that from west on the Expressway. The flow from the north will arrive just as the advance green signal is activated and the flow from Ramp W-S travels into place as the signal switches to solid green. Also, a long left turn bay (175 metres) is required at the signalized South Service Road intersection to accommodate traffic turning into the Twin Oaks Business Park from the north.

For example, **Alternative A.2**, incorporates the left turn lane on Lauzon Parkway at the new collector, the rebuilding of Ramp W-S, and the installation of traffic signals and other such road works. All of which are integral to the concept.

At a review meeting staff at the Ministry of Transportation of Ontario (MTO) intimated that they would not approve Alternative F.2 the 'buttonhook' design despite similar installations along on Highway 401 at Port Hope, Whitby, and Pickering, Ontario, and as well others on the QEW at Jordan Harbour, Ontario. As well, it was pointed out that the design was tantamount to providing special access from a freeway to private development - a policy that MTO has always resisted. Since the Expressway is to come under the jurisdiction of the City on April 1, 1997, the importance of the MTO approval is lessened.

Despite the Ministry's comments, Alternative F.2 is recommended for Stage 2 construction to provide Expressway access from the west at an appropriate time during the development of the Twin Oaks Business Park.

In addition, there are other road improvements necessary which are a direct result from the impact of traffic generated by the Twin Oaks Business Park and one other whose implementation will assist in maintaining a reasonable level of service at the South Service Road intersection. These are:

1. The lane arrangement for the buttonhook ramp where it meets the Twin Oaks collector is an important location and needs to be designed very carefully. The lane arrangement on the opposing road should avoid lining up with the ramp so that a motorist need not make an error and travel the wrong-way on the ramp and out onto the Expressway.

2. At the intersection of the collector and Lauzon Parkway, there will be a substantial right turn estimated at 610 pcuph. This requires a separate lane on the Twin Oaks collector as well as a through lane. To be properly aligned with lanes on the South Service Road, a left-turn lane is required as well.

3. The Twin Oaks collector meets Banwell Road on an extension of the alignment of Intersection Road. At the time this intersection is constructed, Intersection Road will need upgrading and likely reserved left-turn lanes.

4. Along the east side of the Lauzon Parkway there is a long tapered speed change lane for traffic exiting to Ramp S-E. (It is the remnant of a rural design.) This is the area where the new Twin Oaks collector will intersect the Parkway. It is recommended that the taper be removed and the intersection for the new Twin Oaks collector be joined to the outside edge of the two through lanes for northbound traffic. It is also recommended that the exit to Ramp S-E be constructed as an urban intersection at Ramp N-E. North of the Twin Oaks collector it is recommended that an auxiliary lane be added between the Twin Oaks collector and the new location of Ramp S-E. This will accommodate the south-to-east movement and provide an additional lane to aid the very large right turn (610 pcuph) in moving into the northbound traffic flow.

Timing for Road Improvements

Estimating a time for commencing construction on the new ramp on **Alternative F.2** is somewhat difficult since much depends upon the marketing strategies of the City, the type of development (labour intensive or not) and whether the general economic atmosphere is one in which businesses are comfortable with expansion. Notwithstanding this, in accordance with the traffic generating assumptions, noting that there will be no access to the east, and considering traffic safety uppermost, **it has been determined that problems will occur on Lauzon Parkway at the South Service Road when the volume of vehicles turning left reaches 450 to 550 passenger car units per hour. At this level, estimates indicate that the developed land will amount to about 74 hectares (183 acres).** It is at this level that **Alternative A.2** can no longer accommodate further growth in the area. and Stage 2 becomes essential.

Given that there are many conditions that could affect this conclusion, it is recommended that the City begin to monitor traffic flow on Lauzon Parkway to assess whether Stage 2 could be implemented or deferred. From the work carried out for this study, it appears that the special monitoring work should take place at the time when development reaches about 50 hectares (125 acres).

In summary, it is recommended that:

- **Ramp W-S be re-constructed on a new alignment parallelling the E.C. Row Expressway and that it be extended straight to an intersection with Lauzon Parkway (Alternative A.2, Stage 1) so as to be in place before any** development commences. Also, that traffic at the Parkway intersection be controlled by means of a traffic signal immediately upon inception.

- A no-right-turn-on-red policy be maintained at the intersection of the new Ramp W-S from its first installation.
- Ramp S-E be re-constructed as an urban intersection farther north at Ramp N-E (now to be Ramp NS-E). Also that the long speed-change lane along the east side of Lauzon Parkway (the remnant of a rural design) be replaced by an auxiliary lane between the new collector and the relocated Ramp S-E.
- As development approaches 50 hectares (125 acres), traffic operations be monitored on Lauzon Parkway from the new Ramp W-S (initially constructed in Stage 1) and the South Service Road. That is, commencing before Twin Oaks development reaches the 74 hectares , or, 183 acres estimated capacity for left turning traffic at the South Service Road. This will allow the City to assess more accurately, in the light of new data, the need for Stage 2 to proceed.
- Stage 2 be implemented - the Buttonhook ramp to Twin Oaks - according to the timing confirmed by monitoring Parkway traffic operations.
- The intersection of the buttonhook Ramp W-TO and internal roads in the Twin Oaks Business Park be constructed so that the possibility of wrong-way manoeuvres on the ramp is virtually nil.
- A traffic signal be installed at Ramp S-W at about the same time the buttonhook ramp is built. Although this is based on projections inherent in this study, monitoring the traffic as noted above will determine actual need and the best time for installation.

3.10.c Future Driving Safety

It is anticipated that collisions will increase in the future along with the total volume of traffic. Whether the accident rate increases will depend upon the quality of the road improvements put in place to serve the Twin Oaks Business Park. Following recommendations of this report ensures that the potential for accidents will be lower than otherwise

3.11 ANTICIPATED FUTURE PUBLIC TRANSIT SERVICES

Extensions to the current system are being considered by Transit Windsor for the East Riverside Development Area (north of Tecumseh Road East between Little River and Banwell Road). However, there are no plans to extend routes to the south along Banwell Road which will be a major access to the East Riverside community. Also, to date, there are no plans for servicing the Twin Oaks Business Park. However, there are two possibilities: Extend existing routes or introduce an industrial feeder route for the morning and afternoon peak travel periods. The latter of these options with a route tying into other routes at a convenient location is preferred by planners at Transit Windsor. The location which seems to be most adaptable for such a route is the proposed terminus for east-end buses at Tecumseh Mall. This property occupies the area north of Tecumseh Road between and Lauzon Road the Parkway and will provide direct access for such a route to the Parkway.

3.12 ANTICIPATED PEDESTRIAN AND CYCLING NEEDS

Neither Lauzon Parkway nor Banwell Road are environments for pedestrians or cyclists. However, the City is an active supporter and developer of cycling pathways both on and off streets. In the Twin Oaks area, Little River provides an opportunity for the extension of bikeways and pedestrian ways or, more likely, a combination of both within pleasurable surroundings. Unfortunately, the E.C. Row Expressway represents a formidable barrier to completing facilities in the Little River corridor. Never-the-less, there are many in the City who believe that overcoming that barrier can be envisaged within the planning period used for this study (20 years). With the introduction of such a large employment area a short distance (as the crow flies) away from the Forest Glade community it appears that there could be a demand develop that would provide impetus for a crossing over the Expressway.

4. CONCLUSIONS

Several issues concerning traffic and the access roads have been identified. These are dealt with separately for the two major access roads.

4.1 LAUZON PARKWAY

An understanding of traffic accident patterns can guide a designer in avoiding the conditions that, in the past, have led to the current accident history. When assessing road improvements, a planner needs to consider:

A. What does the past record of collisions indicate with regard to the following:

1. Does The pattern of collisions in the past indicate special concerns that can be overcome with the design of future road needs?

It is noted that, typical of a Parclo-B interchange, there have been a considerable number of accidents on the loop ramp W-N. The resulting accident rate is double that for the Parkway. This was a major factor in rejecting one of the alternatives studied. As well, it is noted that the greater number of accidents in the southern half of the study area occur as northbound motorists approach the South Service Road intersection. This confirms the first assessment that some form of warning will be required to alert northbound motorists of traffic queues waiting at the signalized, South Service Road intersection before they travel over the crest on the Parkway bridge at the Canadian Pacific Railway.

2. Have there been an inordinate number of accidents on the roads in the study area?

No. Accident rates throughout the section of the Lauzon Parkway from Forest Glade Drive to the CPR are lower than for many arterial roads. However, unlike many, **there are no driveways to interfere with through and turning traffic movements so a much lower rate than usual is to be expected.**

On Lauzon Parkway it is understood that, with the extension of the South Service Road into Twin Oaks, a left-turn bay will need to be constructed for traffic turning to the east. Other issues concerning future traffic on the Lauzon Parkway are:

B. Given the anticipated increase in traffic, what operational improvements would be necessary to accommodate the anticipated traffic volumes? For example:

1. Does the access to Twin Oaks at the South Service Road need to be signalized?

Yes. Future traffic volumes are too great to allow discretionary turns. Also, because of the speed of northbound traffic and the fact that the intersection is somewhat hidden by the crest over the railway, safety can be improved by signalization. **It is recommended that a signal be installed at the same time the left-turn bay is cut into the raised median.**

2. Would advance warning of a red signal at the South Service Road be needed for northbound traffic to prevent collisions with vehicles at the rear of a queue of stopped traffic?

Yes. In fact unless this is done, the queue of traffic stopped at the signal will severely increase the potential for accidents by reducing the stopping space for cars travelling over the crest at the railway.

3. Will those exiting Twin Oaks destined for areas to the west via the E.C. Row Expressway require a traffic signal to negotiate the left turn from Lauzon Parkway to Ramp S-W?

Yes. It is anticipated that the volume of left-turning traffic returning to the west in the will be about 600 vehicles per hour in both the morning and afternoon peak hours. This volume is much too great for left turns to be left to the discretion of drivers.

4. If the left turn for northbound traffic heading west (movement S-W) needs to be signalized, how will this affect traffic from loop Ramp W-N northbound on the Parkway?

Motorist's reaction to the signal could be mixed and there would no doubt be some confusion as to whether the signal applied to the traffic from the loop ramp W-N. However, installing a signal facing the merging traffic and exhibiting a continuous green signal would allow the merging to take place as it is now. **This course of action is recommended.**

C. Given the anticipated increase in traffic and the existing road configurations, what road improvements would be necessary to accommodate the anticipated traffic volumes? For example:

1. Is there space to construct a left-turn bay at the South Service Road intersection sufficient to accommodate the total traffic demand turning into the Twin Oaks area from Lauzon Parkway?

No. The existing raised concrete median between Ramp N-E and the South Service Road is 200 metres long (656 feet). At a traffic volume of 760 pcph, the reach of the traffic queue would be 157.5 metres (517 feet) assuming that the traffic flow would be consistent throughout the hour. However, this is rarely the case. To accommodate fluctuations in traffic flow throughout a peak hour the minimum possibility of a queue of vehicles backing up into the southbound through lanes needs to be considered. (The minimum possibility assumed here would be only a 5% chance - or, two signal cycles in the hour). The storage length required for this condition is 217.5 metres (714 feet). This excludes a nominal transition distance for drivers to enter the protected area.

2. Is there sufficient space to allow drivers from E.C. Row Expressway Ramp W-S to weave across southbound traffic on Lauzon Parkway and position their vehicles in the

queue that will be waiting to turn left into Twin Oaks at the intersection of the South Service Road?

No. It has been estimated that about 760 vehicles need to turn to the east (left) at the South Service Road. Of these, nearly 60% (440 pcpu) would travel from Ramp W-S to the left turn at the South Service Road.. This volume weaving across southbound traffic flows on Lauzon Parkway would require a distance of 136 metres (445 feet) at the lowest level of service acceptable - Level of service E - having an operating speed of 40 k/hr (25 mph) . Accounting for a minimum stopping distance of 24 metres (80 feet) and the average queue length of 157.5 metres (517 feet), the total weaving distance required would be the total: 317.5 metres (1042 feet). With the existing road configuration there is a total of 177,5 metres (582 feet) available from the merging end of Ramp W-S to the intersection at the South Service Road.

It is critical to note that this is not based on any determination of intersection capacity. It is based solely on the restricted distance between the terminus of Ramp W-S and the South Service Road. It is much too short to allow vehicles to queue at the left turn into Twin Oaks while others approach the end of a queue by weaving through southbound traffic on the Parkway. The disruption in traffic would lead to serious conflicts and accidents.

3. Will those exiting the Twin Oaks development destined for areas to the west via the E.C. Row Expressway have sufficient storage space to make the left turn onto Ramp S-W without affecting the flow of northbound through traffic?

In Part. To store the average flow of anticipated traffic so that vehicles and drivers could be protected from the through flows the distance required is 127.5 metres (418 feet) - less than the length of the existing left-turn bay. However, to accommodate fluctuations in traffic flow throughout a peak hour the minimum possibility of a queue of vehicles backing up into the southbound through lanes needs to be considered. (The minimum possibility assumed here would be only a 5% chance - or, two signal cycles in the hour). The storage length required for this condition is 187.5 metres (615 feet) in the afternoon peak and slightly less in the morning peak hour. The existing left-turn bay is 175 metres long (574 feet) - somewhat shy of the full requirement. In fact, at 175-metre storage length, analysis shows that the length will be exceeded 4% in the a.m. peak and 8% of the time in the p.m. peak. That is, for two to four cycles respectively in the morning and evening peak hours.

4. If there is neither sufficient space along Lauzon Parkway to allow for weaving manoeuvres nor adequate space for the construction of a left-turn at the intersection of the South Service Road, what other access possibilities are there? What form would they take and how could they be programmed to minimize the City's start-up costs?

The large volumes of weaving traffic between Ramp W-S and the South Service Road traffic cannot be accommodated on the Parkway. **Fourteen alternatives were studied** for access to the Twin Oaks area from the west. Of these, **Alternative F.2** is recommended because it proved to be the most beneficial for traffic operation and also it cost the least.

These improvements involve constructing a new Expressway ramp east of Lauzon Parkway to connect the lanes for eastbound traffic directly to the new Twin Oaks collector road (Ramp W-TO). This will decrease the amount of traffic having to make a left turn at the South Service Road by about sixty percent (440 pcuph).

Further to this, **Alternative A.2,** one of the other 13 concepts reviewed, while not able to accommodate all traffic from the entire development, can be used as a first stage of road improvements - **provided right turns on a red signal are prohibited. This prohibition is extremely important because the entire purpose for using Alternative A.2 is to eliminate the weaving manoeuvres north of the South Service Road intersection and to provide safe passage.**

These improvements involve extending that part of Ramp W-S paralleling the Expressway straight through to a signalized intersection at Lauzon Parkway. Here, motorists on the ramp will be provided with sufficient green time to prevent the need to turn right on the red signal. In fact, **the 'right turn on red' movement must be expressly prohibited. This is essential since the entire purpose of reconstructing this ramp is to break the north-south traffic flow so that it is not necessary for weaving manoeuvres to take place along the Parkway.** An added benefit is that the interruption in the traffic flow allows the left-turn bay at the South Service Road to be used alternately by the traffic demand from north on the Parkway and then by that from west on the Expressway. The flow from the north will arrive just as the advance green signal is activated and the flow from Ramp W-S travels into place as the signal switches to solid green. Also a long left turn bay (175 metres) is required at the signalized South Service Road intersection to accommodate traffic turning into the Twin Oaks Business Park from the north.

For example **Alternative A.2,** incorporates the left turn lane on Lauzon Parkway at the new collector, the rebuilding of Ramp W-S, and the installation of the traffic signals. All of which are integral to the concept.

5. What would be the timing for any road construction needed to accommodate future traffic?

Estimating a timing for commencing construction on the new ramp and the complimentary work is somewhat difficult since much depends upon the marketing strategies of the City, the type of development (labour intensive or not) and whether the general economic atmosphere is one in which businesses are comfortable to expand. Notwithstanding this, in accordance with the assumptions inherent in estimating traffic and considering traffic safety uppermost, it has been determined that development can be handled as a first stage by implementing **Alternative A.2** . This concept will be able to accommodate traffic between a signalized Ramp W-S and the South Service Road to a stage where the developed land is in the range of 66 to 82 ha (162 to 203 acres) - say, 75 ha (185 acres).

As the developed land approaches this level, the new ramp proposed in **Alternative F.2** would have to be constructed.

It is recommended that traffic volumes be monitored to assess the actual extent and impact of traffic as the land area is developed. This would allow the City to make a qualified judgement regarding the need for accelerating or deferring construction of Stage Two.

6. Given the recommendations for the two construction stages, is it possible, for economy, to break down the stages of construction into smaller elements?

No, not economically. Notwithstanding the fact that the Twin Oaks collector can be constructed in various stages, there are certain other elements that are inter-dependent:

To defer the building of Alternative A.2 (Stage One), it might be possible to utilize the existing ramp and lane arrangement up to a certain level of development. Problems will occur as motorist weave in the short distance between Ramp W-S and the South Service Road when the volume of vehicles turning left reaches 130 to 170 vehicles per hour. At this level, it has been estimated that the speed of traffic in the short weaving length will take place at about 50 k/hr which is much slower than current speeds of southbound flows on the Parkway. The extent of development to which these volumes are directly related is in the range of 18 to 24 hectares (45 to 60 acres). (All travel to and from Twin Oaks up to this time will be on Lauzon Parkway.) This is the greatest extent of development that could be accommodated by the **Null Alternative** - the **'do nothing' scenario.**

To put this interim solution in place, it is felt that a left turn of neither more nor less than 90 metres (300 feet) in length would need to be constructed. The length of the full-width median to the north of the left-turn bay is important because it would channel motorists into a weaving manoeuvre. A longer left turn bay would tempt motorists to cross abruptly into the left-turn lane if it were situated immediately across from the terminus of Ramp W-S. It would not be unusual to find motorists waiting on the ramp for a gap in the southbound flow (a stop that would not be anticipated by following motorists). **This parsing of Stage one is not recommended.**

D. Are there other road geometry improvements intimately related to the Twin Oaks project?

Yes, there are four in particular:

1. The lane arrangement for the buttonhook ramp where it meets the Twin Oaks collector is an important location and needs to be designed very carefully. The lane arrangement on the opposing road should avoid lining up with the ramp so that a motorist need not make an error and travel the wrong-way on the ramp and out onto the Expressway.

2. At the intersection of the collector and Lauzon Parkway, there will be a substantial right turn estimated at 610 pcuph. This requires a separate lane on the Twin Oaks collector as well as a through lane. To be properly aligned with lanes on the South Service Road, a left-turn lane is required as well.

3. The Twin Oaks collector meets Banwell Road on an extension of the alignment of Intersection Road. At the time this intersection is constructed, Intersection Road will need upgrading and likely reserved left-turn lanes.

4. Along the east side of the Lauzon Parkway there is a long tapered speed change lane for traffic exiting to Ramp S-E. (It is the remnant of a rural design.) This is the area where the new Twin Oaks collector will intersect the Parkway. It is recommended that the taper be removed and the intersection for the new Twin Oaks collector be joined to the outside edge of the two through lanes for northbound traffic. It is also recommended that the exit to Ramp S-E be constructed as an urban intersection at Ramp N-E. North of the Twin Oaks collector it is recommended that an auxiliary lane be added between the Twin Oaks collector and the new location of Ramp S-E. This will accommodate the south-to-east movement and provide an additional lane to aid the very large right turn (610 pcuph) in moving into the northbound traffic flow.

4.2 BANWELL ROAD

Issues that needed to be addressed concerning Banwell Road are:

A. Have there been an inordinate number of accidents on Banwell Road?

Collision statistics for Banwell Road were not studied since work by others has indicated that an interchange will be needed prior to the end of the 20-year planning period used for the Twin Oaks study. However, to date, neither the Province or the County of Essex has set an official date for construction of the interchange. It is anticipated that the proposed interchange between Banwell Road and Highway 2 will be in operation prior to the end of the Twin Oaks planning period (the year 2016).

B. Given the anticipated increase in traffic, would operational improvements accommodate the anticipated traffic volumes?

Yes, this is possible for areas outside of the Highway 2 intersection where, as noted,. there is a requirement for an interchange. Analysis for the Twin Oaks study showed that there would be very serious congestion at this intersection - even assuming four lanes in each direction on the Highway 2 approaches.

C. Would there be any need for road widenings or other road construction to accommodate the travel demand from the Twin Oaks Business Park?

Yes but not for some time. Development is most likely to proceed from the west to the east, hence, the traffic impact on Banwell Road will be delayed for several years. However, as Twin Oaks development proceeds and as the area along the east side of Banwell develops, the Twin Oaks access to Banwell Road (on the extension of Intersection Road) will be needed and it will become necessary to improve the intersection with paving and widening to increase the number of through lanes and to provide protected left-turn lanes.

4.3 OTHER CONSIDERATIONS

A. Are there other improvements indicated from the study findings that are not directly related to the Twin Oaks project?

Yes, an additional traffic lane for right turns will be required on the west approaches of the South Service Road at the intersection with Lauzon Parkway. This is necessary to accommodate a future right-turn for a southbound traffic volume of about 460 pcuph. This would allow the right turn to be synchronized with an advance left turn for the south-to-west movement.

B. Can Public Transit reduce the need for automobile travel to the extent that traffic volumes would be reduced substantially?

No, although it is intended by Transit Windsor to provide peak hour transit service this is not anticipated as sufficient to reduce vehicular traffic.

C. To what extent will pedestrians and cyclists be affected given anticipated traffic and the road proposals?

The street environments along Lauzon Parkway and Banwell Road are not conducive to walking or cycling. However, the Little River basin is the site for both pedestrian and cycling facilities and the City is actively promoting their construction and use.

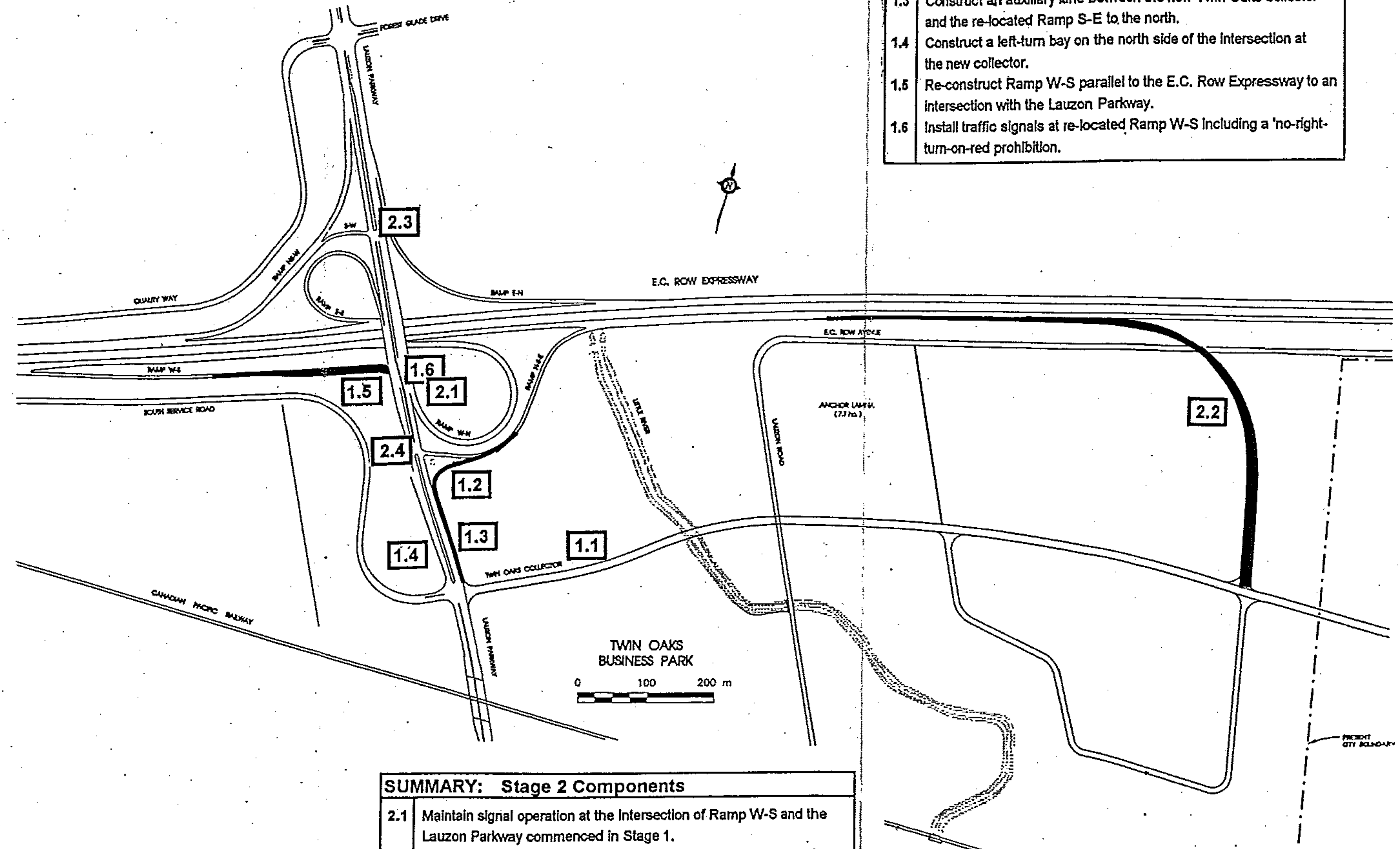
D. What is the impact of the Province transferring responsibility for roads to municipal governments?

In the case of constructing interchange ramps along the E.C. Row Expressway, it is of no concern that the Ministry of Transportation in Ontario does not support the buttonhook concept recommended for Stage 2 construction in this report - despite several installations being approved and carried out by the Ministry at other locations throughout the province.

One Final Point

Under no condition should any private access be allowed on the buttonhook ramp.

SUMMARY:	Stage 1 Components
1.1	Construct a new collector road into the Twin Oaks Business Park aligned with the South Service Road and starting at the east edge of the through lanes for northbound Parkway traffic.
1.2	Relocate Ramp S-E to the north at Ramp N-E and carry out underground work for a future traffic signal.
1.3	Construct an auxiliary lane between the new Twin Oaks collector and the re-located Ramp S-E to the north.
1.4	Construct a left-turn bay on the north side of the intersection at the new collector.
1.5	Re-construct Ramp W-S parallel to the E.C. Row Expressway to an intersection with the Lauzon Parkway.
1.6	Install traffic signals at re-located Ramp W-S including a 'no-right-turn-on-red prohibition.



SUMMARY:	Stage 2 Components
2.1	Maintain signal operation at the intersection of Ramp W-S and the Lauzon Parkway commenced in Stage 1.
2.2	Construct a new buttonhook ramp from the eastbound lanes of the E. C. Row Expressway into Twin Oaks Business Park
2.3	Install traffic signal at Ramp S-W if monitoring traffic indicates a need
2.4	Install traffic signal at Ramp N-E if monitoring traffic indicates a need

Figure 4.1 RECOMMENDED ROAD PLAN

APPENDICES TO

TRAFFIC ANALYSIS AND PLANNING REPORT

TWIN OAKS BUSINESS PARK

City of Windsor, Ontario

February, 1997

Prepared by:

E. Fearnley Limited Willowdale, Ontario

for:

La Fontaine, Cowie, Buratto, and Associates Windsor, Ontario

APPENDICES

A. TRIP GENERATION RATES

B. TRIP DISTRIBUTION FACTORS

SOURCE: TRAFFIC ANALYSIS AND PLANNING REPORT
TECUMSEH ROAD EAST RE-CONSTRUCTION PROJECT
E. FEARNLEY LIMITED, 1996.

C. EXISTING TRAFFIC AND DEVELOPMENT OF DESIGN HOUR VOLUMES

1. LAUZON PARKWAY
2. BANWELL ROAD

D. FUTURE TRAFFIC VOLUME vs EXISTING ROAD CAPACITY

E. ALTERNATIVES FOR ACCESS FROM THE WEST

F. SAMPLE WEAVING CALCULATIONS

G. BUTTONHOOK RAMPS IN ONTARIO

APPENDIX A

TRIP GENERATION FACTORS

APPENDIX A TABLE 1

1995 TRIP GENERATION: (a)
GENERAL MOTORS TRIM PLANT (LAUZON ROAD)
LAND USE TYPE: MEDIUM INDUSTRY

File: c:\TwinOaks\TG\Ind-95

Time of Day	Total Two-way Traffic	Directional Split INbound	Directional Split OUTbound
MORNING	NA	NA	NA
AFTERNOON/EVENING			
2:45 to 3:45 p.m.	NA	NA	635
Trip Generation Rate: Peak Hour	OUTBOUND ONLY - P.M.		4.96 (a)
Directional Split as Percent	--------------->		Not Known

NOTE: (a) Vehicle Trips per Gross Acre of developed land during the peak hour for exiting traffic. (parking lot count). Total area of GMC Trim Plant property on Lauzon Road as measured from aerial photos = 128.08 acres in 1995. (Verified by Trim Plant staff.)

APPENDIX A TABLE 2

TRIP GENERATION RATES (a)
LAND USE TYPE: LIGHT INDUSTRY (b)

File: c:\TwinOaks\TG\Ind-95

Time of Day	Total Two-way Traffic	Directional Split INbound	Directional Split OUTbound
MORNING (a)	7.51	6.23	1.28
Directional Split as Percent	100%	83%	17%
AFTERNOON/EVENING (a)	7.26	.87	6.39
Directional Split as Percent	100%	12%	88%

NOTE: (a) Vehicle Trips per Gross Acre of developed land during the peak hour for adjacent street traffic.
(b) SOURCE:
Trip Generation, Institute of Transportation Engineers Fifth Edition, 1991, Pages 102 and 103.

APPENDIX A TABLE 3

TRIP GENERATION RATES (a) (b)
LAND USE TYPE: INDUSTRIAL PARK

File: c:\TwinOaks\TG\Ind-95

Time of Day	Total Two-way Traffic	Directional Split INbound	Directional Split OUTbound
MORNING (a)	10.09	8.27	1.82
Directional Split	100%	82%	18%
AFTERNOON/EVENING (a)	10.48	2.20	8.28
Directional Split	100%	21%	79%

NOTE: (a) Vehicle Trips per Gross Acre of developed land during the peak hour for adjacent street traffic.
(b) SOURCE:
Trip Generation, Institute of Transportation Engineers Fifth Edition, 1991, Pages 145 and 146.

APPENDIX A TABLE 4

1995 TRIP GENERATION: WALKER INDUSTRIAL PARK (a)

File: c:\TwinOaks\TG\Ind-95

Time of Day	INbound Traffic Volumes (b) Central Avenue	Rhodes Avenue	Total Trips	OUTbound Traffic Volumes (b) Central Avenue	Rhodes Avenue	Total Trips	Totals for Two-way Traffic	Proportion: Peak Hour vs Peak Period
MORNING								
7:00 to 8:00 a.m.	593	148	741	188	57	245	986	
8:00 to 9:00 a.m.	629	174	803	237	70	307	1110	
Totals 2-hour Peak Period	1222	322	1544	425	127	552	2096	
Peak Hour: 7:15 to 8:15 a.m.	679	161	840	195	64	259	1099	
Trip Generation Rates (a)			3.17			.98	4.15	
Directional Split			76%			24%	100%	52%
AFTERNOON/EVENING								
3:00 to 4:00 p.m.	398	69	467	558	142	700	1167	
4:00 to 5:00 p.m.	320	54	374	538	137	675	1049	
5:00 to 6:00 p.m.	146	32	178	514	239	753	931	
Totals: 3-hour Peak Period (c)	864	155	1019	1610	518	2128	3147	
Trip Generation Rates: 3-hr Peak Period (a)			3.85			8.03	11.88	
Peak Hour: 3:00 to 4:00 p.m.	398	69	467	558	142	700	1167	
Trip Generation Rates: Peak Hour (a)			1.76			2.64	4.40	
Directional Split			40%			60%	100%	37%

NOTE: (a) Vehicle Trips per Gross Acre of developed land as measured from aerial photographs = 264.9 acres in 1995.
(b) SOURCE: City of Windsor Automatic Traffic Recorder Counts, July, 1995.
City of Windsor Turning Movement Counts, Central Avenue and E.C.Row Ramp W-NS, August, 1995
(c) Total inbound and outbound traffic from 2:00 p.m. to 5:00 p.m. is within 3% of the 3-hour period from 3:00 p.m. to 6:00 p.m.

APPENDIX A TABLE 5

1994 TRIP GENERATION: WALKER INDUSTRIAL PARK (a)

File: c:\TwinOaks\TG\Ind-94

Time of Day	INbound Traffic Volumes (b) Central Avenue	Rhodes Avenue	Total Trips	OUTbound Traffic Volumes (b) Central Avenue	Rhodes Avenue	Total Trips	Totals for Two-way Traffic	Proportion: Peak Hour vs Peak Period
MORNING								
Peak Hour: 7:15 to 8:15 a.m.	679	157	836	195	63	258	1094	
Trip Generation Rates (a)			3.16			.97	4.13	
Directional Split			76%			24%	100%	NA
AFTERNOON/EVENING								
Peak Hour: 3:00 to 4:00 p.m.	398	64	462	558	142	700	1162	
Trip Generation Rates: Peak Hour		(a)	1.74			2.64	4.39	
Directional Split			40%			60%	100%	NA

NOTE: (a) Vehicle Trips per Gross Acre of developed land as measured from aerial photographs = 264.9 acres for 1995.
(b) SOURCE: City of Windsor Automatic Traffic Recorder Counts, July, 1995.
City of Windsor Turning Movement Counts, Central Avenue and E.C.Row Ramp W-NS, August, 1995

Single-Family Detached Housing (< 300 Units) (210)

Average Vehicle Trip Ends vs:	Dwelling Units
On a:	Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m.

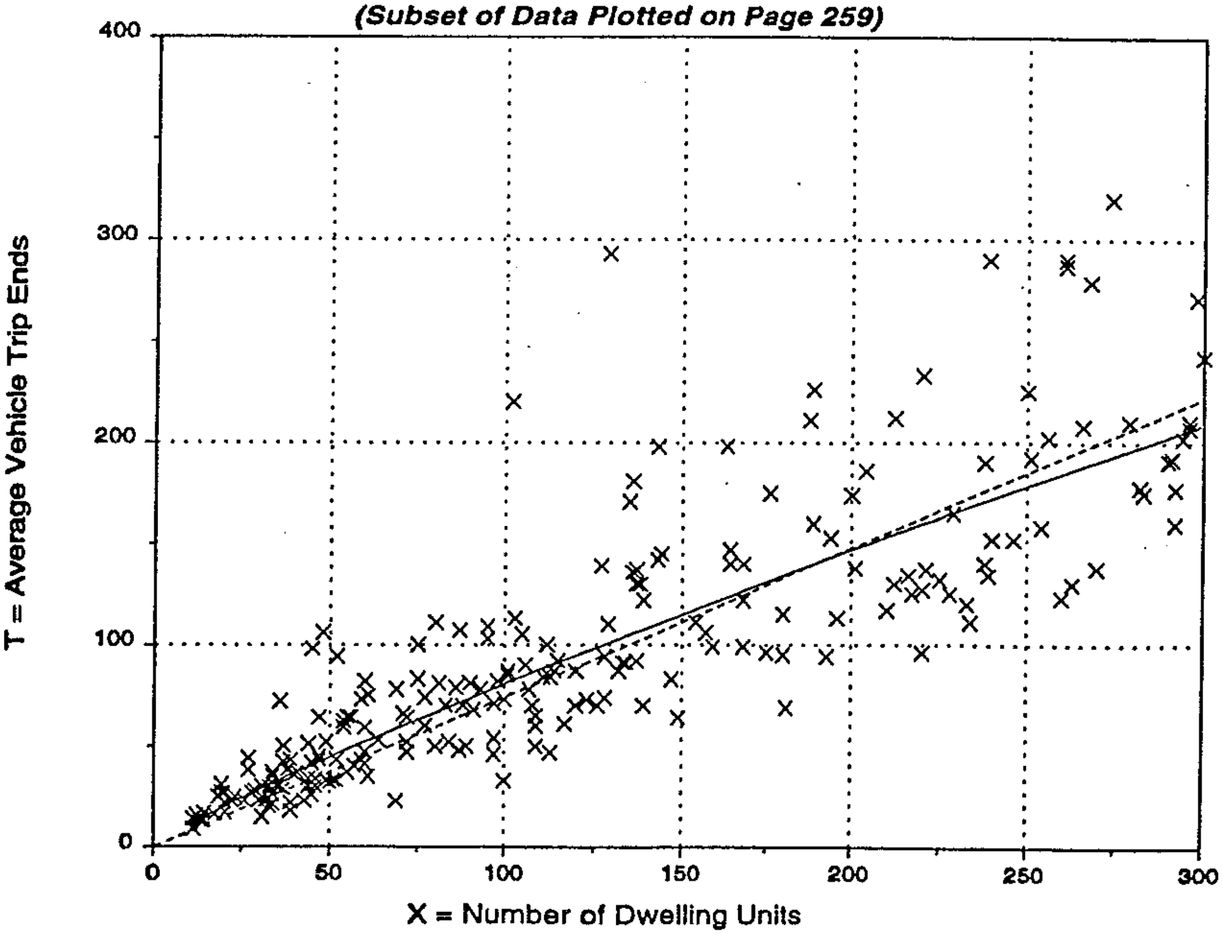
Number of Studies:	280
Average Number of Dwelling Units:	210
Directional Distribution:	26% entering, 74% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.74	0.33 - 2.27	0.90

Data Plot and Equation

(Subset of Data Plotted on Page 259)



X Actual Data Points —— Fitted Curve ------ Average Rate

Fitted Curve Equation: $Ln(T) = 0.867\ Ln(X) + 0.398$ $R^2 = 0.89$

Single-Family Detached Housing
(210)

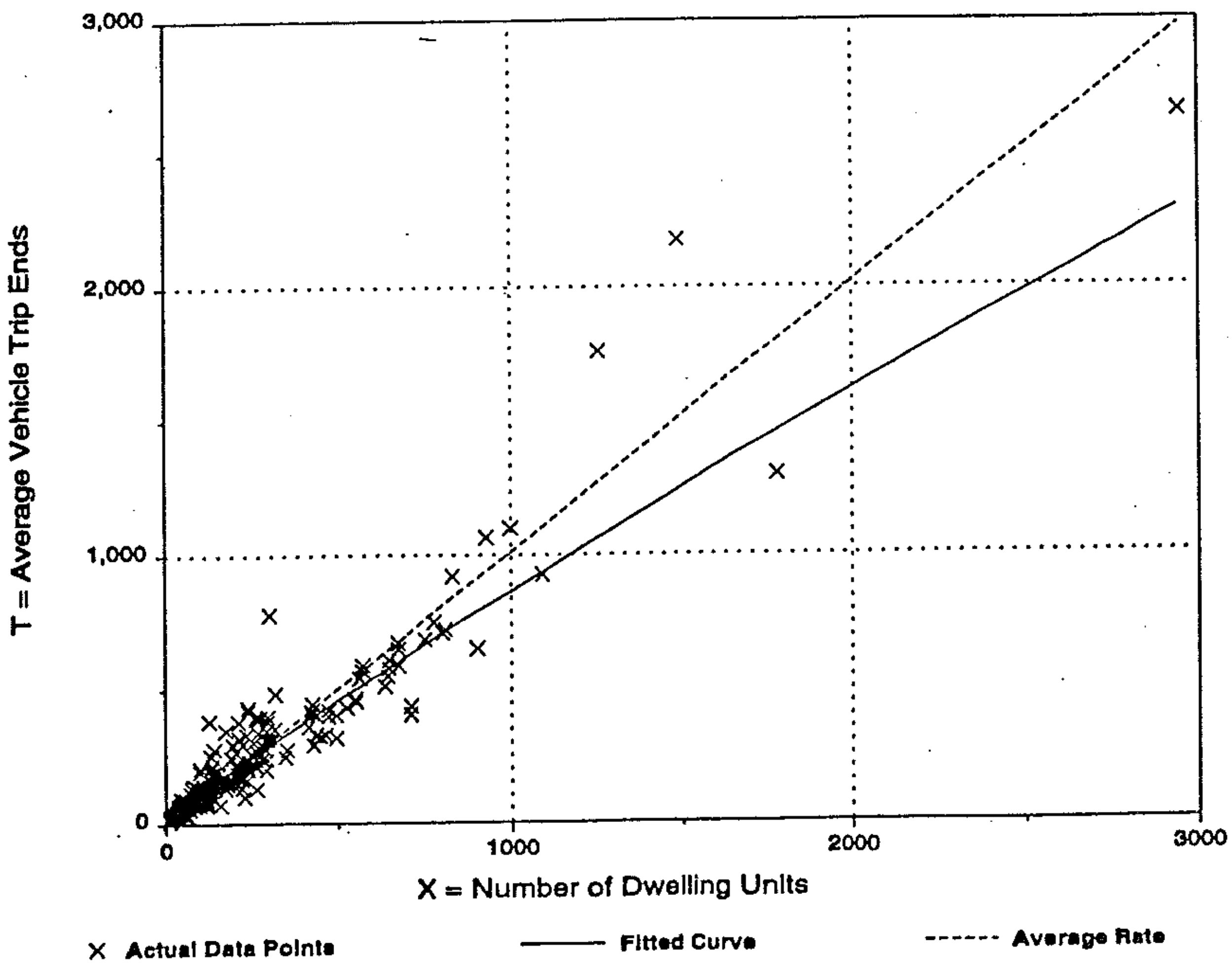
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Number of Studies: 301
Average Number of Dwelling Units: 222
Directional Distribution: 65% entering, 35% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
1.01	0.42 - 2.98	1.05

Data Plot and Equation



Fitted Curve Equation: $Ln(T) = 0.902\ Ln(X) + 0.528$ $R^2 = 0.92$

APPENDIX B

TRIP DISTRIBUTION FACTORS

SOURCE: TRAFFIC ANALYSIS AND PLANNING REPORT
TECUMSEH ROAD EAST RE-CONSTRUCTION PROJECT
E. Fearnley Limited, 1995

TRIP DISTRIBUTION FACTORS

The exhibit in this appendix gives approximate proportions for the home end of trips generated in activity areas.

Since there was no up-to-date origin-destination information available for the City, residential areas were marked on a map and the proportions of total trip ends were estimated and noted as percentages of the total. A balance is provided since the total must equal 100%. The figures represent a level of activity and as such are subject to adjustment depending upon the proximity of a generator. For example, the closer a residential area is to a major activity area, the more likely it is for travel to gravitate towards that centre - particularly for shopping or other non-work trip purposes. A transportation planner would be cognizant of this and other factors and adjust distributions (and traffic assignments) accordingly. The proportions shown on the exhibit were used for distributing all site-generated trips resulting from the new industrial development in the Twin Oaks area.

These distribution values are not intended to represent actual population. They are merely guides, in the absence of other data, to assist in the distribution and assignment of trips.

An illustration of the use of these factors follows. For example, for every 100 trips to and from Twin Oaks, a review of the percentages indicates that most trips would originate to the west of Lauzon Parkway, somewhat fewer to the north, and the fewest to the south and east. **Traffic was assigned to the road network accordingly.**

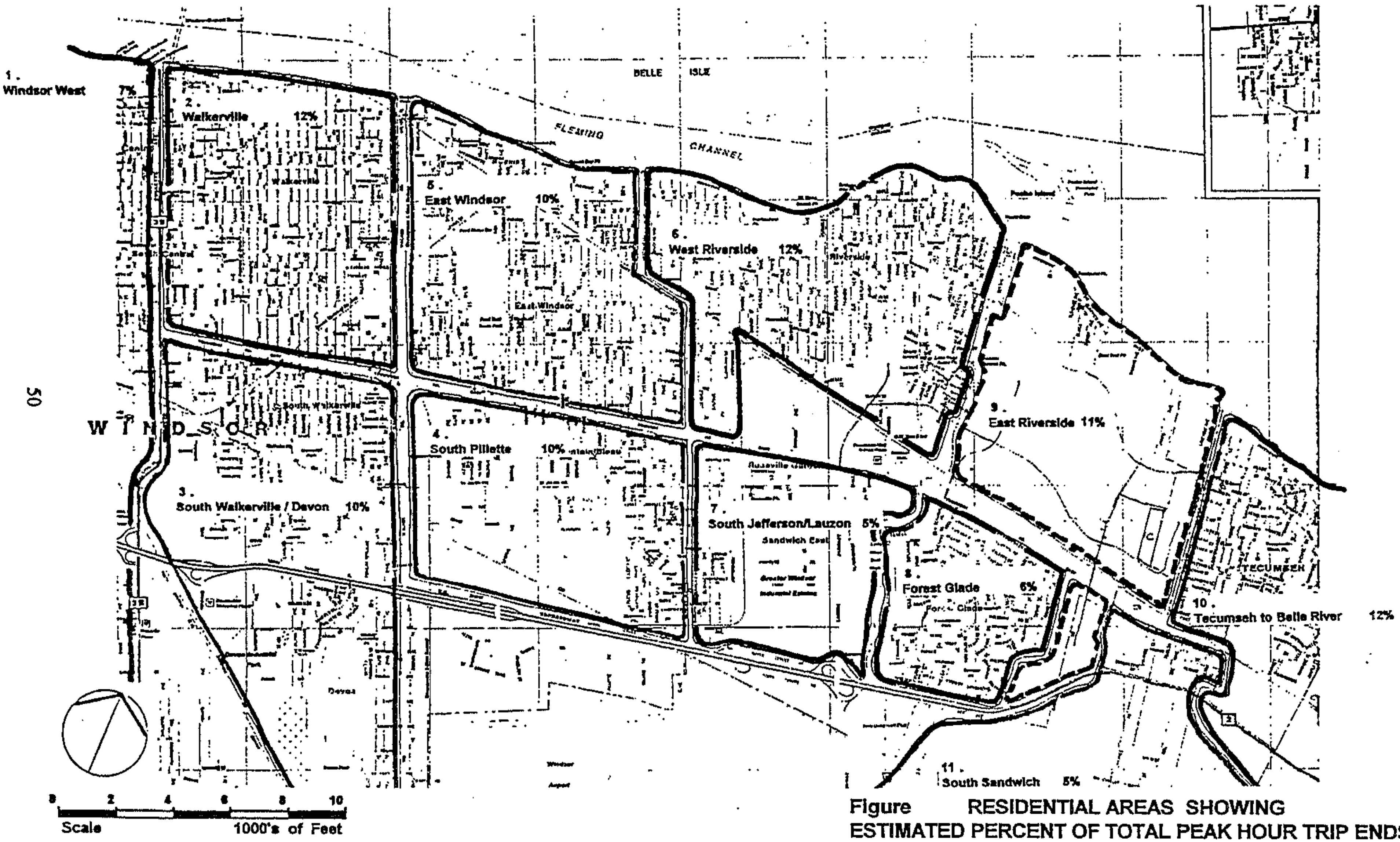


Figure RESIDENTIAL AREAS SHOWING ESTIMATED PERCENT OF TOTAL PEAK HOUR TRIP ENDS

APPENDIX B

APPENDIX C

EXISTING TRAFFIC AND DEVELOPMENT OF DESIGN HOUR VOLUMES

APPENDIX C.1

LAUZON PARKWAY

EXISTING TRAFFIC AND DEVELOPMENT OF DESIGN HOUR VOLUMES

A P P E N D I X C.1 - F I G U R E 1

L A U Z O N P A R K W A Y (a)
E X I S T I N G P E A K H O U R T R U C K T R A F F I C

C N R R A I L W A Y T O Q U A L I T Y W A Y A N D F O R E S T G L A D E D R I V E

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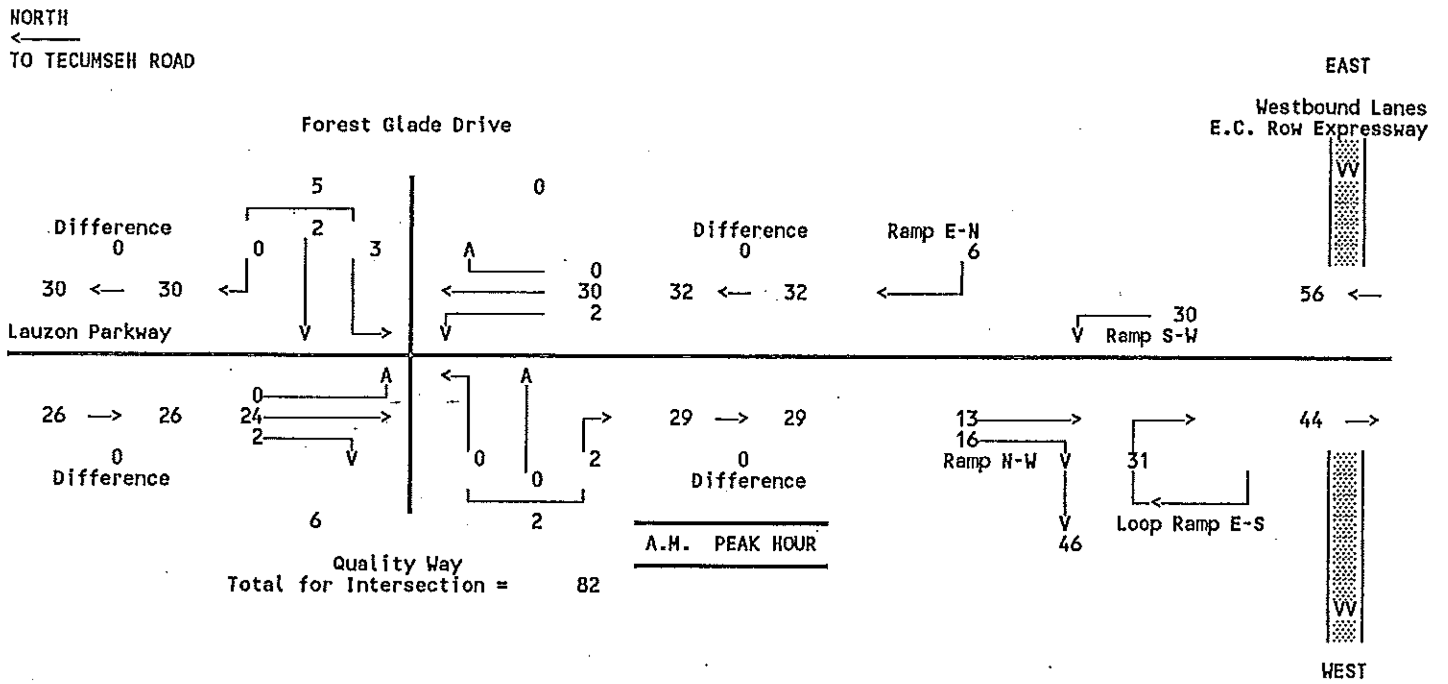
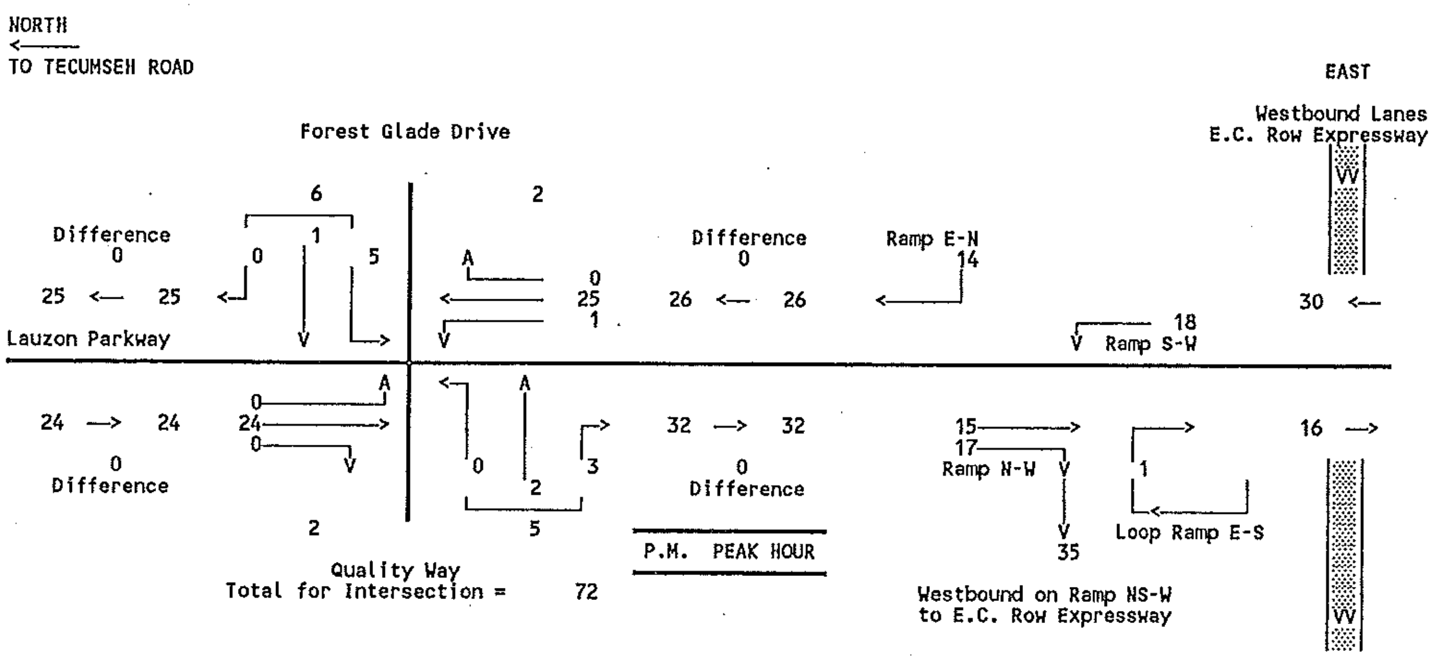
Directory: c:\TwinOaks\Rep\App



A.M. E X I S T I N G P E A K H O U R T R U C K T R A F F I C

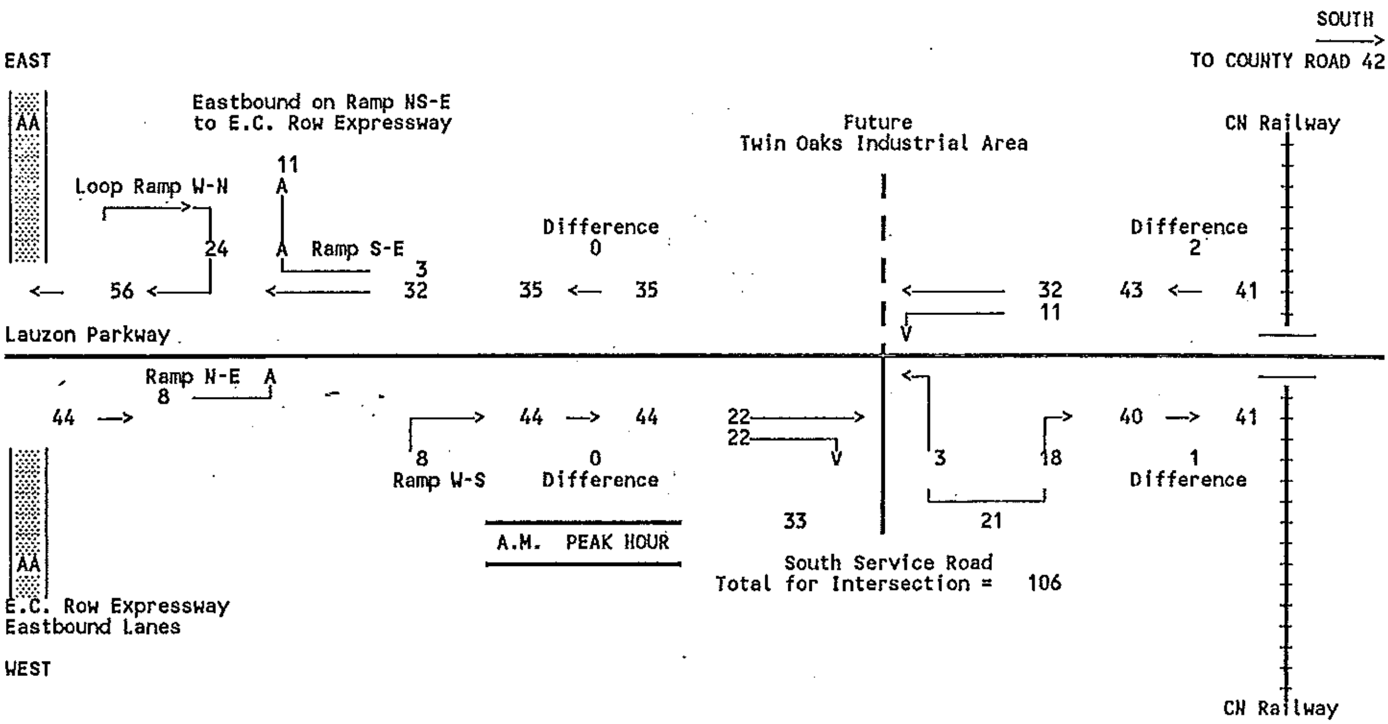
P.M. E X I S T I N G P E A K H O U R T R U C K T R A F F I C



NOTE: (a) SOURCE for all base data recorded in Appendix C.1:
City of Windsor records and special traffic surveys carried out by
E. Fearnley Limited and LaFontaine, Cowie, Buratto and Associates.

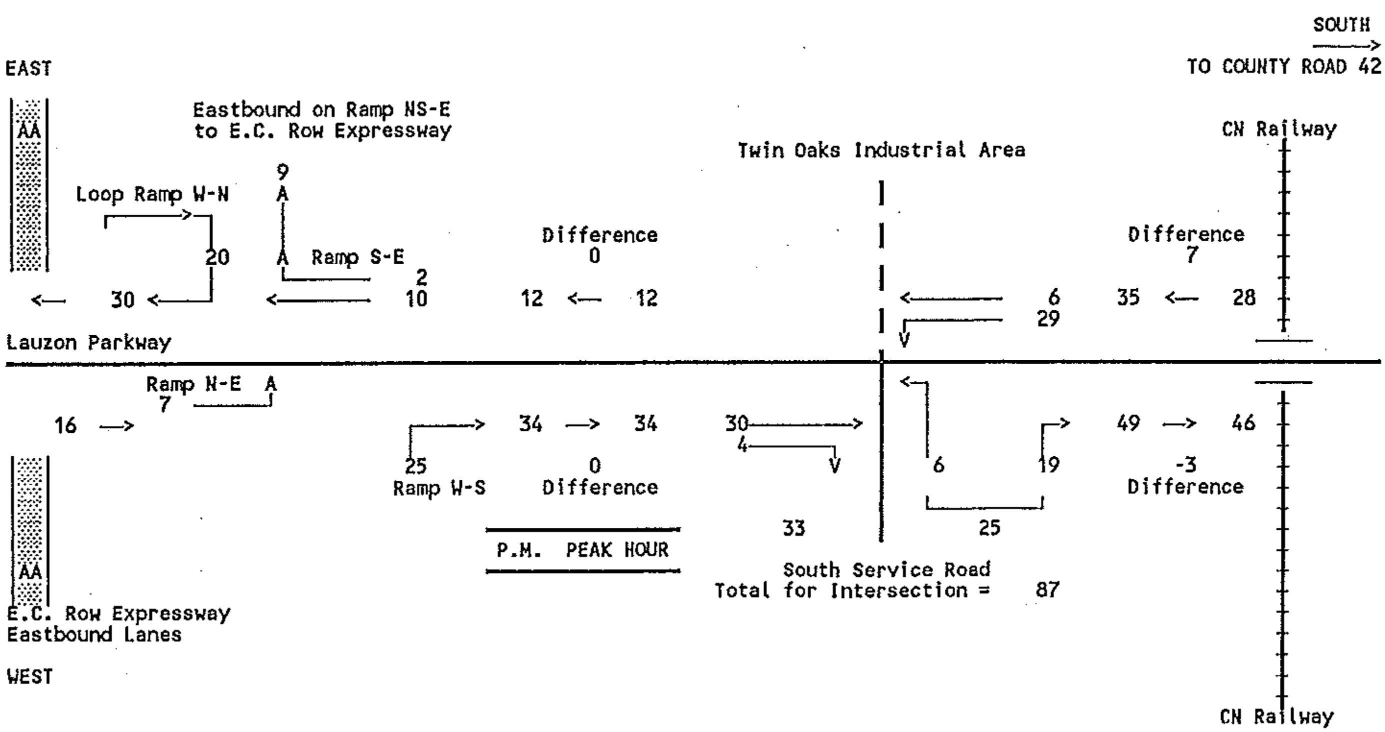
LAUZON PARKWAY
EXISTING PEAK HOUR TRUCK TRAFFIC

CNR RAILWAY TO QUALITY WAY AND FOREST GLADE DRIVE



A.M. EXISTING PEAK HOUR TRUCK TRAFFIC

P.M. EXISTING PEAK HOUR TRUCK TRAFFIC



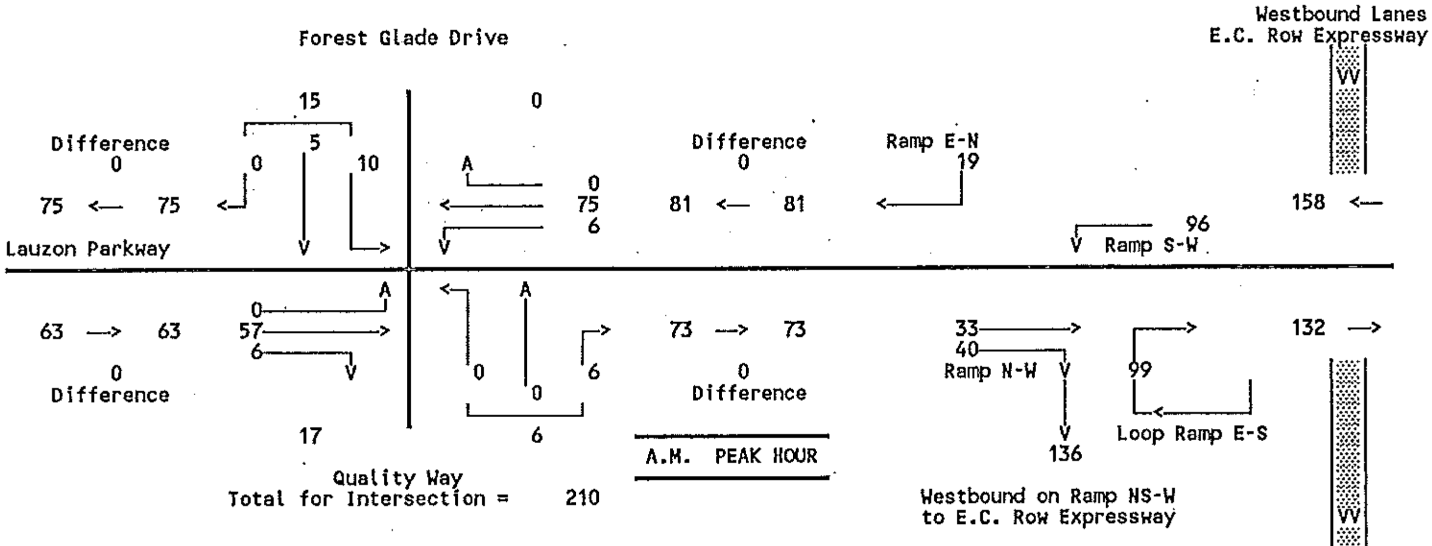
A P P E N D I X   C.1   -   F I G U R E   2

L A U Z O N   P A R K W A Y
P E A K   H O U R   T R U C K   T R A F F I C   A S   P A S S E N G E R   C A R   E Q U I V A L E N T S

C N R   R A I L W A Y   T O   Q U A L I T Y   W A Y   A N D   F O R E S T   G L A D E   D R I V E

File: C1
Directory: c:\TwinOaks\Rep\App

NORTH
<——
TO TECUMSEH ROAD



NOTE: To obtain truck equivalents as cars these factors are used:
3.2 passenger cars for left turns and right turns on upward slopes and
2.5 passenger cars for other movements.

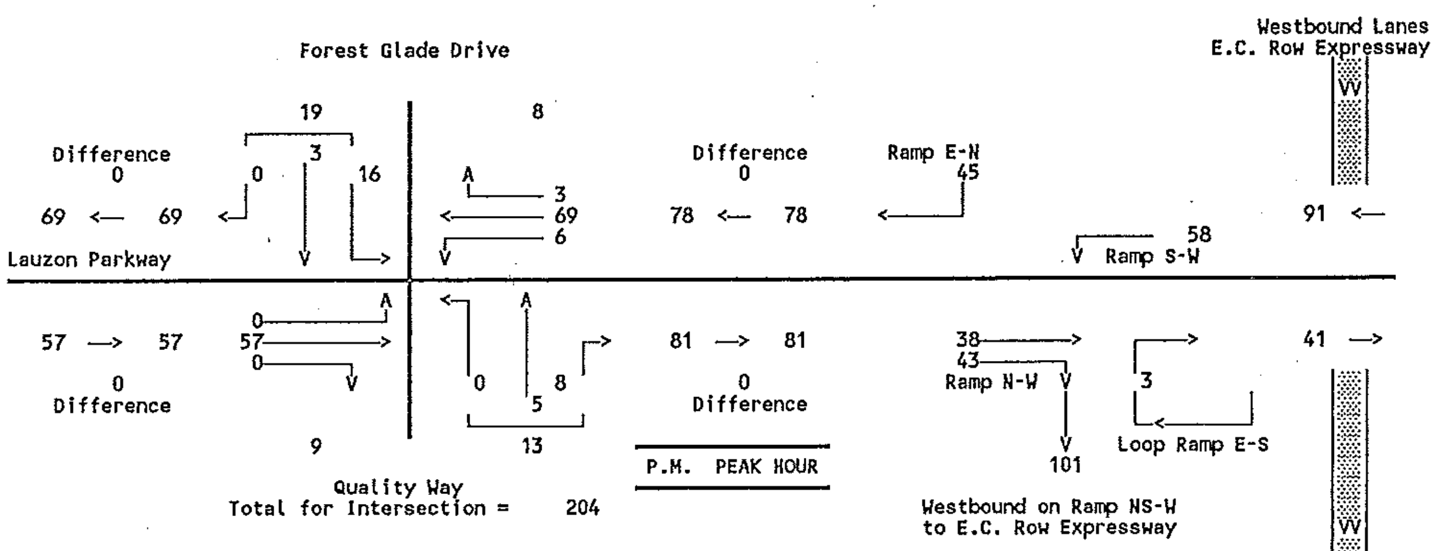
WEST

A.M. P E A K   H O U R   T R U C K   T R A F F I C   A S   P A S S E N G E R   C A R   E Q U I V A L E N T S

P.M. P E A K   H O U R   T R U C K   T R A F F I C   A S   P A S S E N G E R   C A R   E Q U I V A L E N T S

NORTH
<——
TO TECUMSEH ROAD

EAST

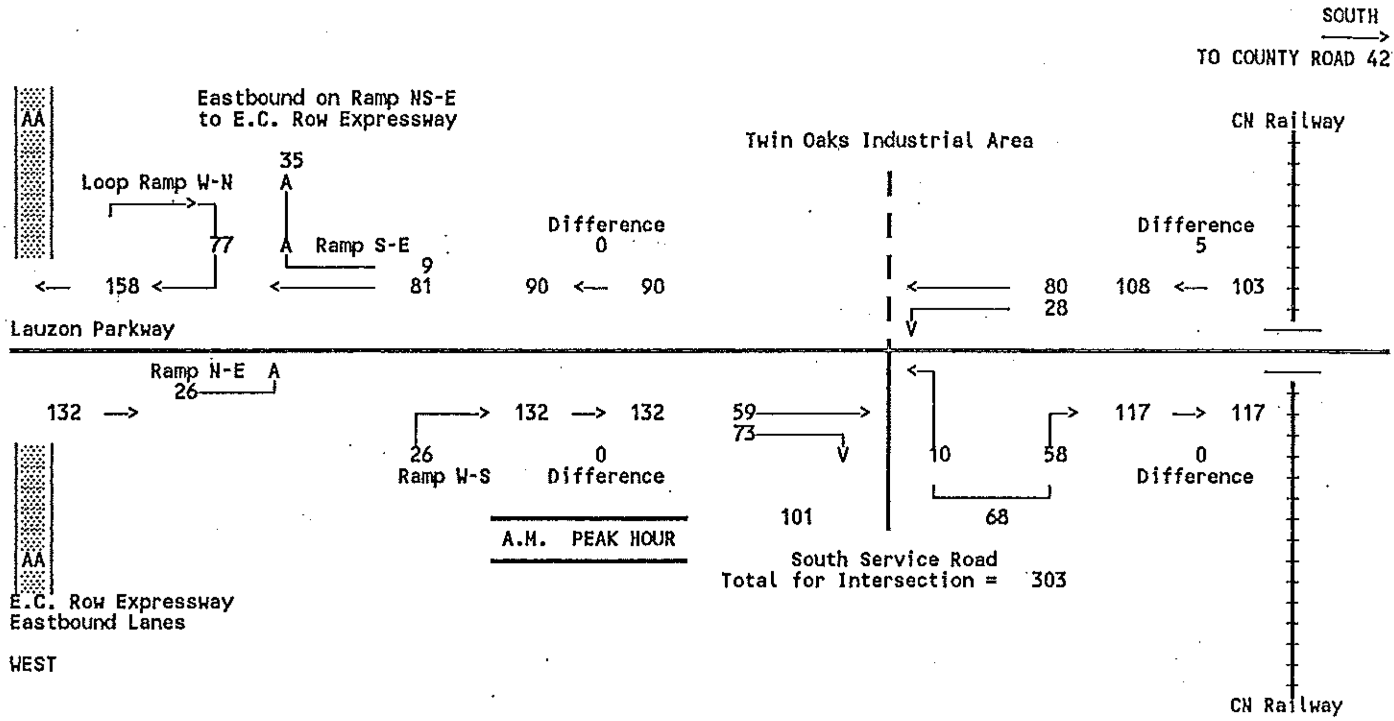


NOTE: To obtain truck equivalents as cars these factors are used:
3.2 passenger cars for left turns and right turns on upward slopes and
2.5 passenger cars for other movements.

WEST

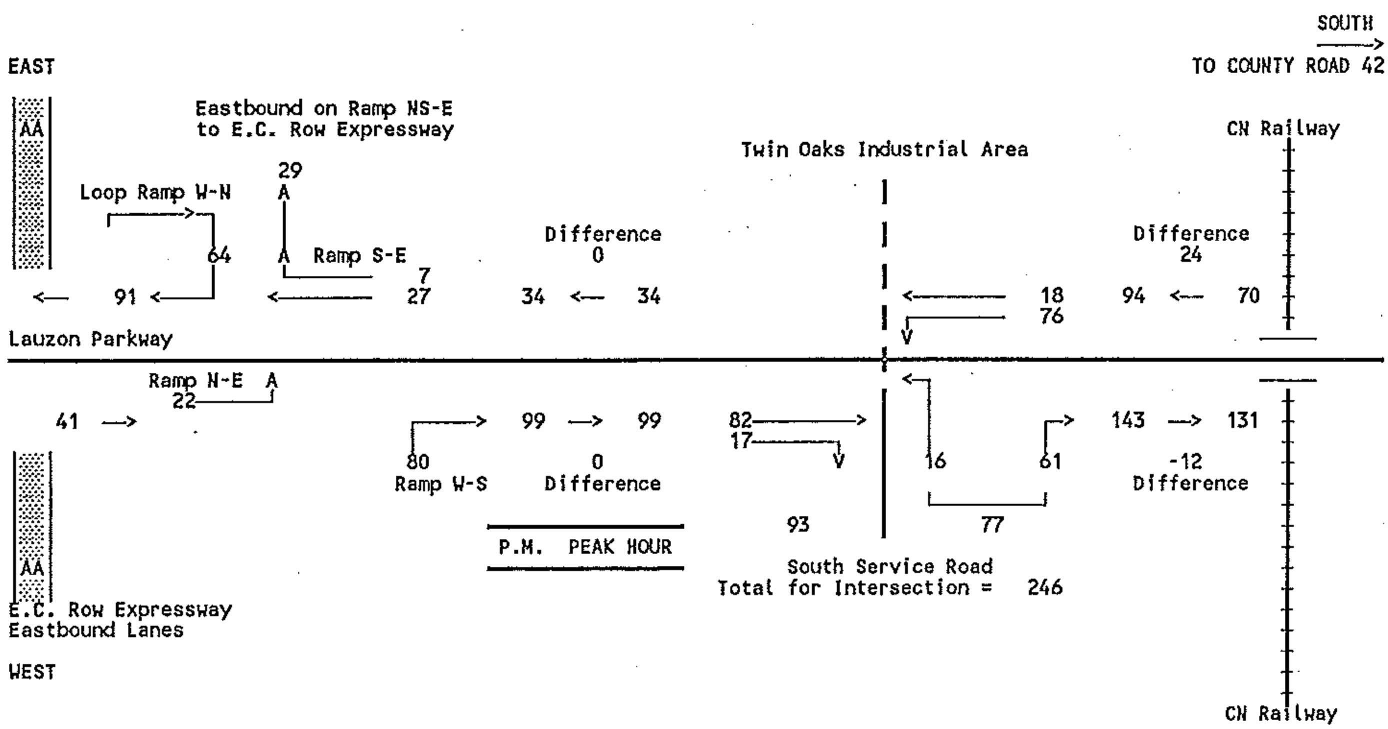
LAUZON PARKWAY
PEAK HOUR TRUCK TRAFFIC AS PASSENGER CAR EQUIVALENTS

CNR RAILWAY TO QUALITY WAY AND FOREST GLADE DRIVE



A.M. PEAK HOUR TRUCK TRAFFIC AS PASSENGER CAR EQUIVALENTS

P.M. PEAK HOUR TRUCK TRAFFIC AS PASSENGER CAR EQUIVALENTS

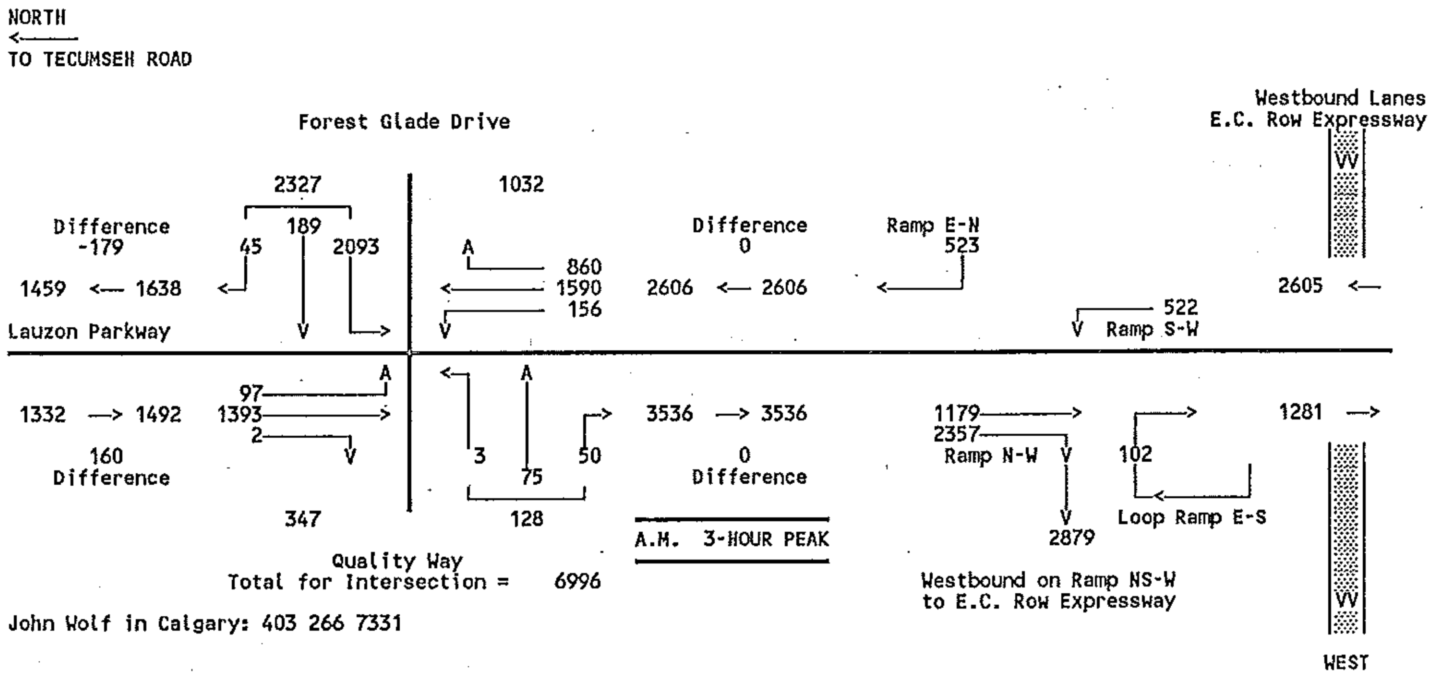


APPENDIX C.1 - FIGURE 3

LAUZON PARKWAY
AUTOMOBILE TRAFFIC: 3-HOUR PEAK PERIOD (BALANCED)

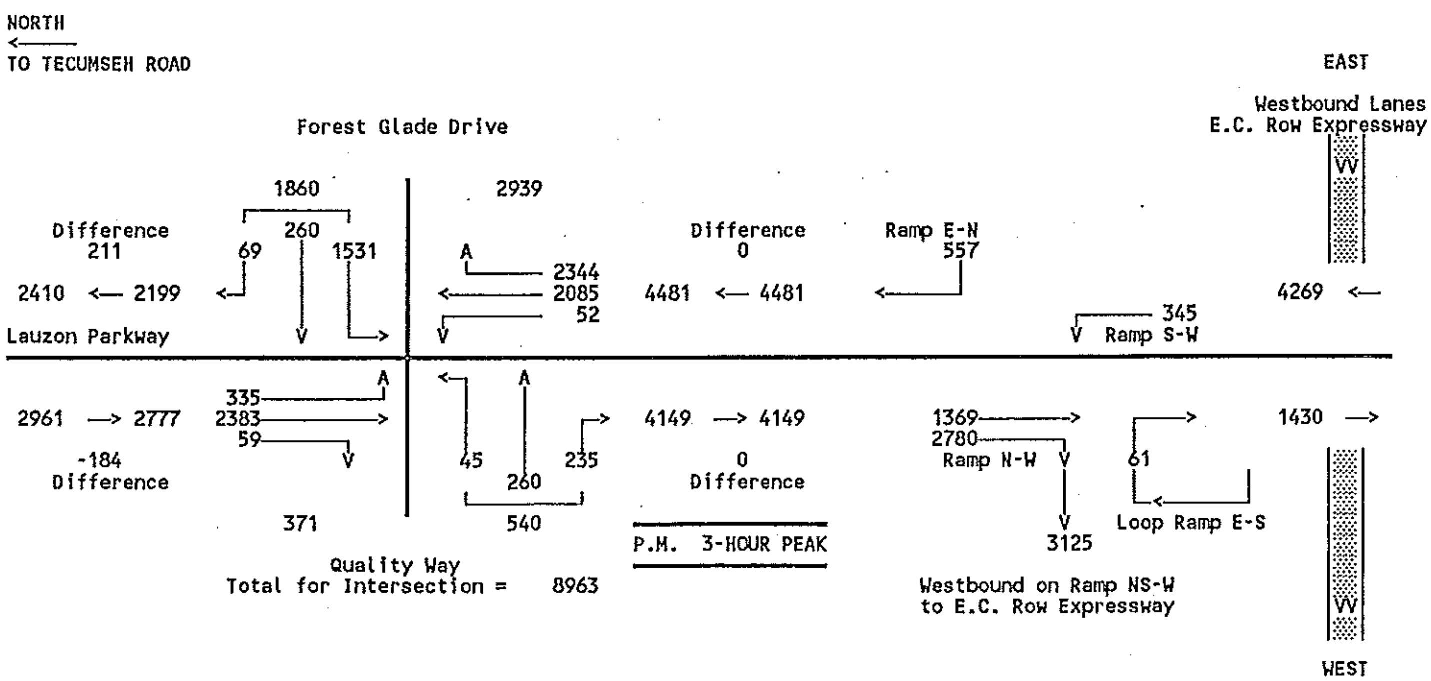
CNR RAILWAY TO QUALITY WAY AND FOREST GLADE DRIVE

File: C1
Directory: c:\TwinOaks\Rep\App



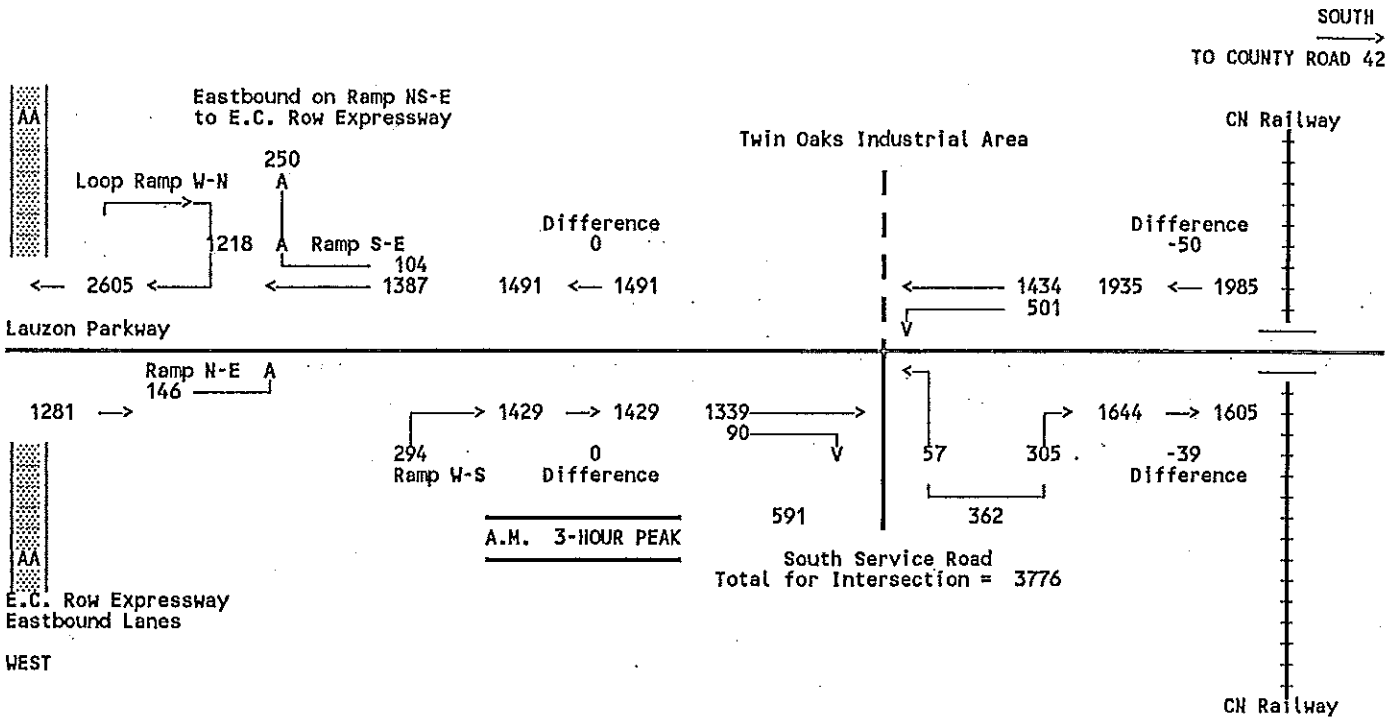
A.M. AUTOMOBILE TRAFFIC: 3-HOUR PEAK PERIOD (BALANCED)

P.M. AUTOMOBILE TRAFFIC: 3-HOUR PEAK PERIOD (BALANCED)



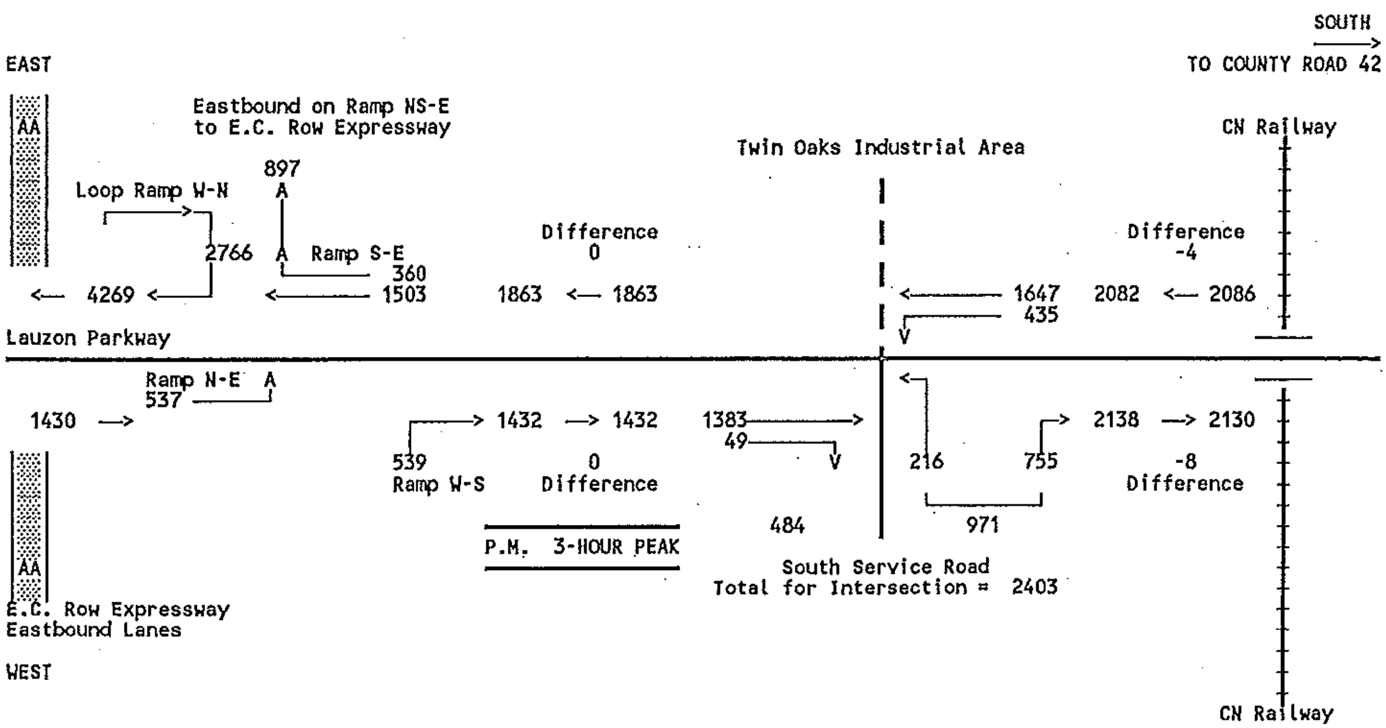
LAUZON PARKWAY
AUTOMOBILE TRAFFIC: 3-HOUR PEAK PERIOD (BALANCED)

CNR RAILWAY TO QUALITY WAY AND FOREST GLADE DRIVE



A.M. AUTOMOBILE TRAFFIC: 3-HOUR PEAK PERIOD (BALANCED)

P.M. AUTOMOBILE TRAFFIC: 3-HOUR PEAK PERIOD (BALANCED)



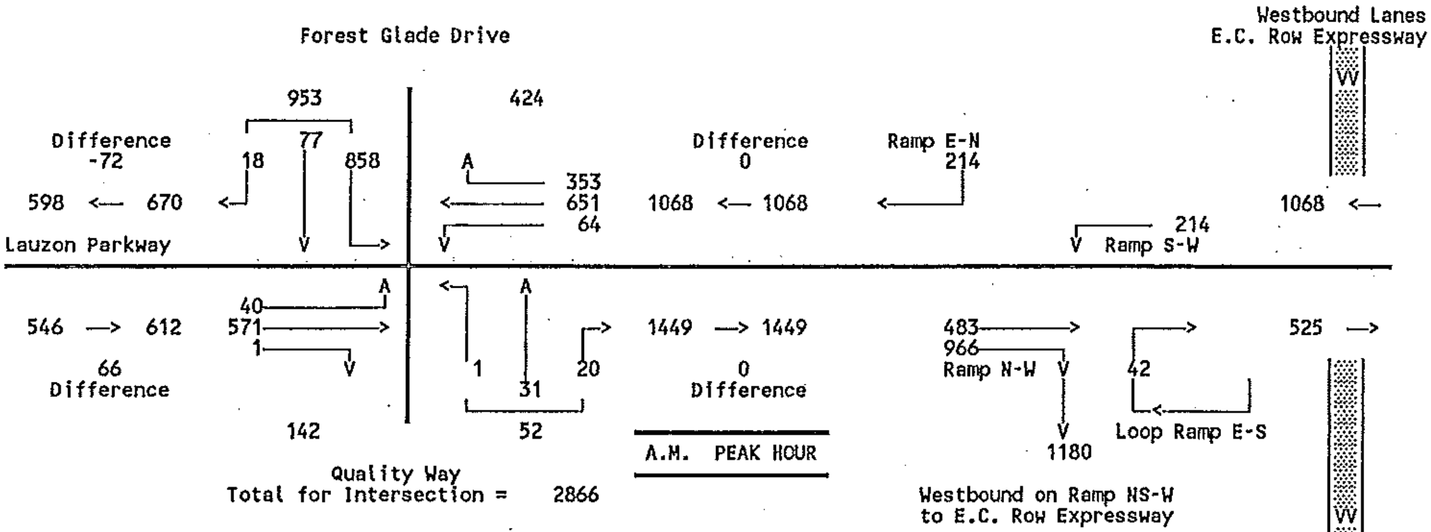
APPENDIX C.1 - FIGURE 4

LAUZON PARKWAY
PEAK HOUR AUTOMOBILE TRAFFIC

CNR RAILWAY TO QUALITY WAY AND FOREST GLADE DRIVE

File: C1
Directory: c:\TwinOaks\Rep\App

NORTH
<——
TO TECUMSEH ROAD



NOTE: Morning peak hour traffic for passenger cars averages 41.0% of the 3-hour peak period volume.

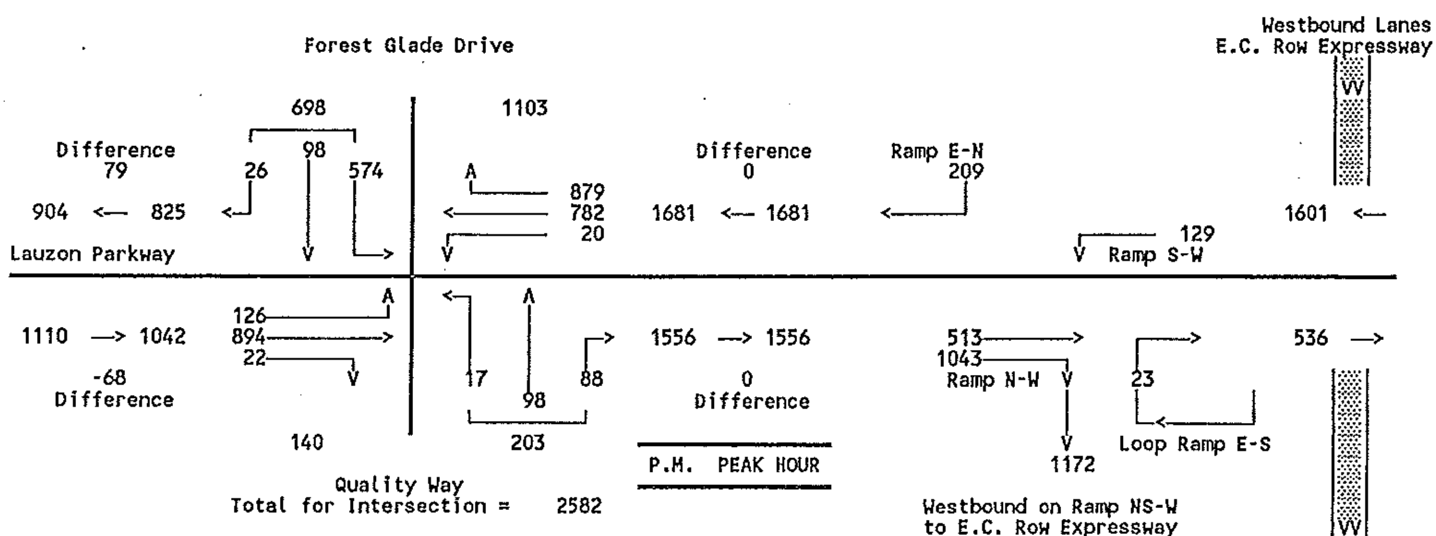
WEST

A.M. PEAK HOUR AUTOMOBILE TRAFFIC

P.M. PEAK HOUR AUTOMOBILE TRAFFIC

NORTH
<——
TO TECUMSEH ROAD

EAST

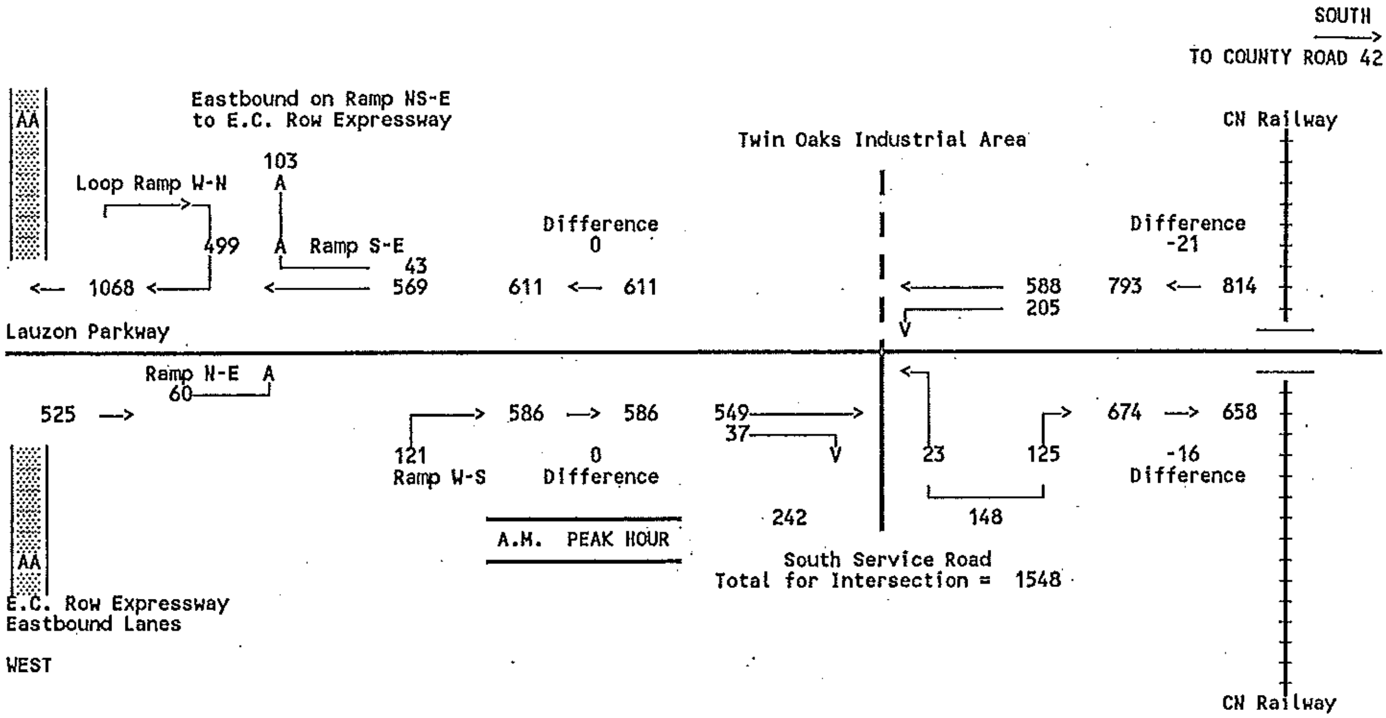


NOTE: Morning peak hour traffic for passenger cars averages 37.5% of the 3-hour peak period volume.

WEST

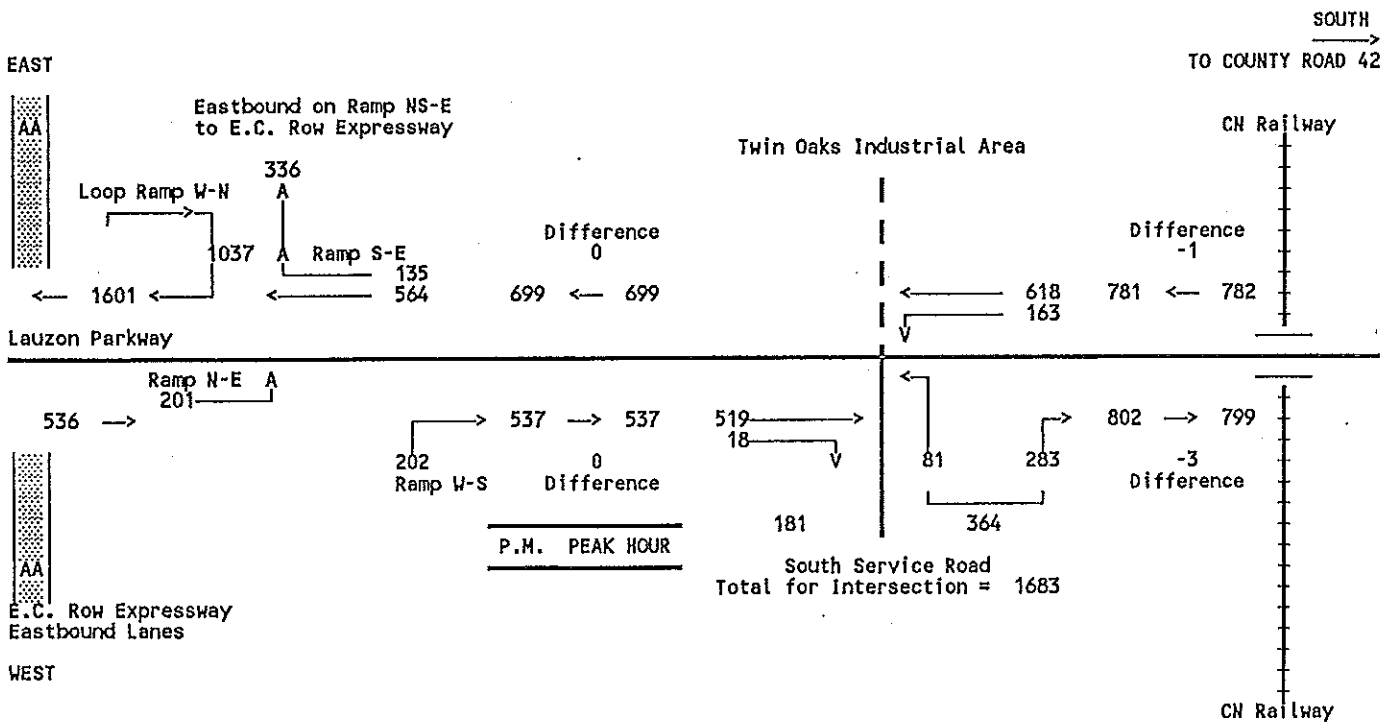
LAUZON PARKWAY
PEAK HOUR AUTOMOBILE TRAFFIC

CNR RAILWAY TO QUALITY WAY AND FOREST GLADE DRIVE



A.M. PEAK HOUR AUTOMOBILE TRAFFIC

P.M. PEAK HOUR AUTOMOBILE TRAFFIC



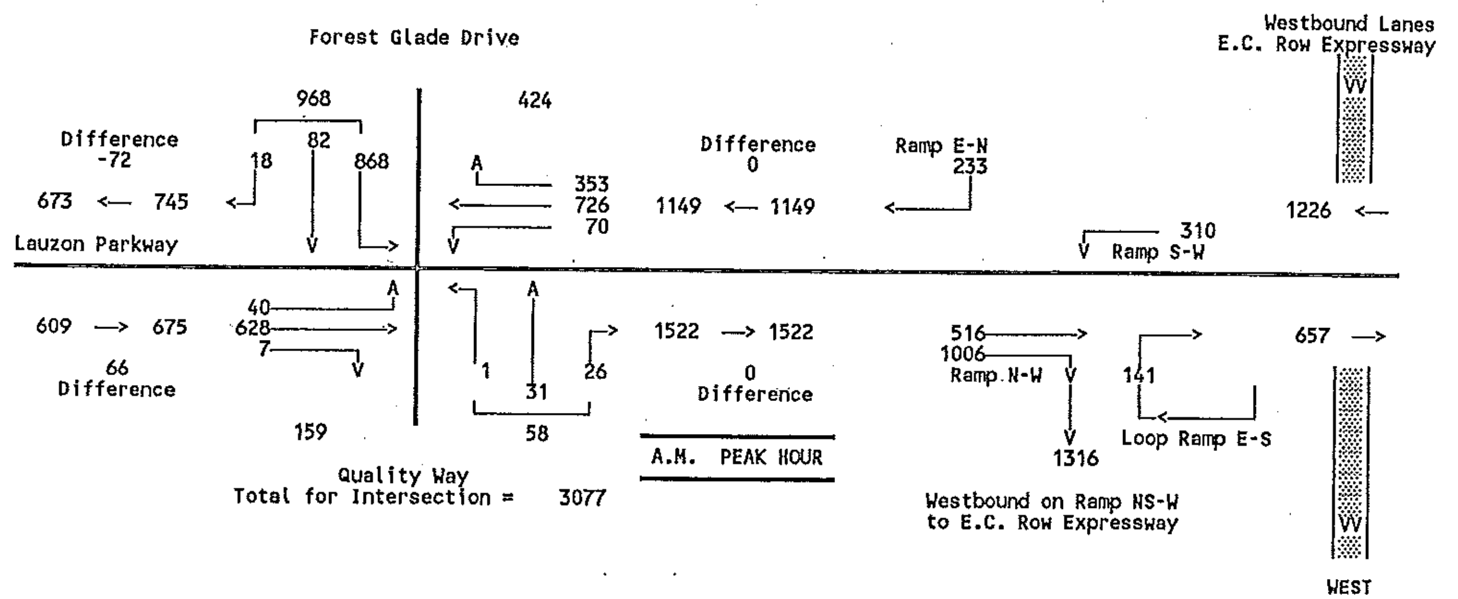
APPENDIX C.1 - FIGURE 5

LAUZON PARKWAY
EXISTING PEAK HOUR TRAFFIC IN PASSENGER CARS PER HOUR

CNR RAILWAY TO QUALITY WAY AND FOREST GLADE DRIVE

File: C1
Directory: c:\TwinOaks\Rep\App

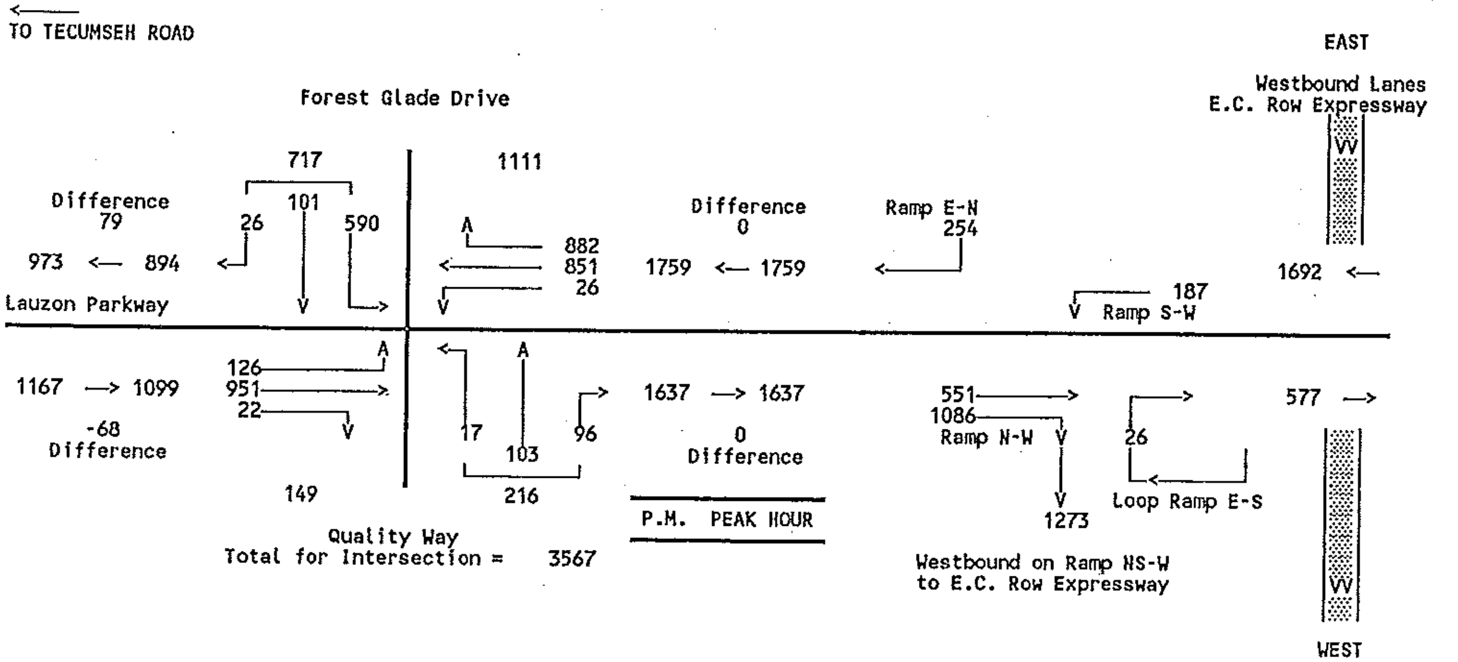
NORTH
<——
TO TECUMSEH ROAD



A.M. EXISTING PEAK HOUR TRAFFIC IN PASSENGER CARS PER HOUR

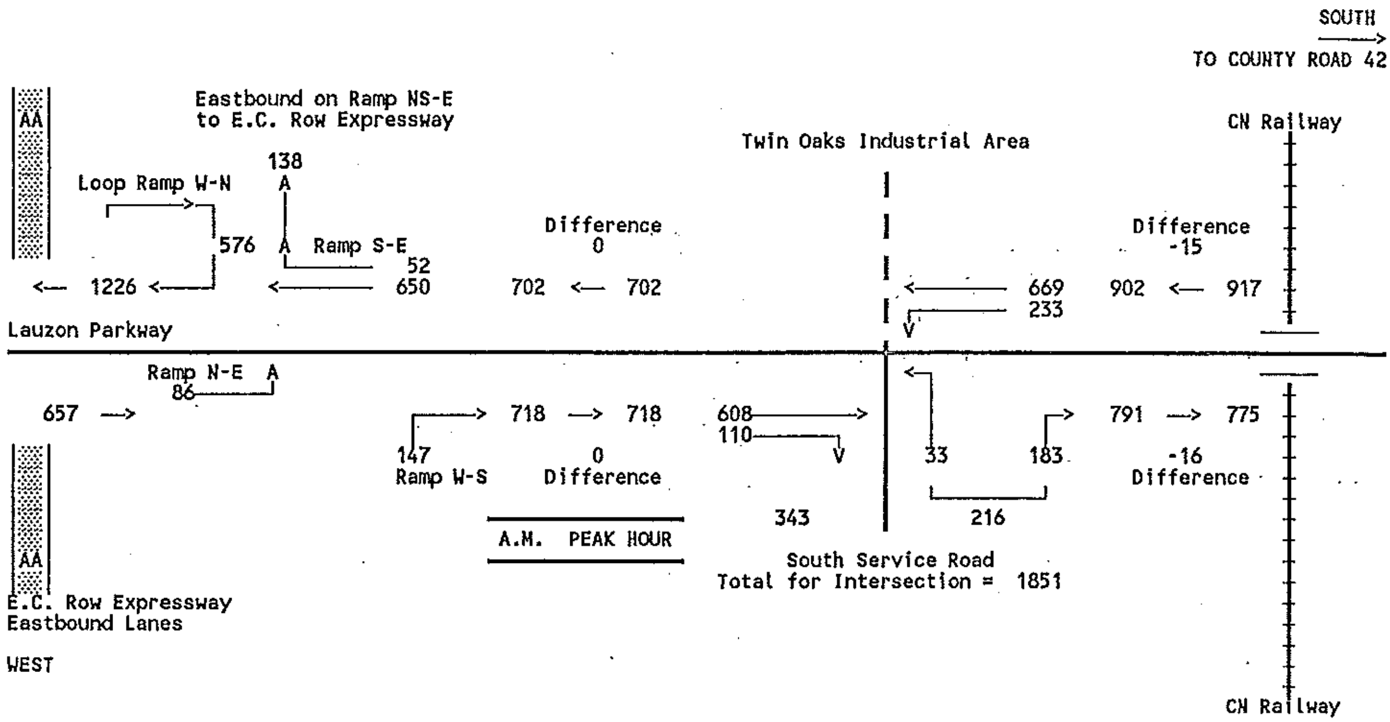
P.M. EXISTING PEAK HOUR TRAFFIC IN PASSENGER CARS PER HOUR

NORTH
<——
TO TECUMSEH ROAD



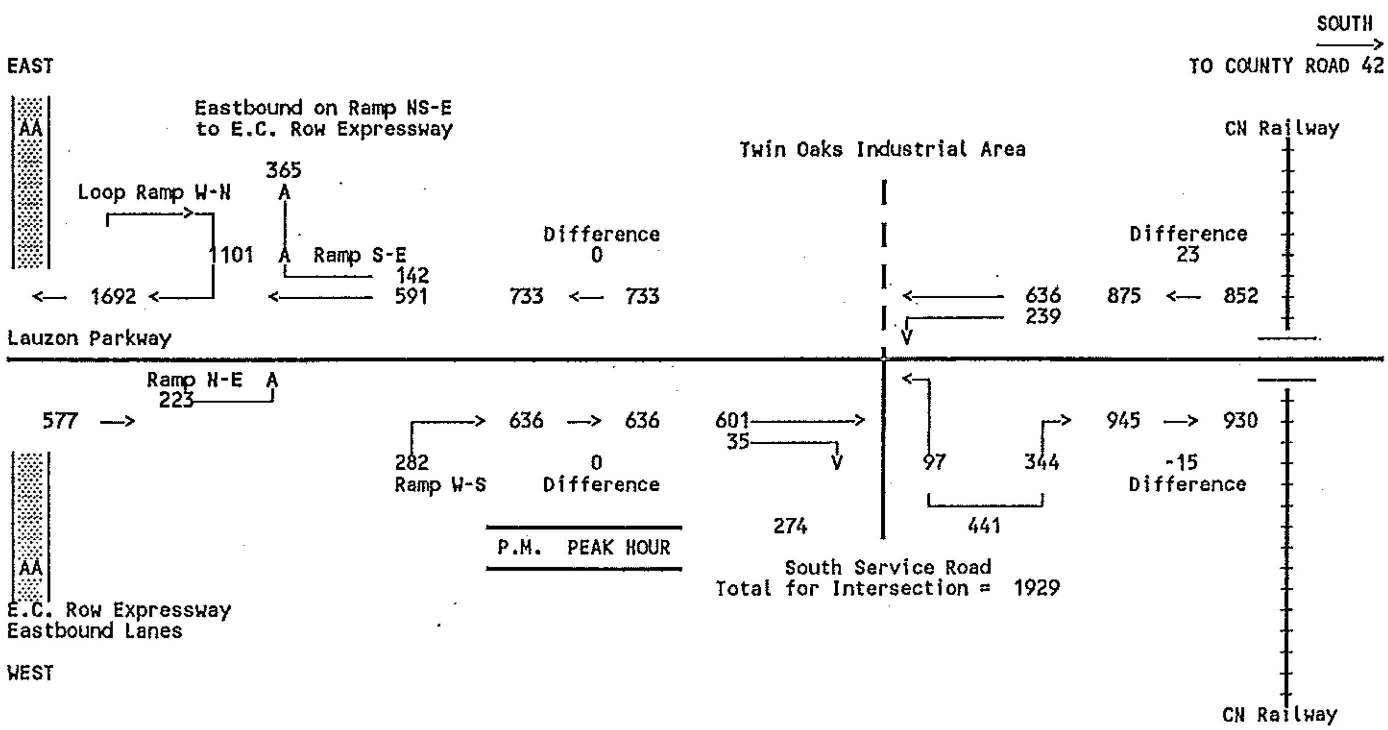
LAUZON PARKWAY
EXISTING PEAK HOUR TRAFFIC IN PASSENGER CARS PER HOUR

CNR RAILWAY TO QUALITY WAY AND FOREST GLADE DRIVE



A.M. EXISTING PEAK HOUR TRAFFIC IN PASSENGER CARS PER HOUR

P.M. EXISTING PEAK HOUR TRAFFIC IN PASSENGER CARS PER HOUR



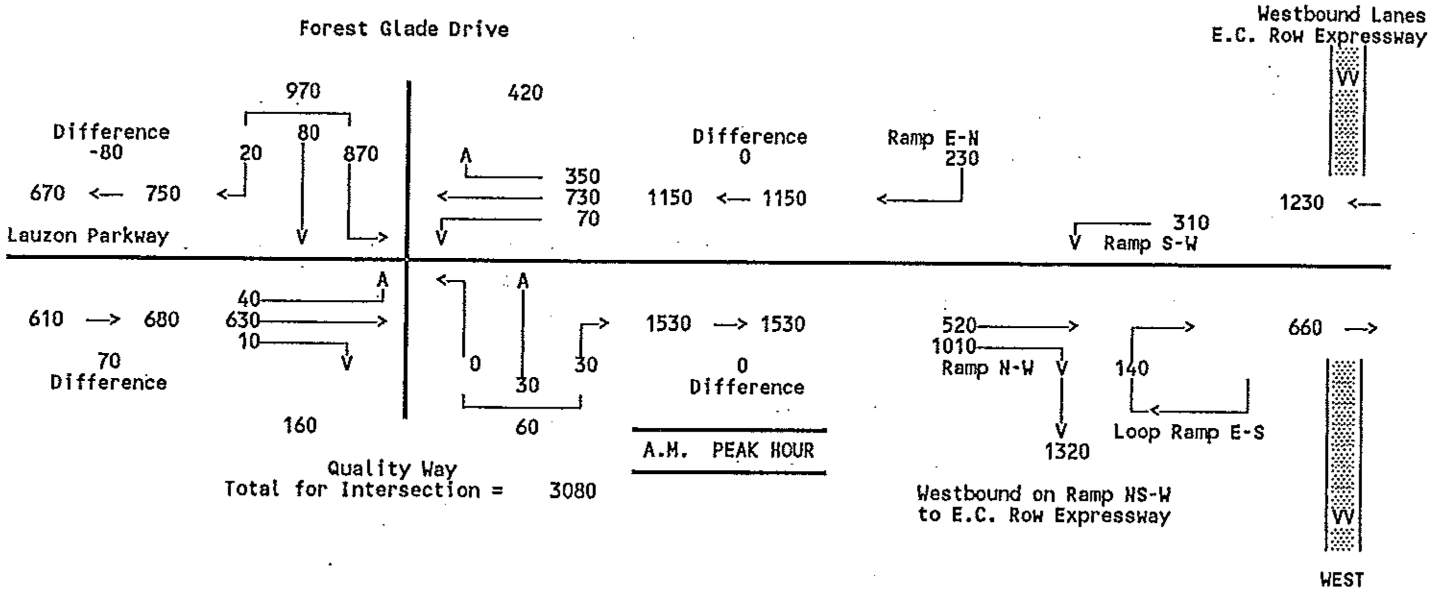
A P P E N D I X C.1 - F I G U R E 6

L A U Z O N P A R K W A Y
R O U N D E D / B A L A N C E D E X I S T I N G P E A K H O U R T R A F F I C F L O W S

C N R R A I L W A Y T O Q U A L I T Y W A Y A N D F O R E S T G L A D E D R I V E

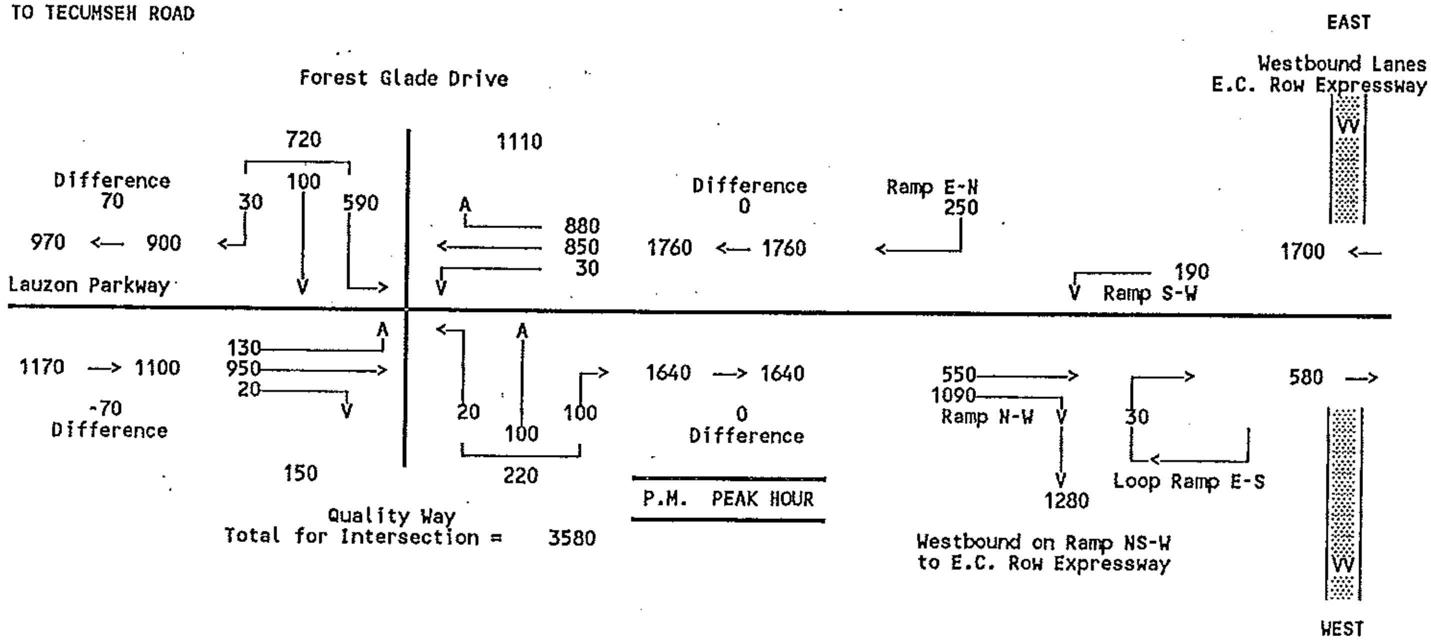
File: C1
Directory: c:\TwinOaks\Rep\App

NORTH
<——
TO TECUMSEH ROAD



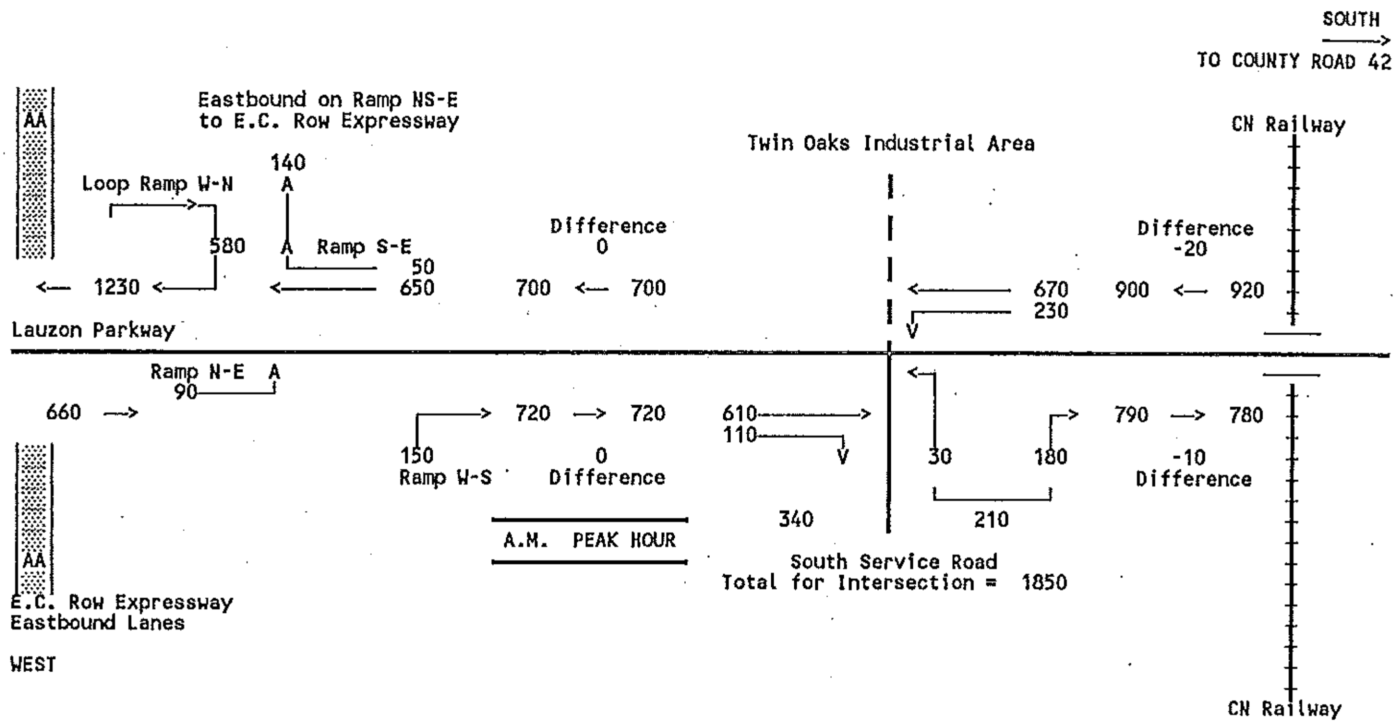
A.M. R O U N D E D / B A L A N C E D E X I S T I N G P E A K H O U R T R A F F I C F L O W S
==
P.M. R O U N D E D / B A L A N C E D E X I S T I N G P E A K H O U R T R A F F I C F L O W S

NORTH
<——
TO TECUMSEH ROAD



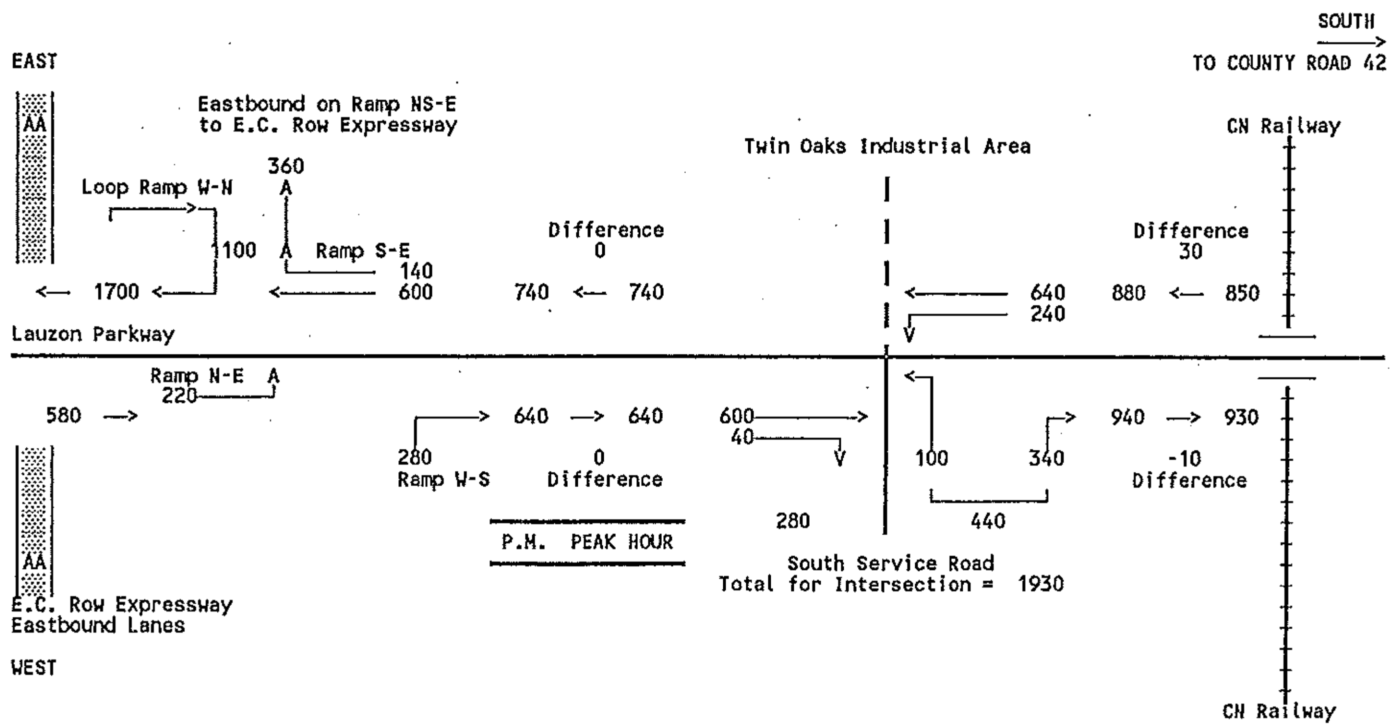
LAUZON PARKWAY
ROUNDED/BALANCED EXISTING PEAK HOUR TRAFFIC FLOWS

CNR RAILWAY TO QUALITY WAY AND FOREST GLADE DRIVE



A.M. ROUNDED/BALANCED EXISTING PEAK HOUR TRAFFIC FLOWS

P.M. ROUNDED/BALANCED EXISTING PEAK HOUR TRAFFIC FLOWS

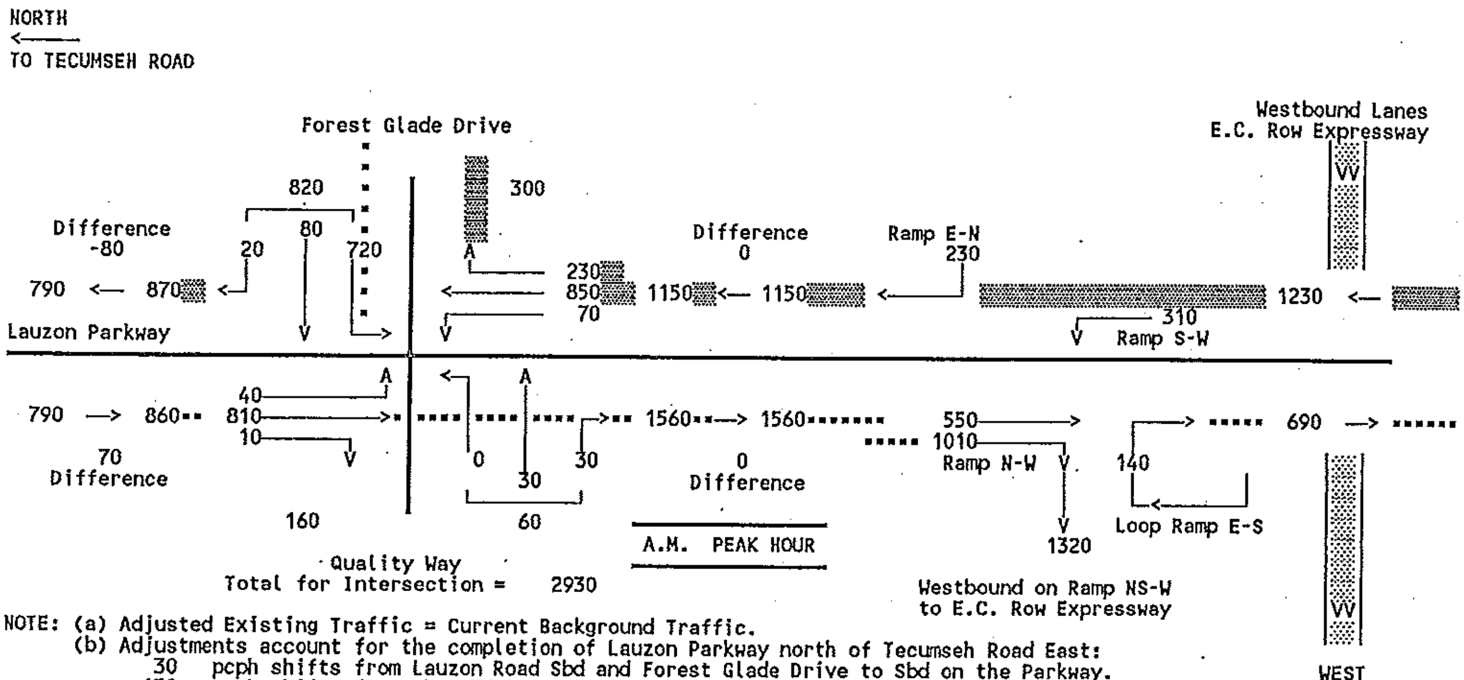


APPENDIX C.1 - FIGURE 7

LAUZON PARKWAY
ADJUSTED EXISTING PEAK HOUR TRAFFIC FLOWS (a) (b)

CNR RAILWAY TO QUALITY WAY AND FOREST GLADE DRIVE

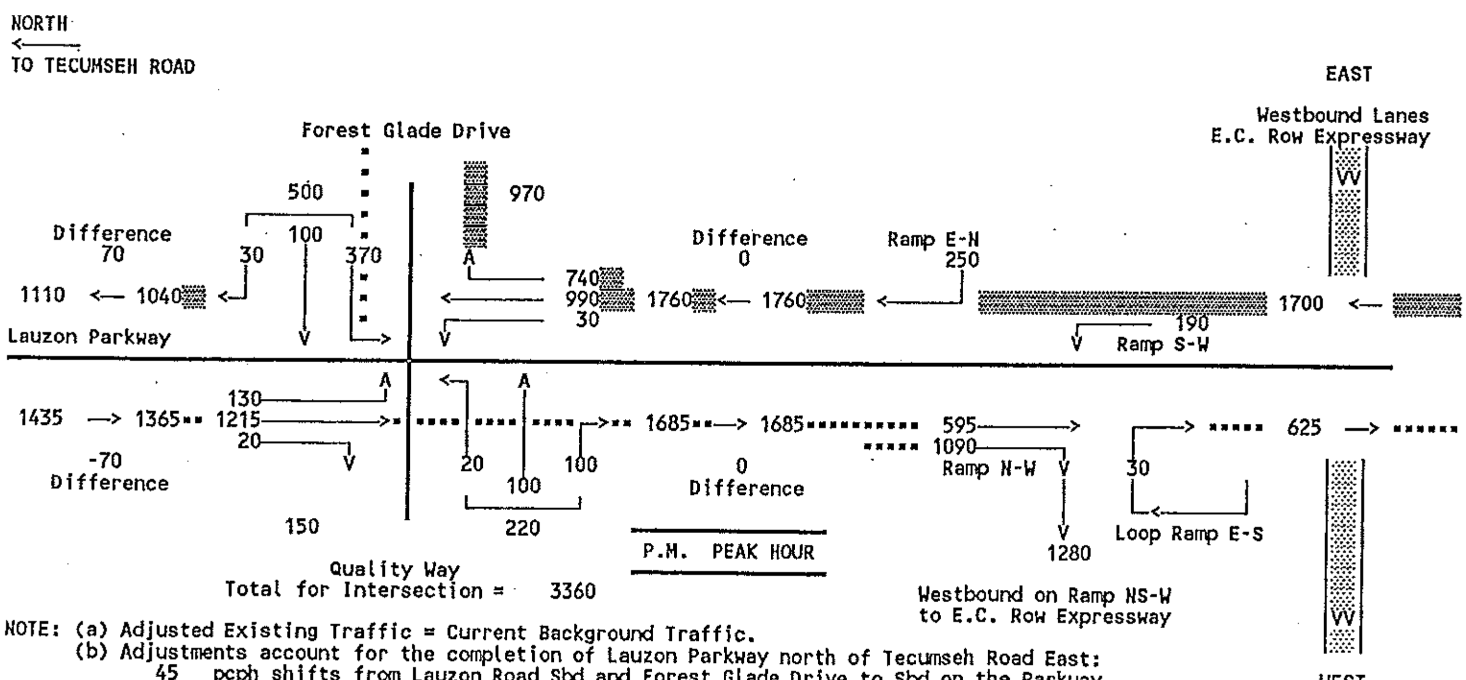
File: C1
Directory: c:\TwinOaks\Rep\App



NOTE: (a) Adjusted Existing Traffic = Current Background Traffic.
(b) Adjustments account for the completion of Lauzon Parkway north of Tecumseh Road East:
30 pcph shifts from Lauzon Road Sbd and Forest Glade Drive to Sbd on the Parkway.
150 pcph shifts from the Wbd left turn on Forest Glade Drive to Sbd on the Parkway.
120 pcph shifts from the Nbd right turn to Forest Glade Drive to Nbd on the Parkway.
SOURCE: TRAFFIC ANALYSIS and PLANNING REPORT, Tecumseh Road East; E. Fearnley Limited, March 1996

A.M. ADJUSTED EXISTING PEAK HOUR TRAFFIC FLOWS

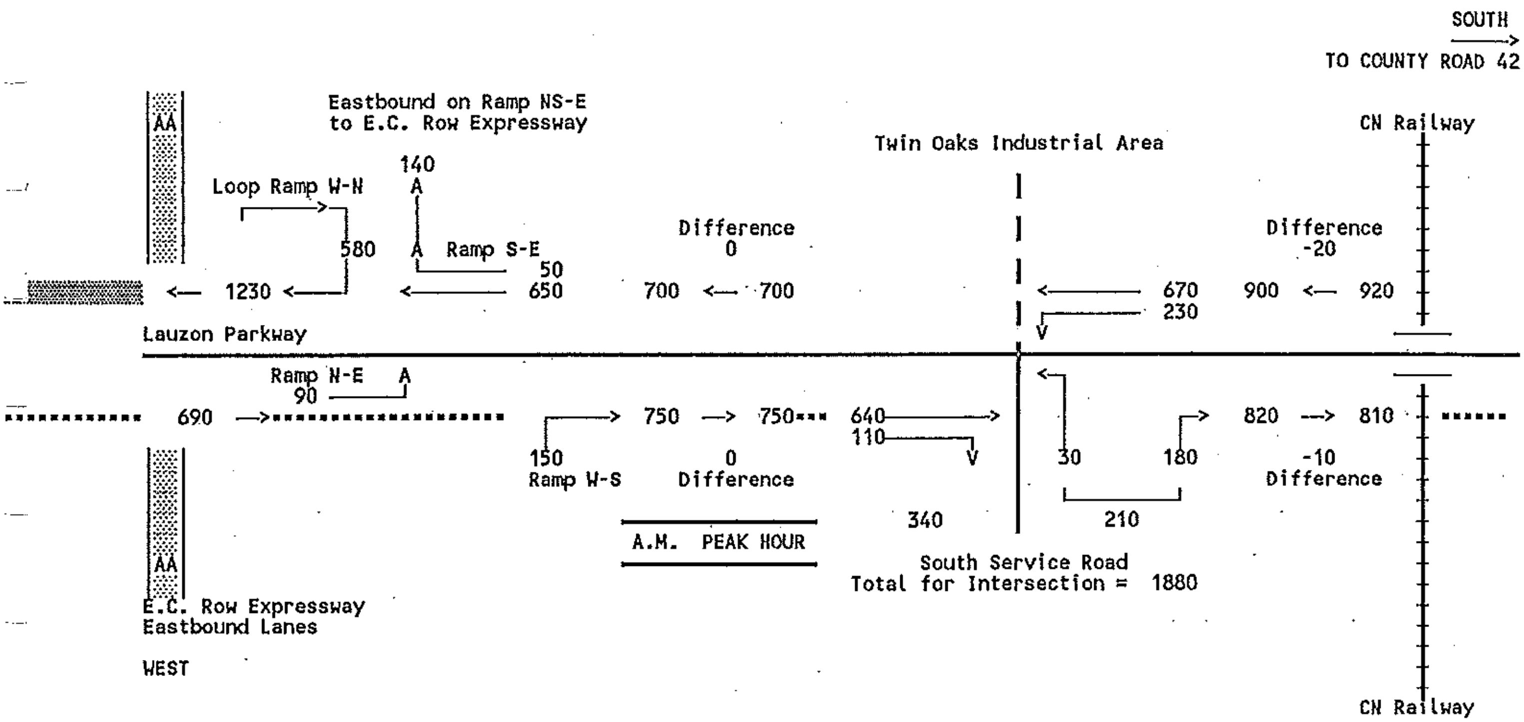
P.M. ADJUSTED EXISTING PEAK HOUR TRAFFIC FLOWS



NOTE: (a) Adjusted Existing Traffic = Current Background Traffic.
(b) Adjustments account for the completion of Lauzon Parkway north of Tecumseh Road East:
45 pcph shifts from Lauzon Road Sbd and Forest Glade Drive to Sbd on the Parkway.
220 pcph shifts from the Wbd left turn on Forest Glade Drive to Sbd on the Parkway.
140 pcph shifts from the Nbd right turn to Forest Glade Drive to Nbd on the Parkway.
SOURCE: TRAFFIC ANALYSIS and PLANNING REPORT, Tecumseh Road East; E. Fearnley Limited, March 1996

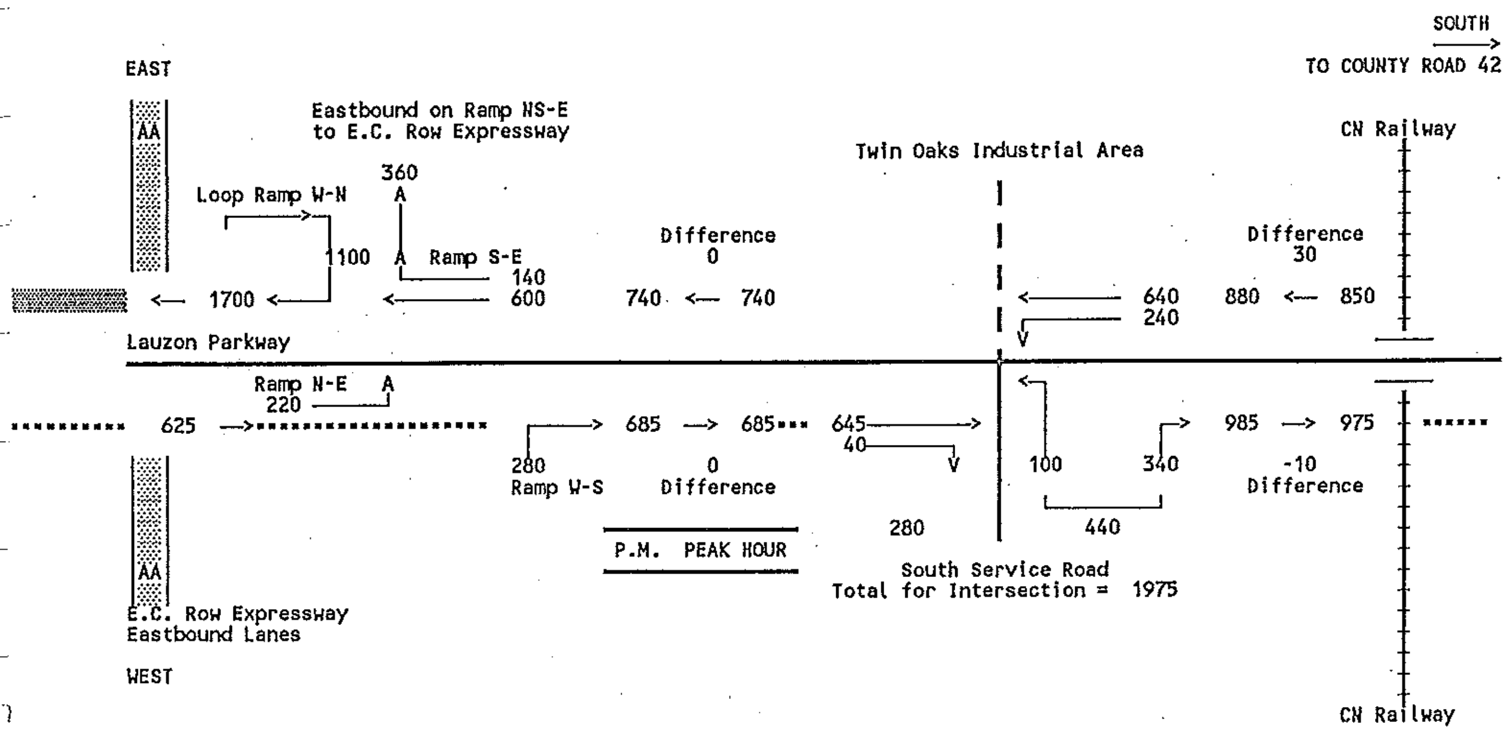
LAUZON PARKWAY
ADJUSTED EXISTING PEAK HOUR TRAFFIC FLOWS

CNR RAILWAY TO QUALITY WAY AND FOREST GLADE DRIVE



A.M. ADJUSTED EXISTING PEAK HOUR TRAFFIC FLOWS

P.M. ADJUSTED EXISTING PEAK HOUR TRAFFIC FLOWS

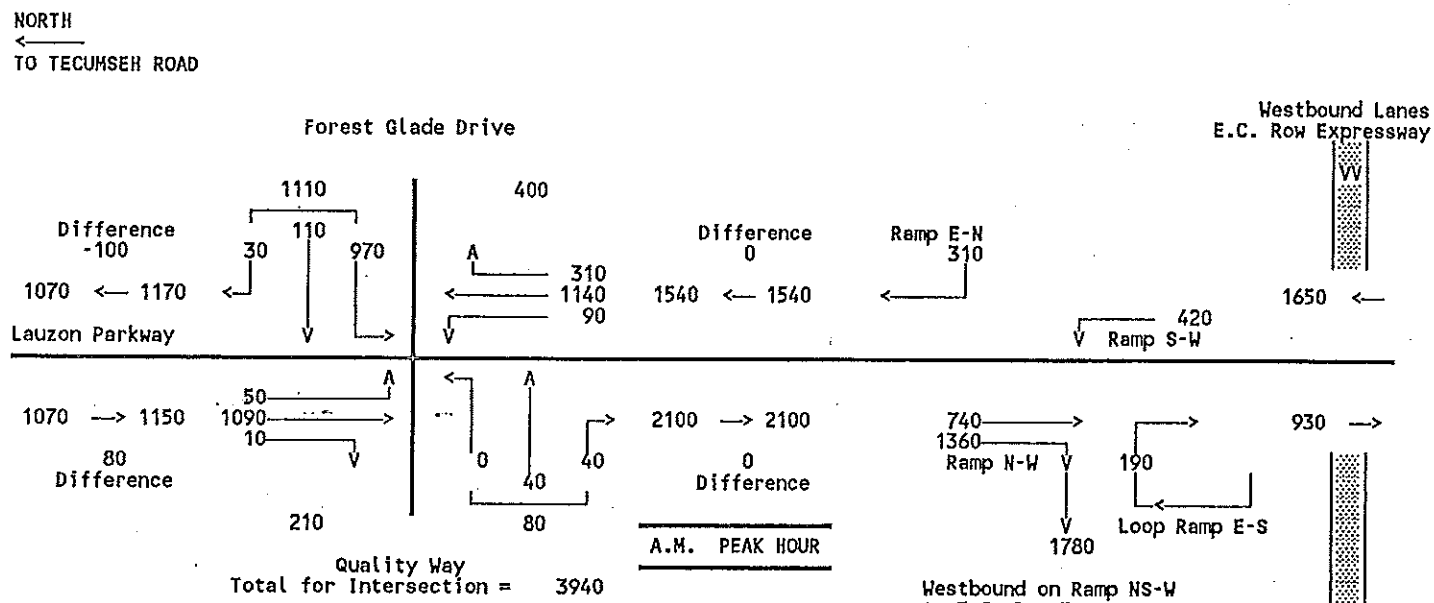


APPENDIX C.1 - FIGURE 8

LAUZON PARKWAY
FUTURE BACKGROUND TRAFFIC: YEAR 2016 (a)

CNR RAILWAY TO QUALITY WAY AND FOREST GLADE DRIVE

File: C1
Directory: c:\TwinOaks\Rep\App



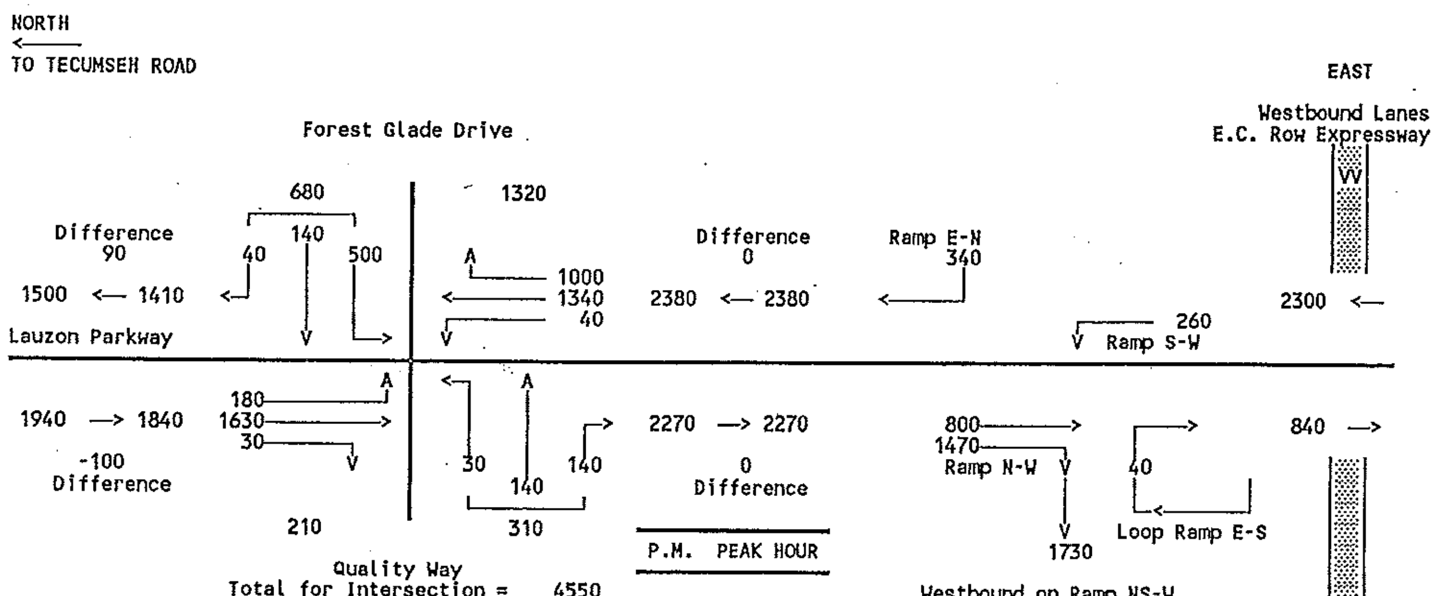
****

NOTE: (a) Background traffic factored for growth at 1.50 percent per year for 20 years, gives 1.35 as an over-all growth factor.

****

A.M. FUTURE BACKGROUND TRAFFIC: YEAR 2016

P.M. FUTURE BACKGROUND TRAFFIC: YEAR 2016



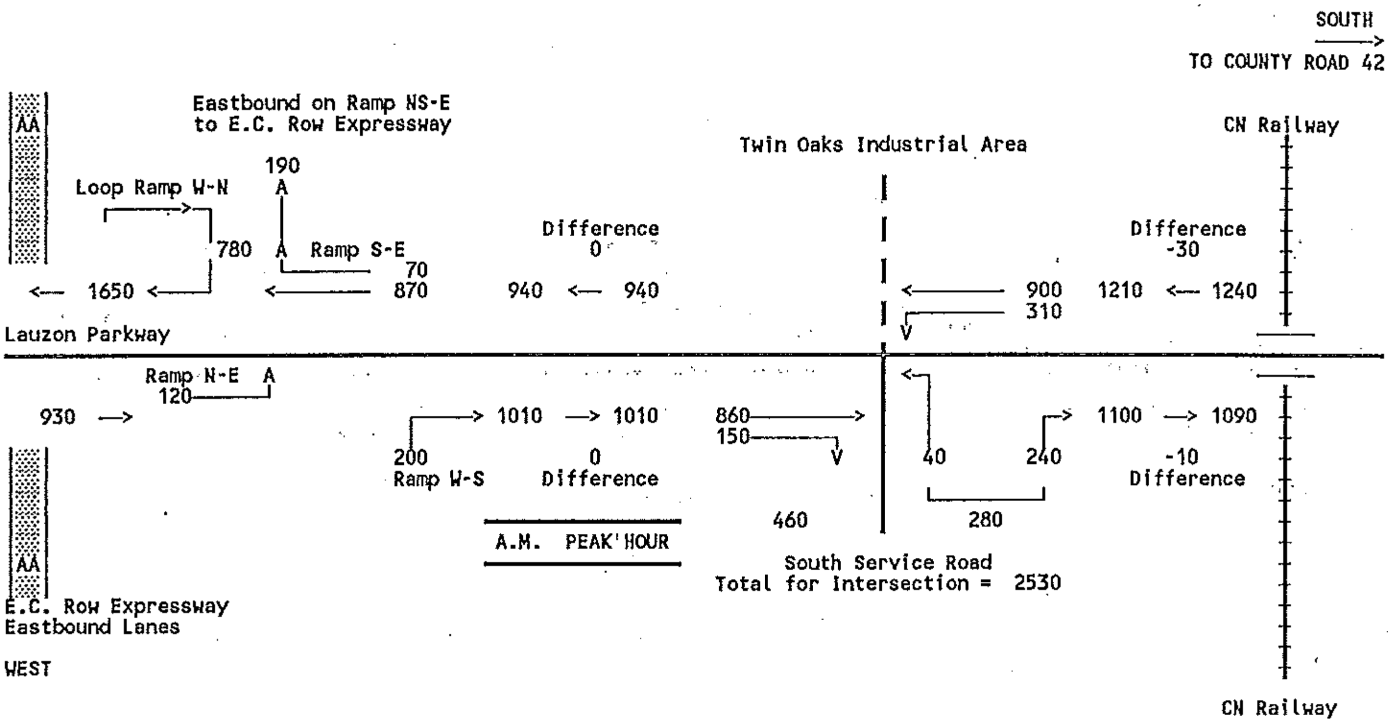
****

NOTE: (a) Background traffic factored for growth at 1.5 percent per year for 20 years, gives 1.35 as an over-all growth factor.

****

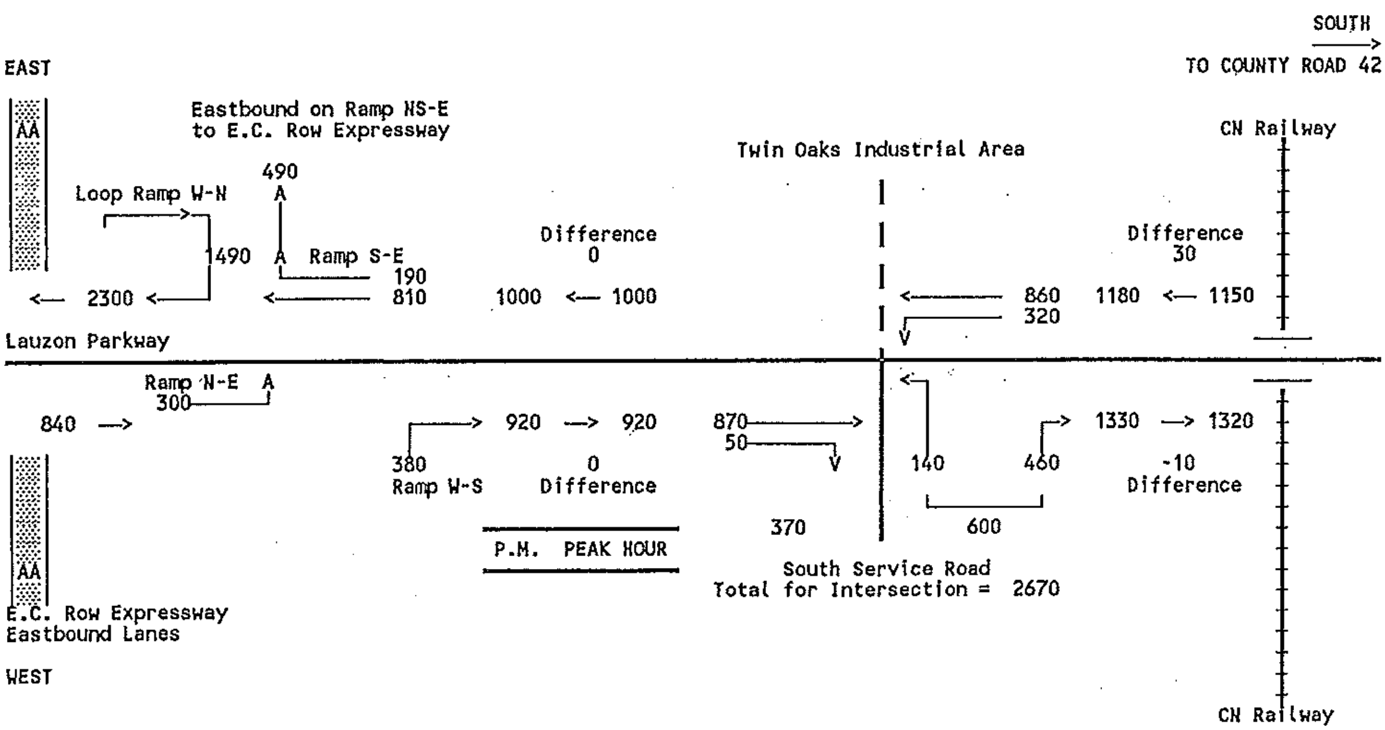
LAUZON PARKWAY
FUTURE BACKGROUND TRAFFIC: YEAR 2016

CNR RAILWAY TO QUALITY WAY AND FOREST GLADE DRIVE



A.M. FUTURE BACKGROUND TRAFFIC: YEAR 2016

P.M. FUTURE BACKGROUND TRAFFIC: YEAR 2016



APPENDIX C.1 - FIGURE 9

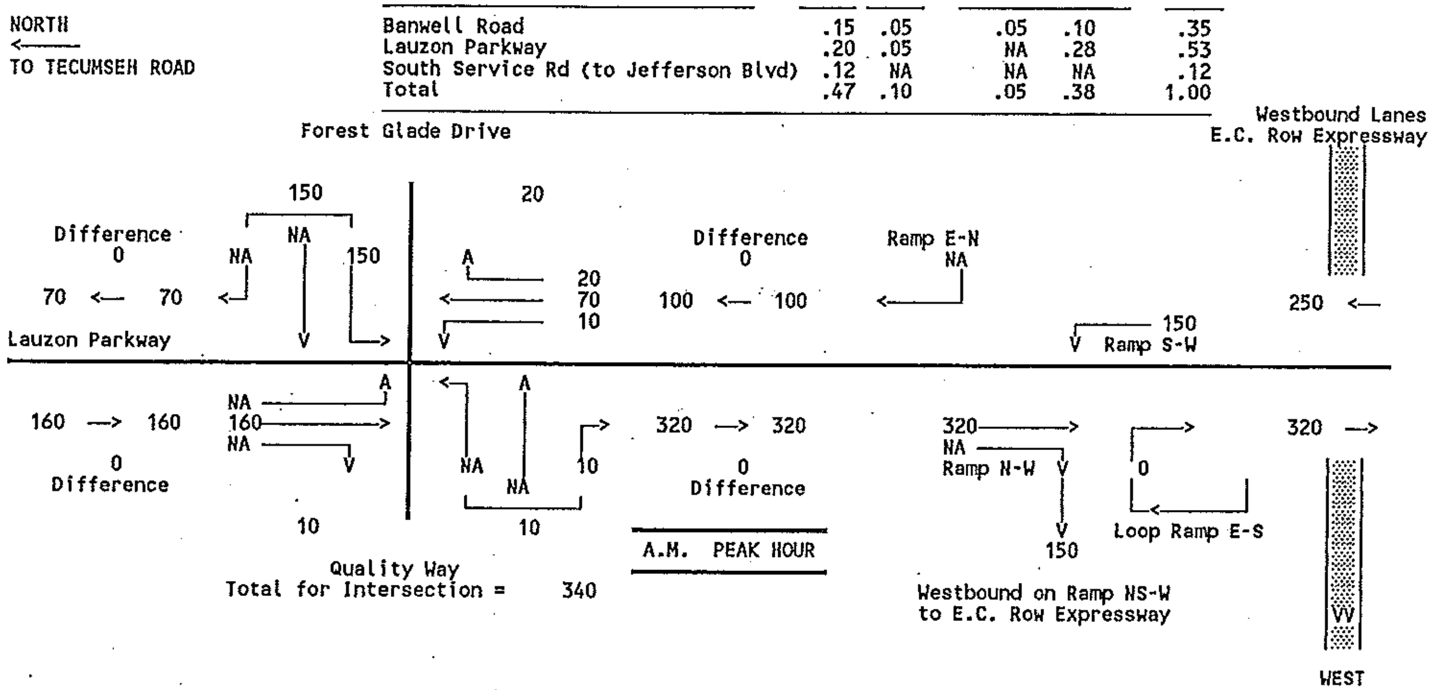
LAUZON PARKWAY (a)
FUTURE SITE-GENERATED TRAFFIC

CNR RAILWAY TO QUALITY WAY AND FOREST GLADE DRIVE

File: C1
Directory: c:\TwinOaks\Rep\App

DISTRIBUTION OF TWIN OAKS SITE-GENERATED TRAFFIC

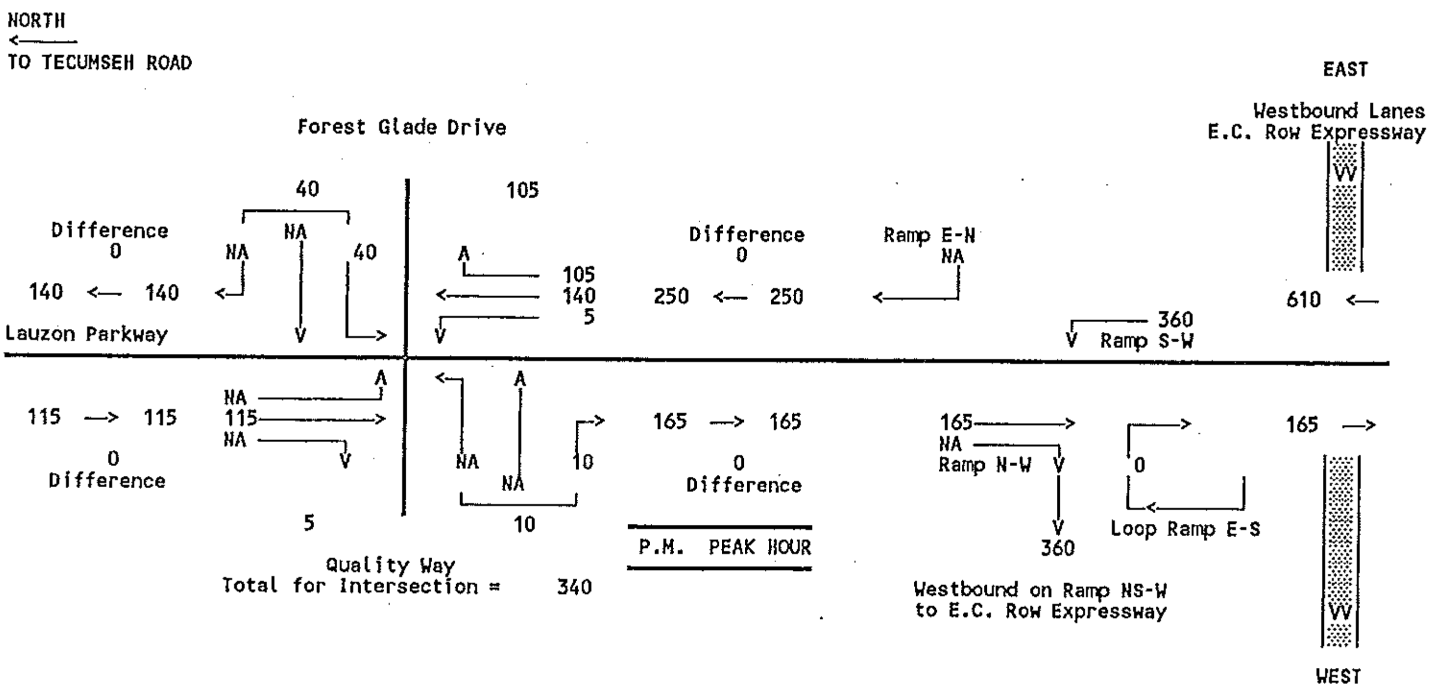
Corridor	North	South	E.C. Row Expway Eastbd	E.C. Row Expway Westbd	Total
Banwell Road	.15	.05	.05	.10	.35
Lauzon Parkway	.20	.05	NA	.28	.53
South Service Rd (to Jefferson Blvd)	.12	NA	NA	NA	.12
Total	.47	.10	.05	.38	1.00



A.M. FUTURE SITE-GENERATED TRAFFIC

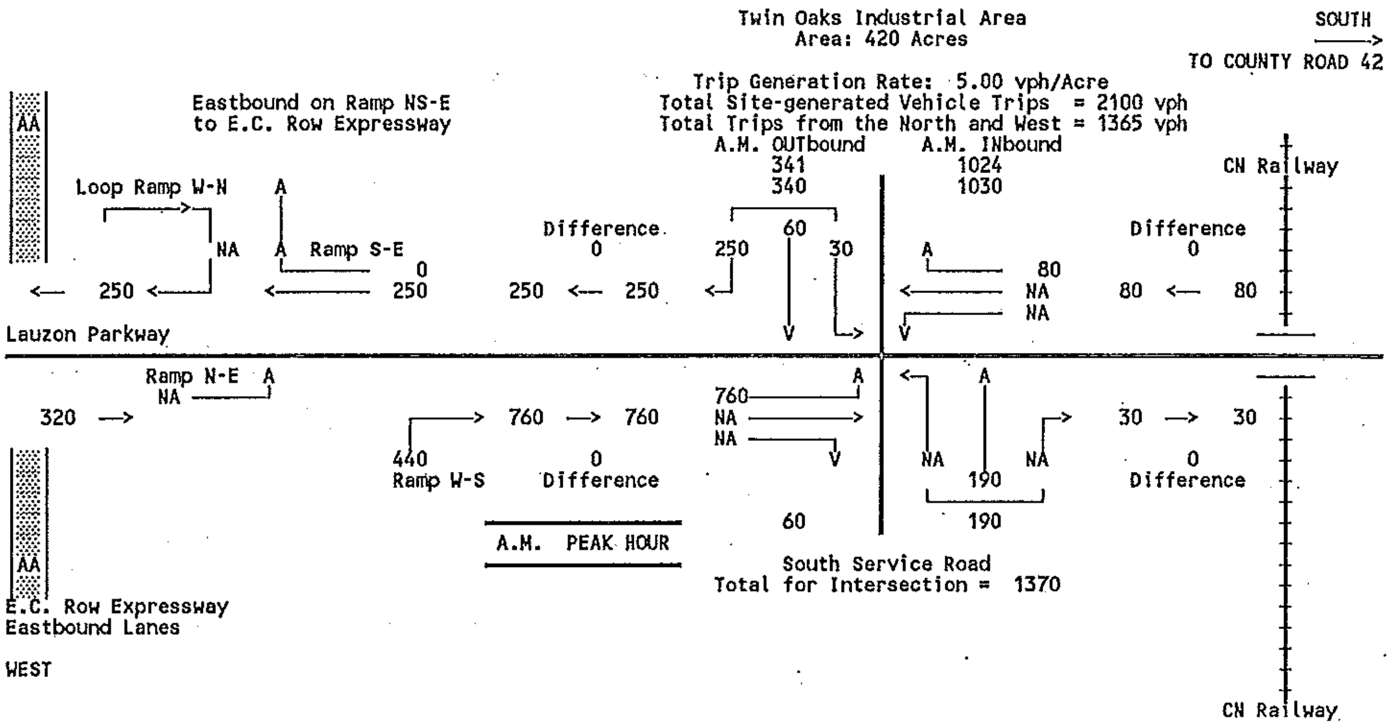
===

P.M. FUTURE SITE-GENERATED TRAFFIC



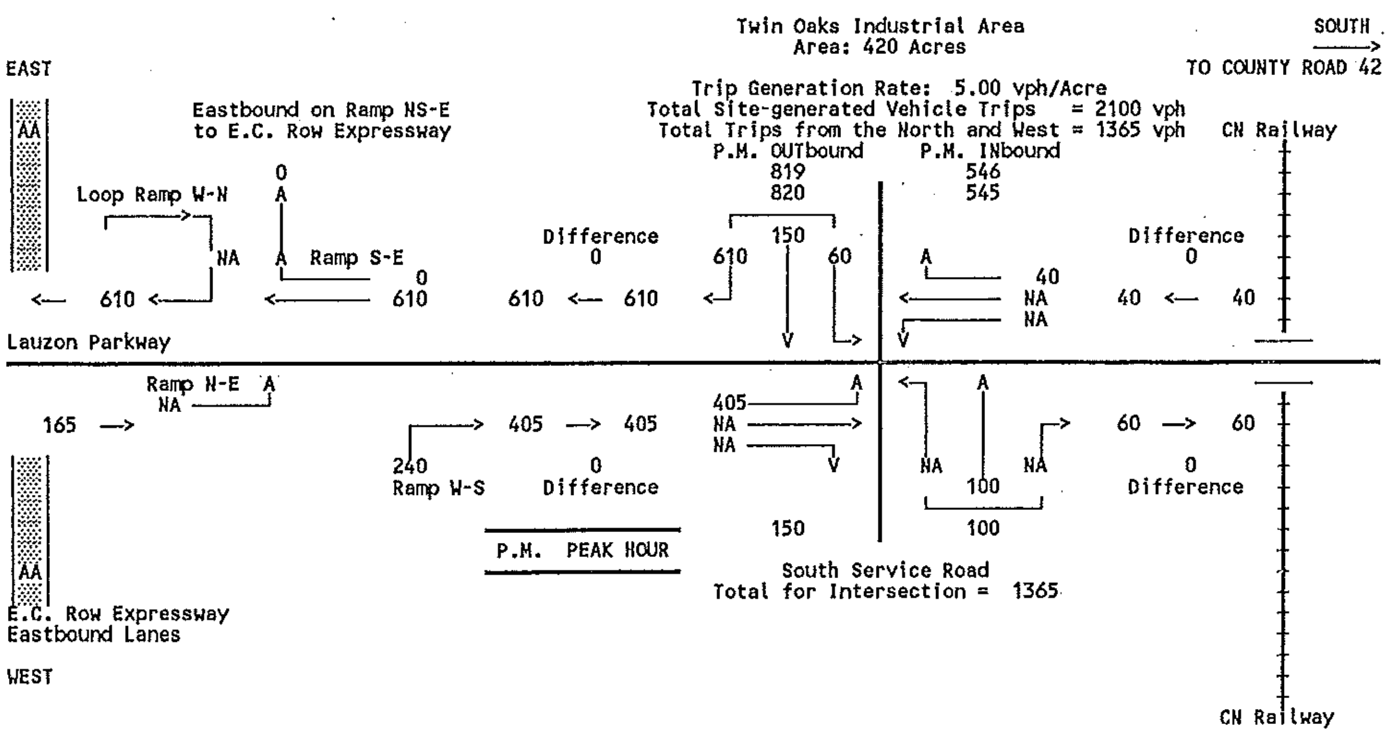
L A U Z O N   P A R K W A Y
F U T U R E   S I T E - G E N E R A T E D   T R A F F I C

C N R   R A I L W A Y   T O   Q U A L I T Y   W A Y   A N D   F O R E S T   G L A D E   D R I V E



A.M.   F U T U R E   S I T E - G E N E R A T E D   T R A F F I C

P.M.   F U T U R E   S I T E - G E N E R A T E D   T R A F F I C

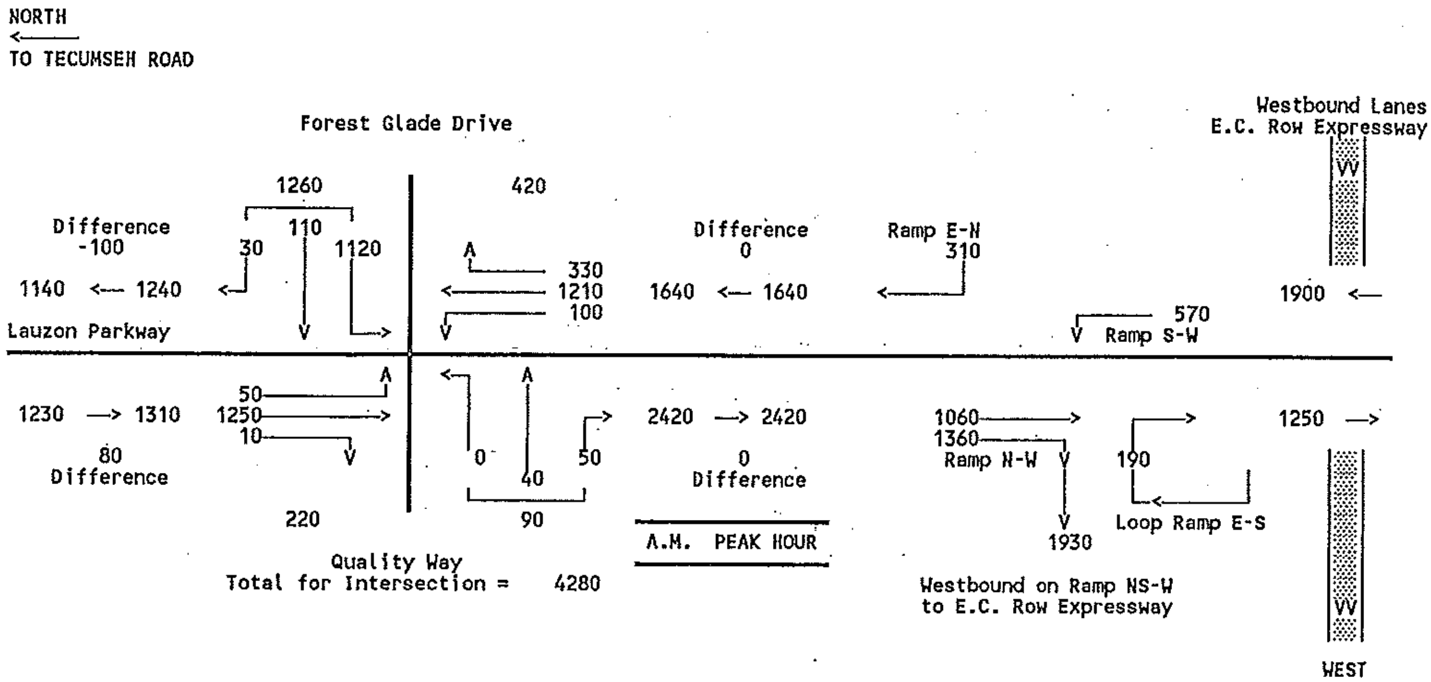


A P P E N D I X C.1 - F I G U R E 10

L A U Z O N P A R K W A Y
F U T U R E T R A F F I C : Y E A R 2 0 1 4 D E S I G N H O U R V O L U M E S (a) (b)

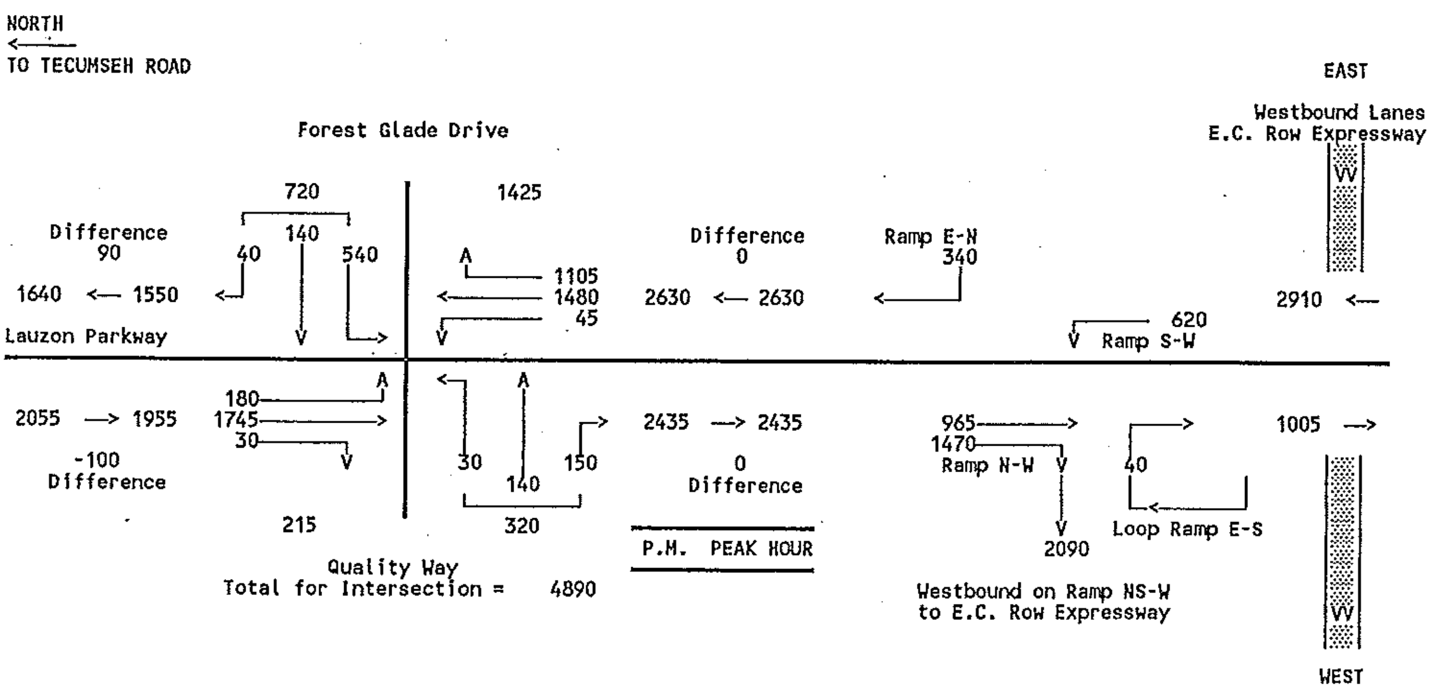
C N R R A I L W A Y T O Q U A L I T Y W A Y A N D F O R E S T G L A D E D R I V E

File: C1
Directory: c:\TwinOaks\Rep\App



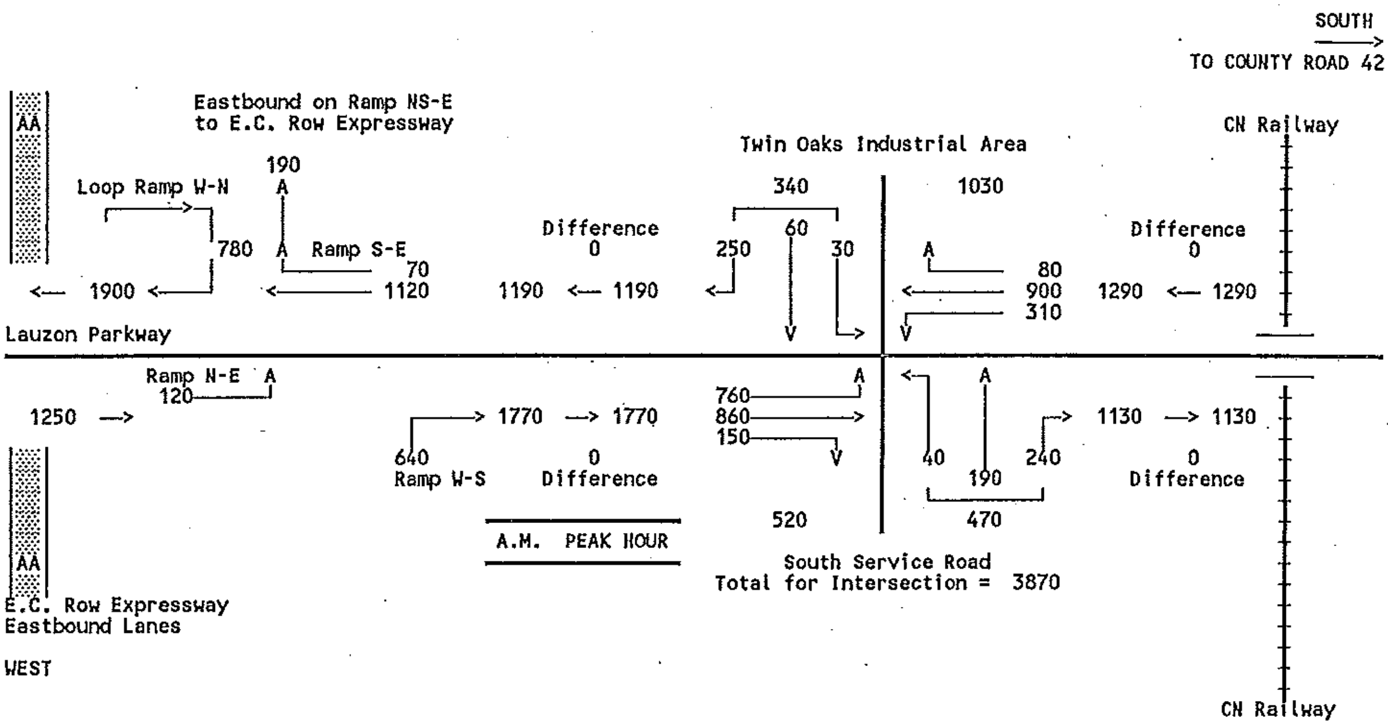
A.M. F U T U R E T R A F F I C : Y E A R 2 0 1 4 D E S I G N H O U R V O L U M E S

P.M. F U T U R E T R A F F I C : Y E A R 2 0 1 4 D E S I G N H O U R V O L U M E S



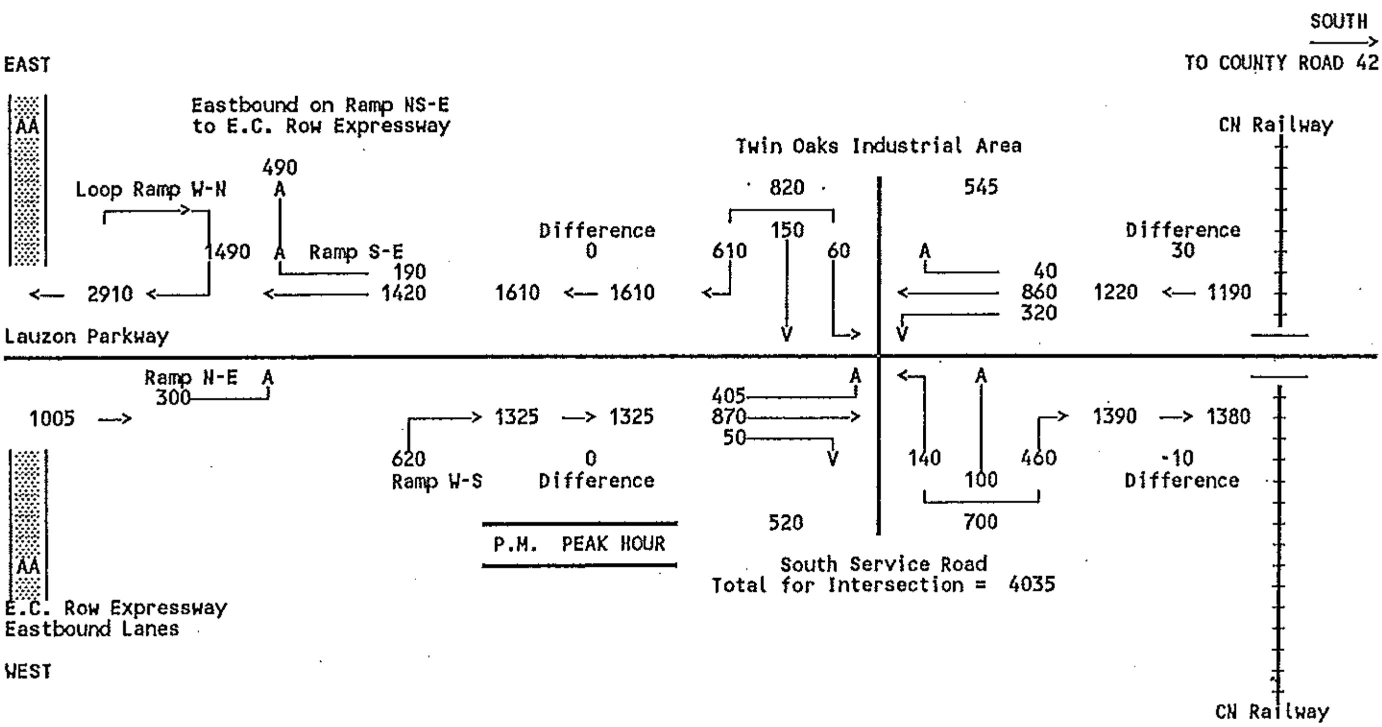
L A U Z O N   P A R K W A Y
F U T U R E   T R A F F I C :   Y E A R   2 0 1 4   D E S I G N   H O U R   V O L U M E S

C N R   R A I L W A Y   T O   Q U A L I T Y   W A Y   A N D   F O R E S T   G L A D E   D R I V E



A.M.   F U T U R E   T R A F F I C :   Y E A R   2 0 1 4   D E S I G N   H O U R   V O L U M E S

P.M.   F U T U R E   T R A F F I C :   Y E A R   2 0 1 4   D E S I G N   H O U R   V O L U M E S



APPENDIX C.2

BANWELL ROAD

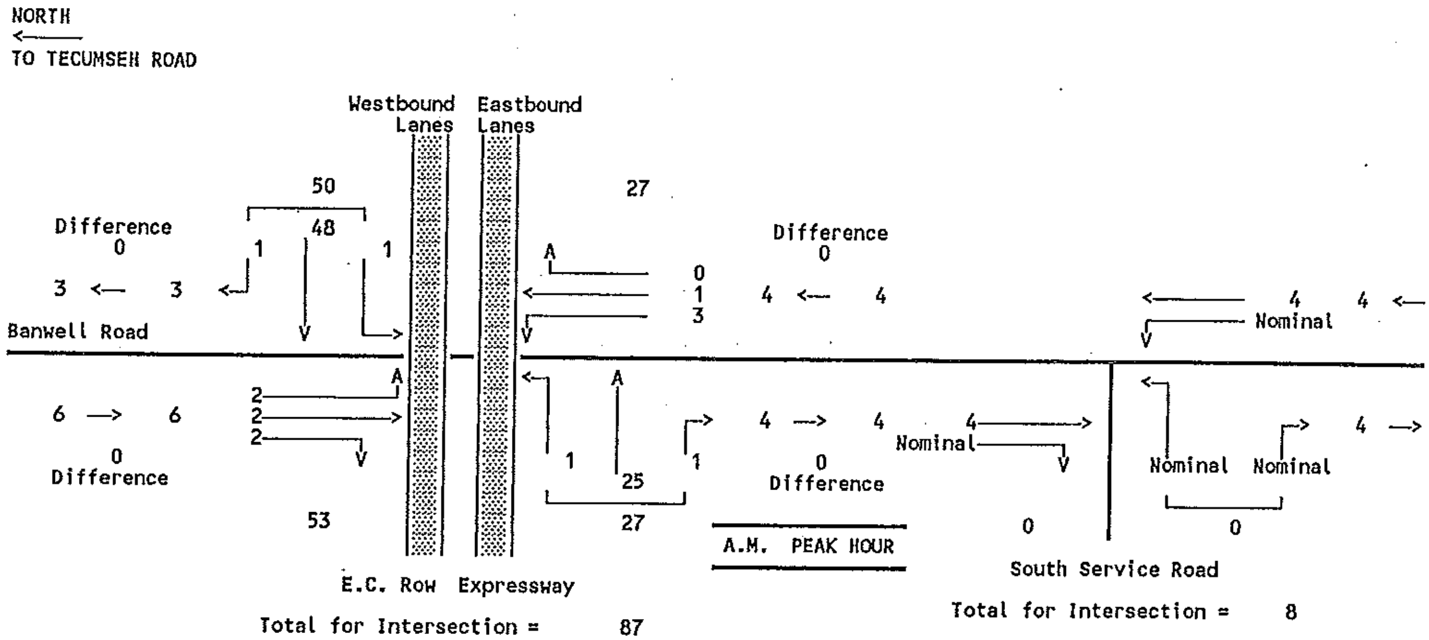
EXISTING TRAFFIC AND DEVELOPMENT OF DESIGN HOUR VOLUMES

APPENDIX C.2 - FIGURE 1

BANWELL ROAD
EXISTING PEAK HOUR TRUCK TRAFFIC(a)

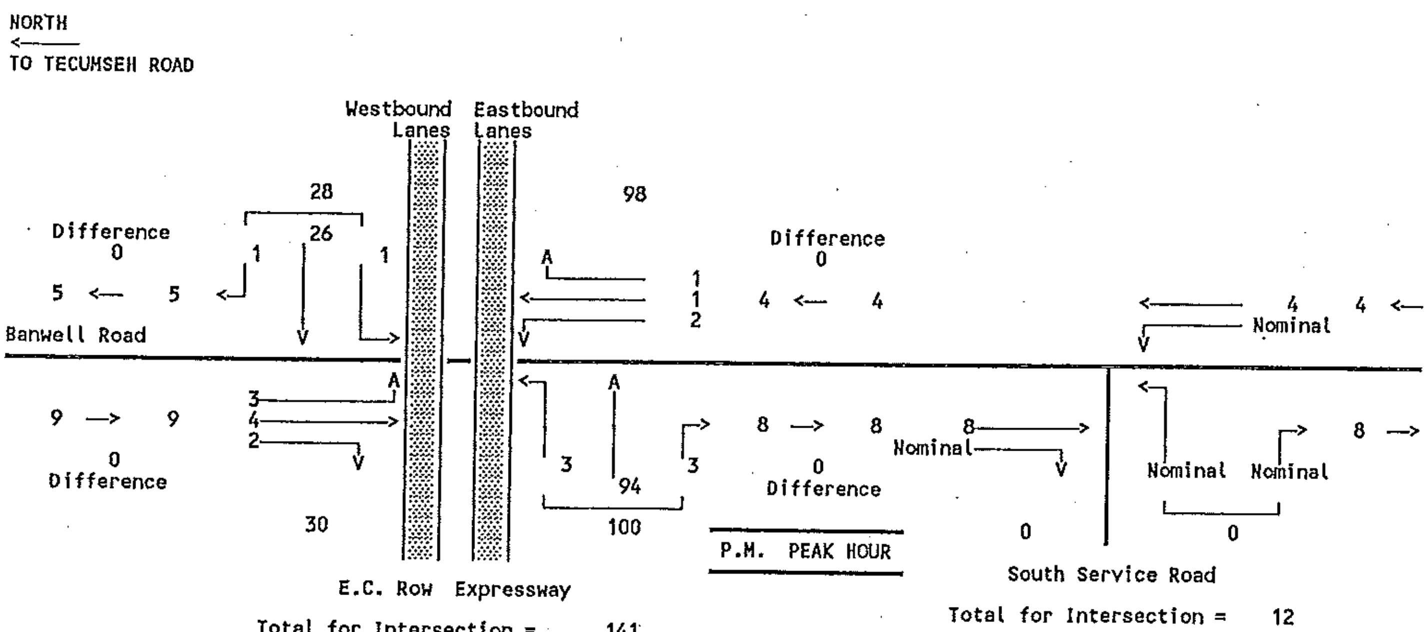
E.C. ROW EXPRESSWAY TO CANADIAN PACIFIC RAILWAY

File: C2
Directory: c:\TwinOaks\Rep\App

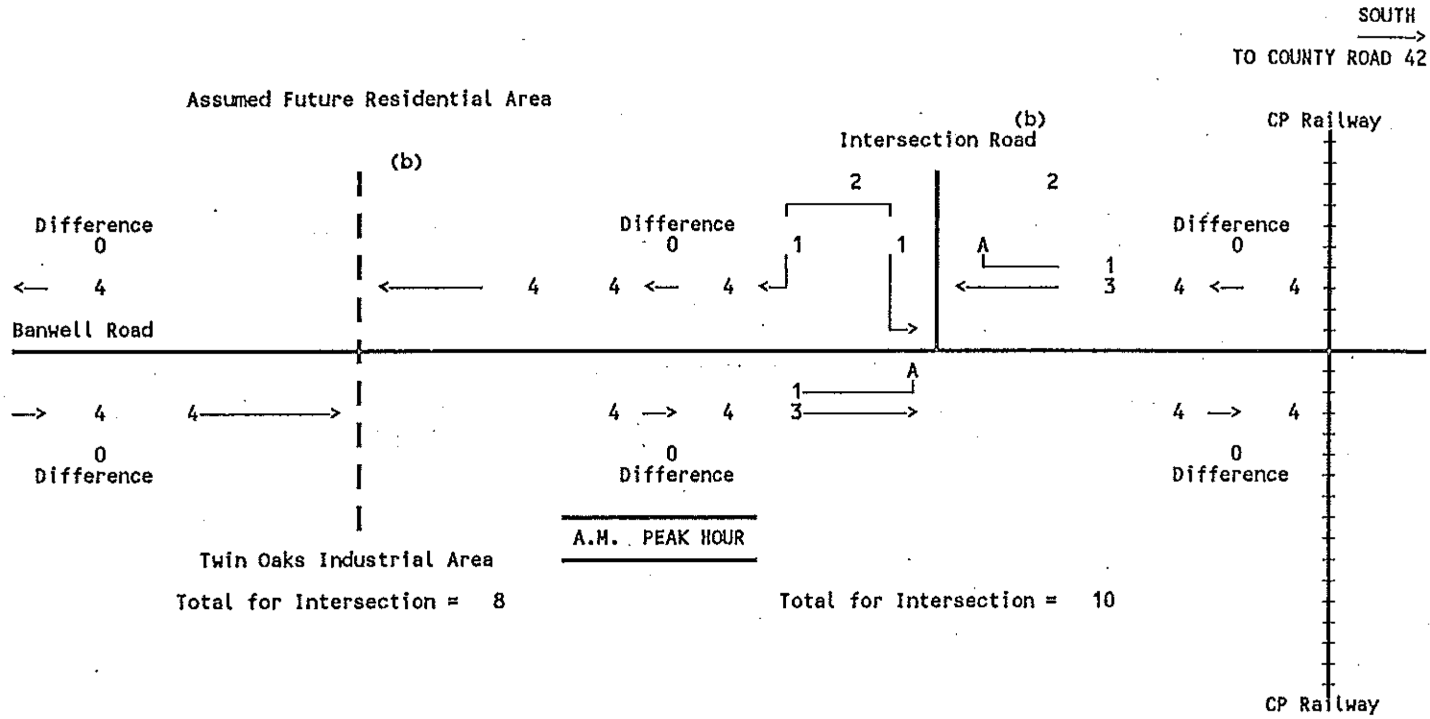


A.M. EXISTING PEAK HOUR TRUCK TRAFFIC

P.M. EXISTING PEAK HOUR TRUCK TRAFFIC

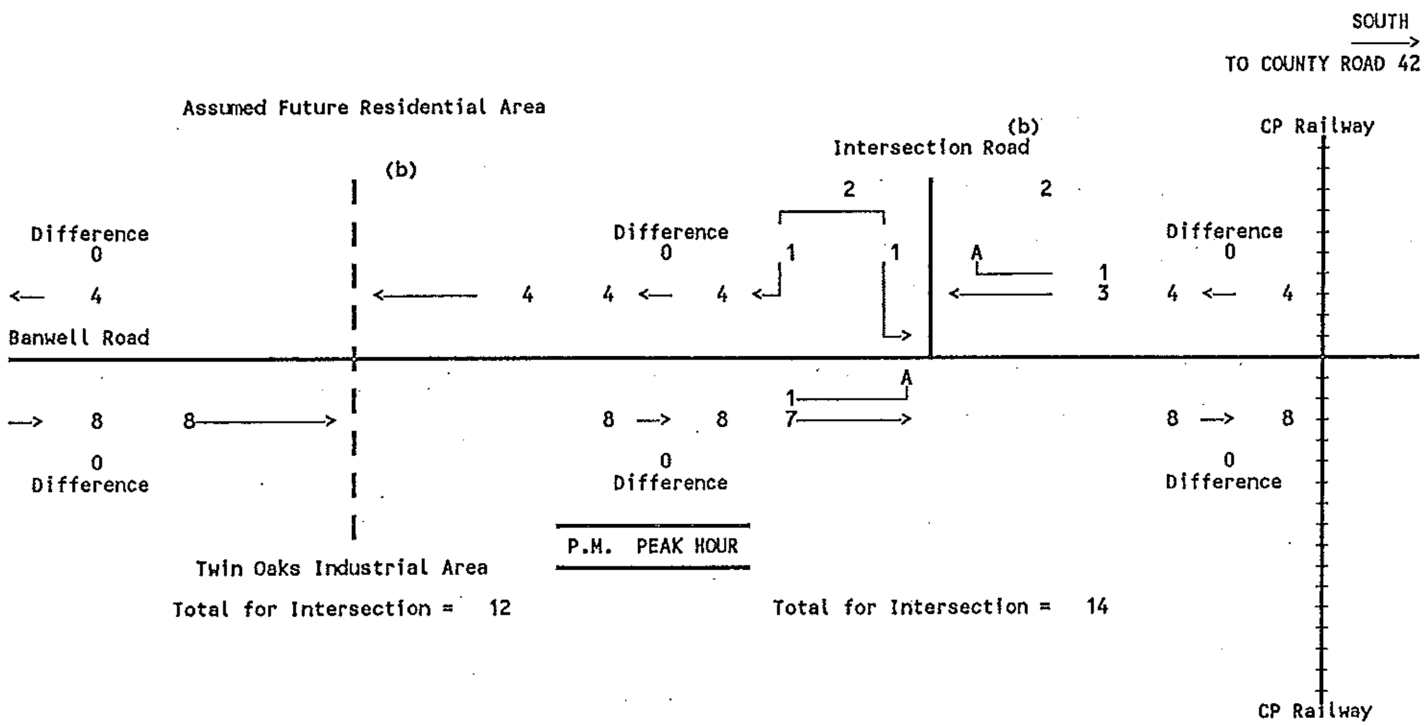


NOTE: (a) SOURCE for base data recorded in Appendix C.2: Ministry of Transportation, Ontario.
(b) Initially, the Twin Oaks Collector intersected Banwell to the north of Intersection Road. Later it was decided to link the new collector directly to Intersection Road to minimize the number of intersections along Banwell Road and provide direct access between these areas.



A.M.   E X I S T I N G   P E A K   H O U R   T R U C K   T R A F F I C

P.M.   E X I S T I N G   P E A K   H O U R   T R U C K   T R A F F I C

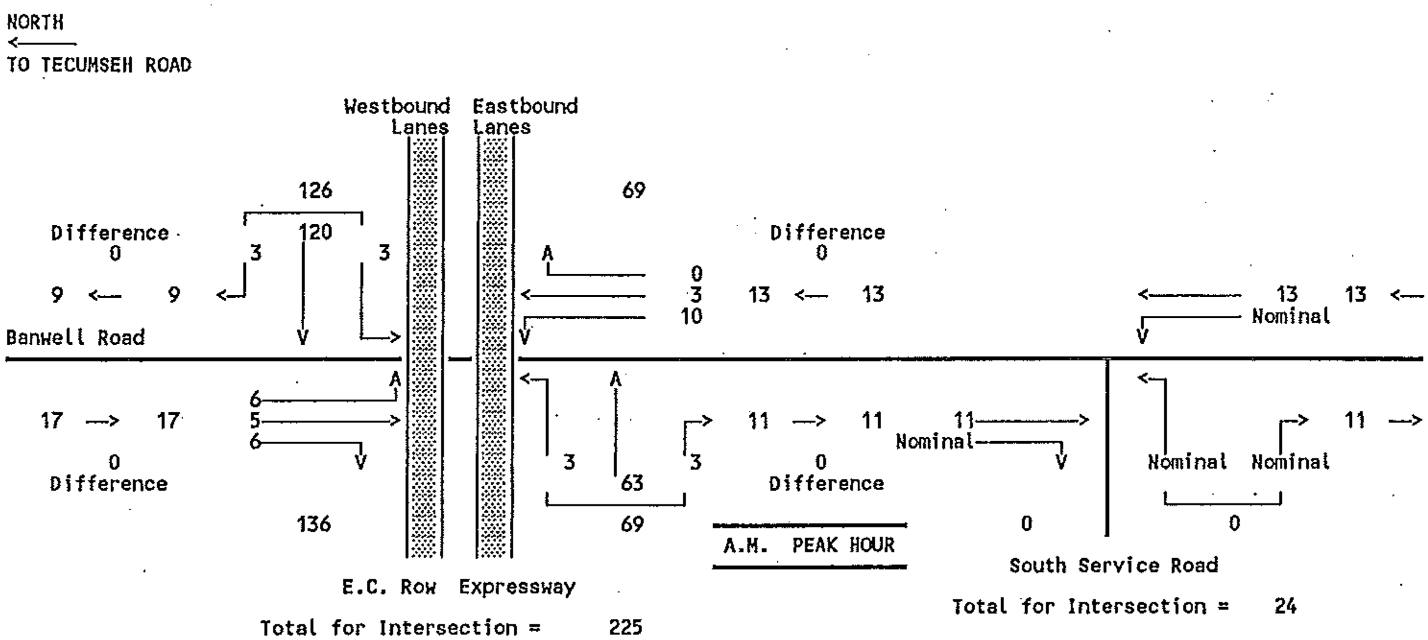


A P P E N D I X C.2 - F I G U R E 2

B A N W E L L R O A D (a)
P E A K H O U R T R U C K T R A F F I C A S P A S S E N G E R C A R E Q U I V A L E N T S

E . C . R O W E X P R E S S W A Y T O C A N A D I A N P A C I F I C R A I L W A Y

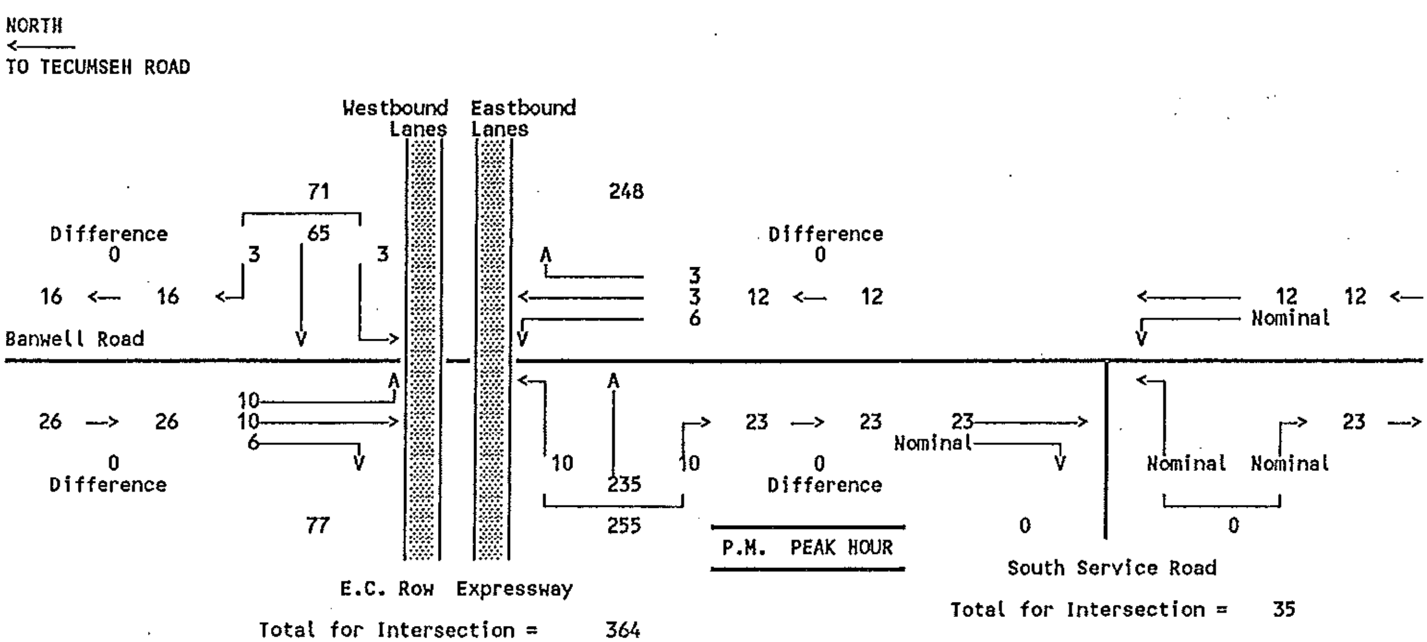
File: C2
Directory: c:\TwinOaks\Rep\App



NOTE: To obtain truck equivalents as cars these factors are used:
3.2 passenger cars for left turns and right turns on upward slopes and
2.5 passenger cars for other movements.

A.M. P E A K H O U R T R U C K T R A F F I C A S P A S S E N G E R C A R E Q U I V A L E N T S

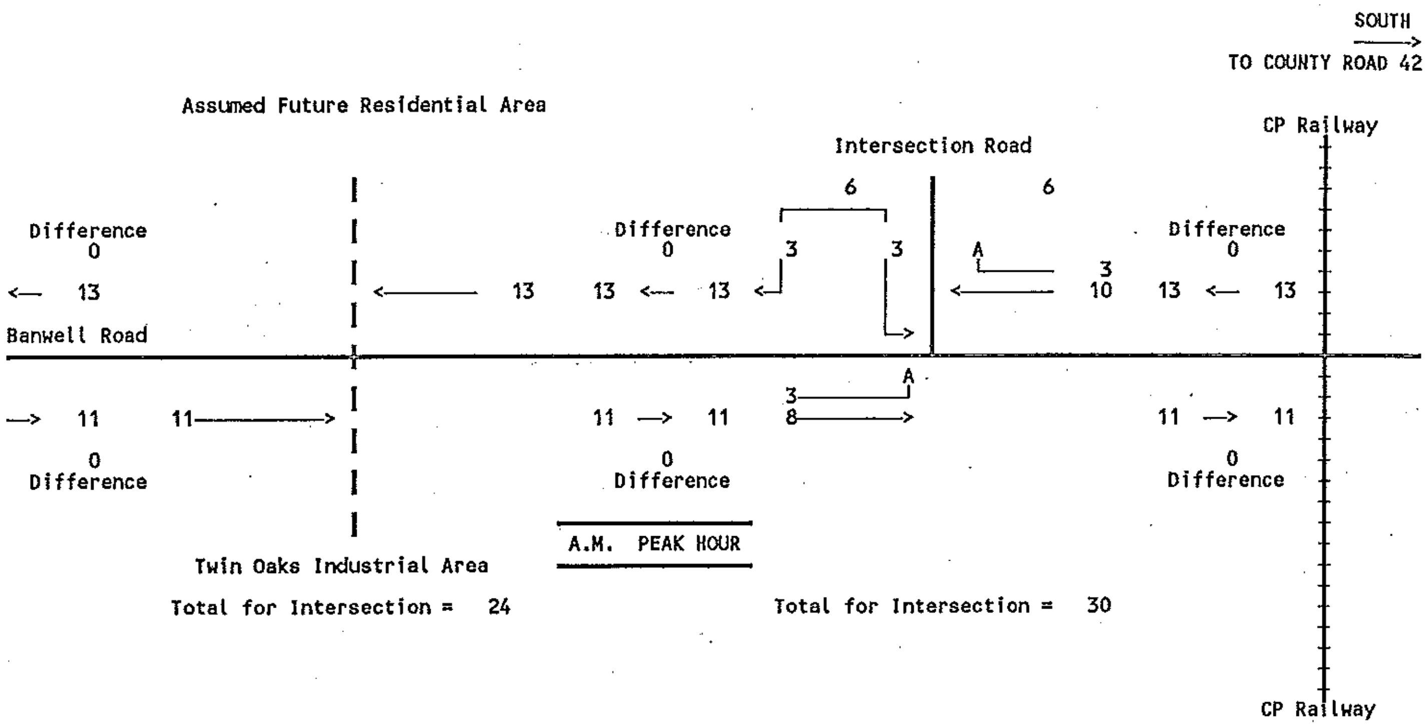
P.M. P E A K H O U R T R U C K T R A F F I C A S P A S S E N G E R C A R E Q U I V A L E N T S



NOTE: To obtain truck equivalents as cars these factors are used:
3.2 passenger cars for left turns and right turns on upward slopes and
2.5 passenger cars for other movements.

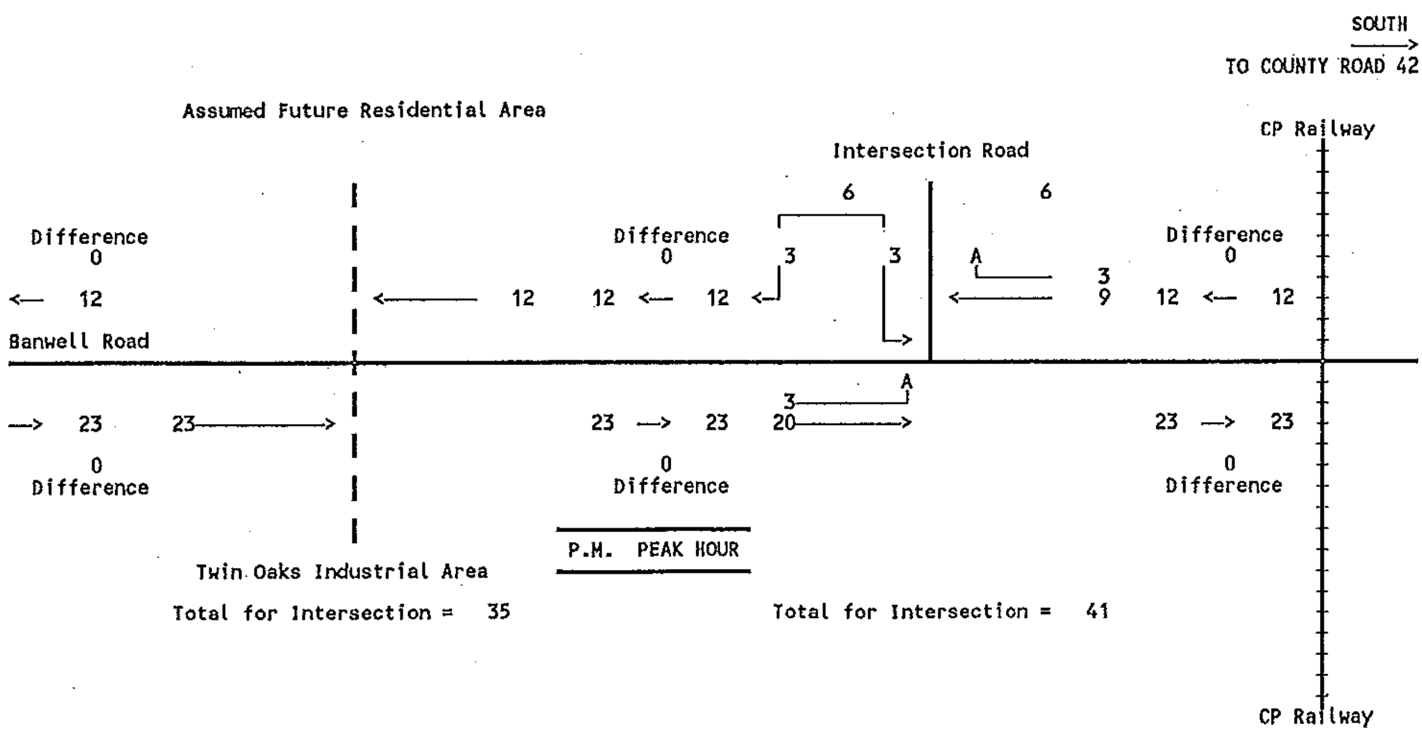
B A N W E L L   R O A D
P E A K   H O U R   T R U C K   T R A F F I C   A S   P A S S E N G E R   C A R   E Q U I V A L E N T S

E . C .   R O W   E X P R E S S W A Y   T O   C A N A D I A N   P A C I F I C   R A I L W A Y



A.M. P E A K   H O U R   T R U C K   T R A F F I C   A S   P A S S E N G E R   C A R   E Q U I V A L E N T S

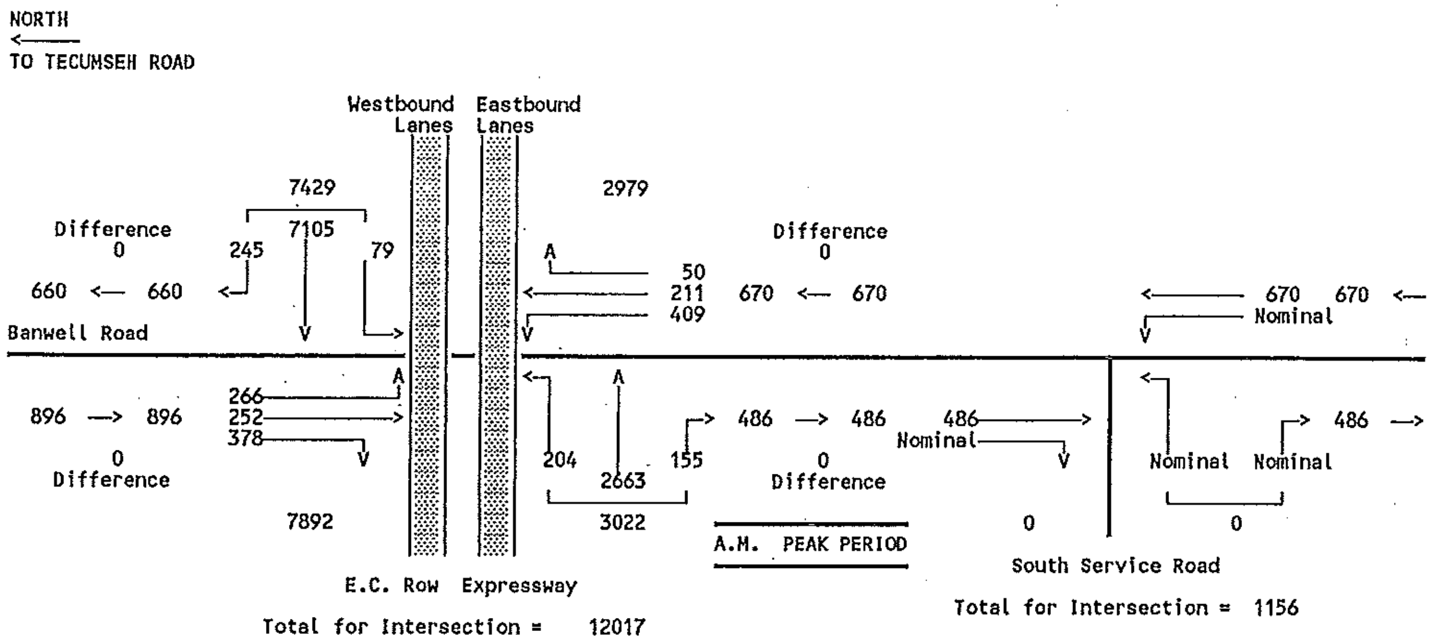
P.M. P E A K   H O U R   T R U C K   T R A F F I C   A S   P A S S E N G E R   C A R   E Q U I V A L E N T S



BANWELL ROAD (a)
AUTOMOBILE TRAFFIC: APPROXIMATE 3-HOUR PEAK PERIOD (BALANCED)

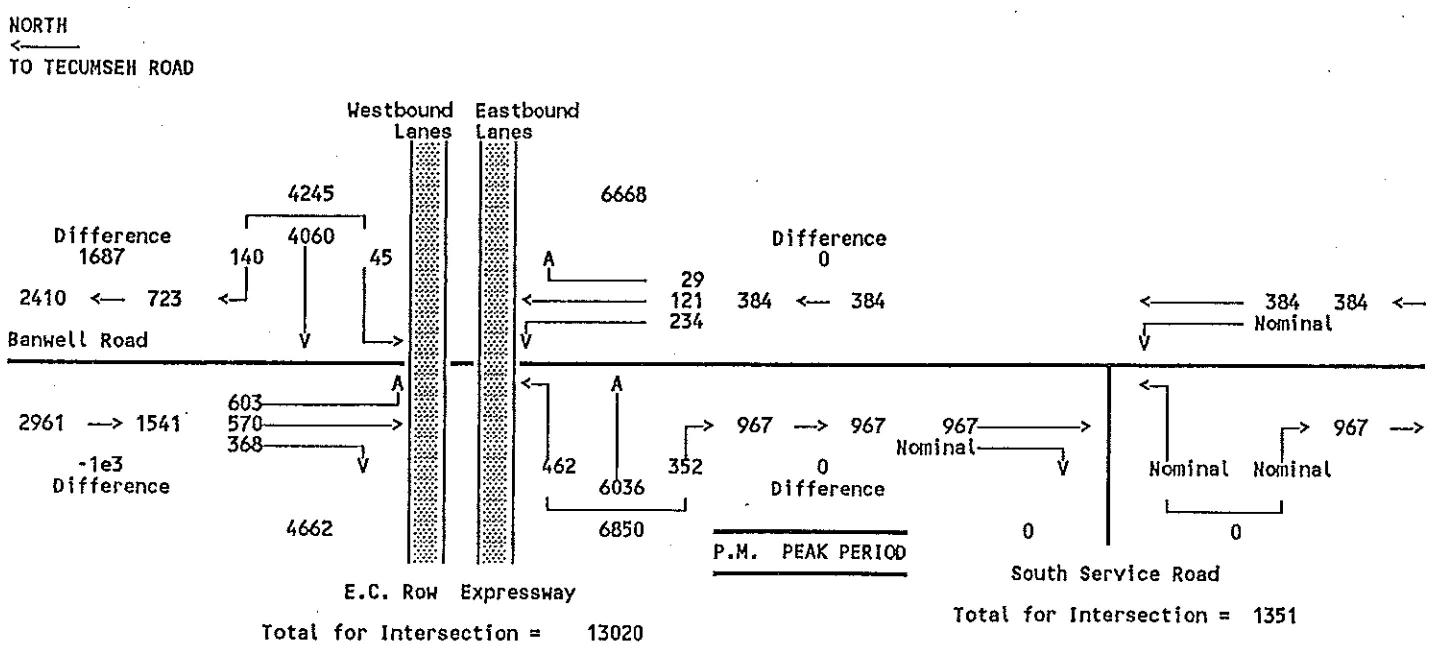
E.C. ROW EXPRESSWAY TO CANADIAN PACIFIC RAILWAY

File: C2
Directory: c:\TwinOaks\Rep\App



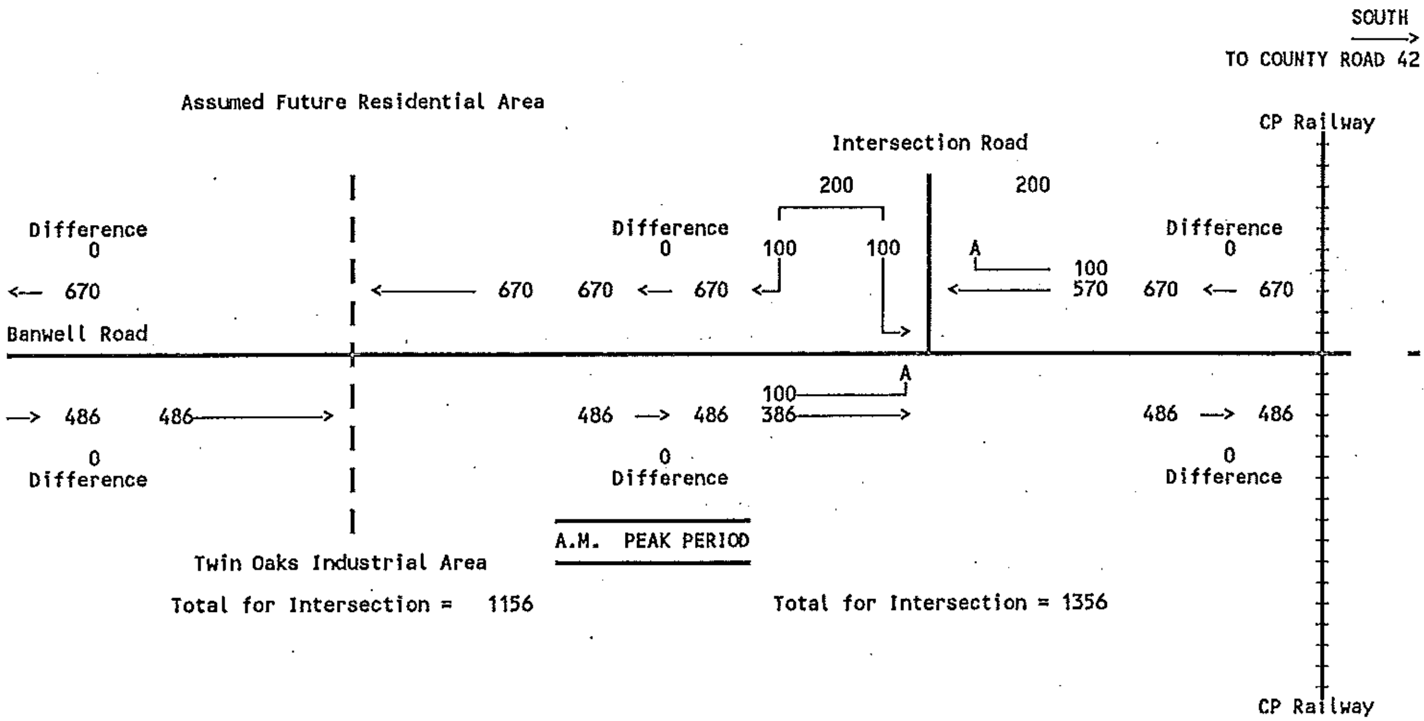
A.M. AUTOMOBILE TRAFFIC: APPROXIMATE 3-HOUR PEAK PERIOD (BALANCED)

P.M. AUTOMOBILE TRAFFIC: APPROXIMATE 3-HOUR PEAK PERIOD (BALANCED)



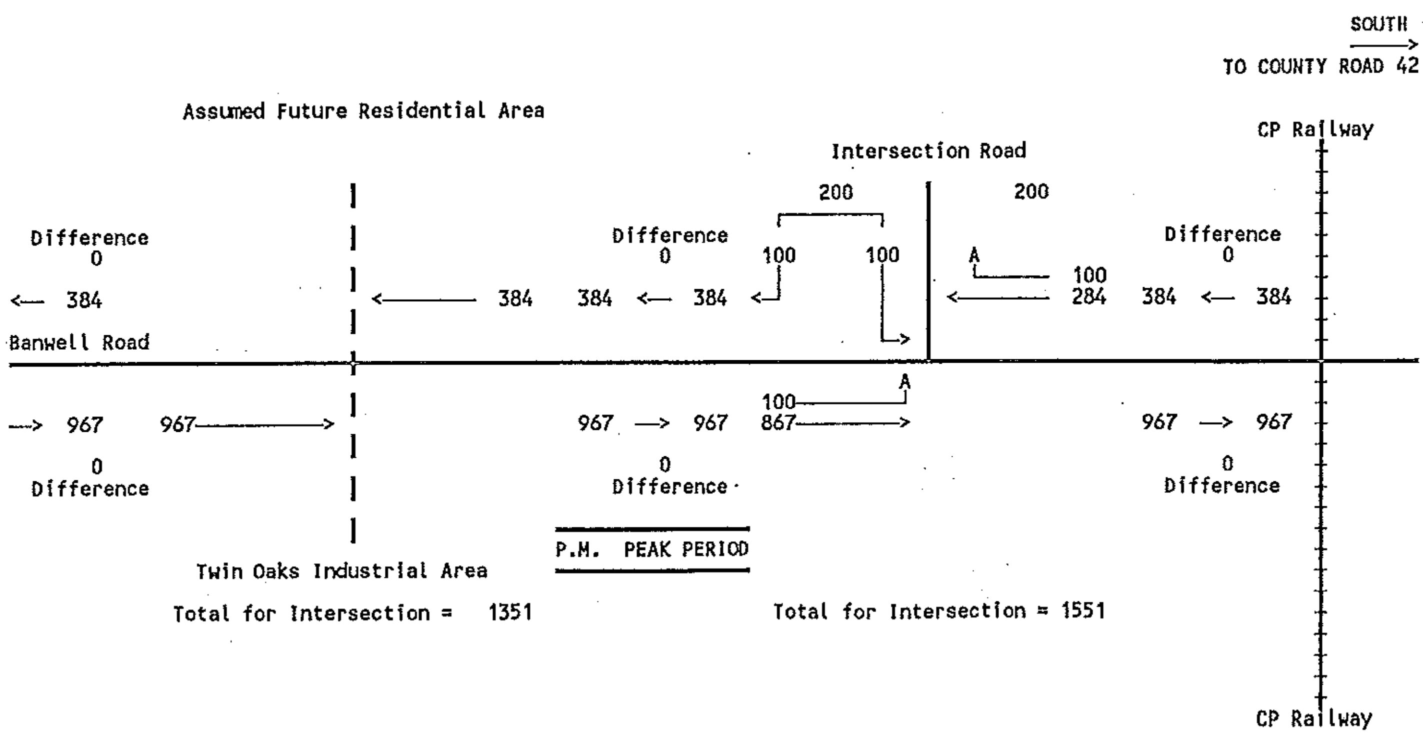
B A N W E L L   R O A D
A U T O M O B I L E   T R A F F I C :   A P P R O X I M A T E   3 - H O U R   P E A K   P E R I O D   (BALANCED)

E . C .   R O W   E X P R E S S W A Y   T O   C A N A D I A N   P A C I F I C   R A I L W A Y



A.M.   A U T O M O B I L E   T R A F F I C :   A P P R O X I M A T E   3 - H O U R   P E A K   P E R I O D   (BALANCED)

P.M.   A U T O M O B I L E   T R A F F I C :   A P P R O X I M A T E   3 - H O U R   P E A K   P E R I O D   (BALANCED)



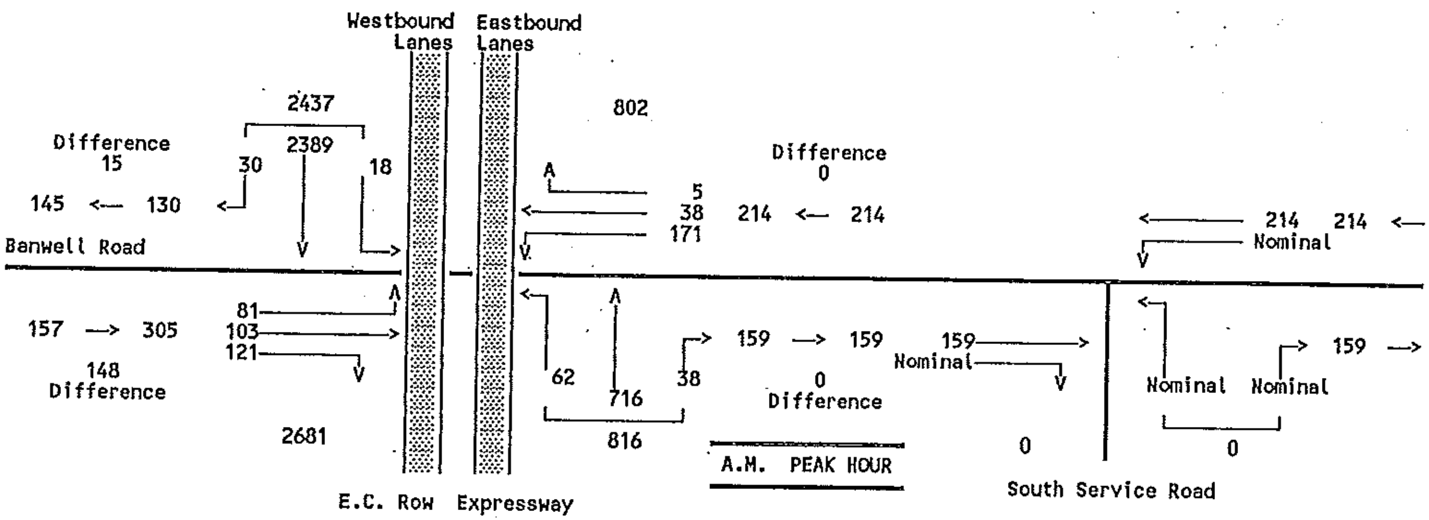
APPENDIX C.2 - FIGURE 4

BANWELL ROAD (a)
PEAK HOUR AUTOMOBILE TRAFFIC

E.C. ROW EXPRESSWAY TO CANADIAN PACIFIC RAILWAY

File: C2
Directory: c:\TwinOaks\Rep\App

NORTH
<——
TO TECUMSEH ROAD



Total for Intersection = 3772

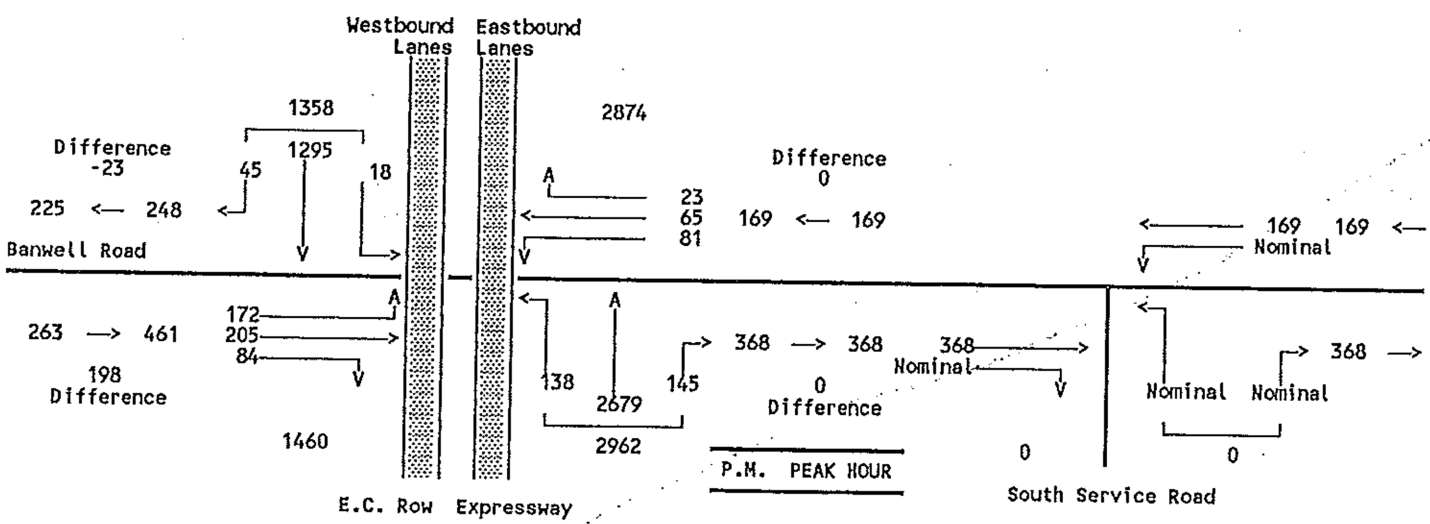
Total for Intersection = 373

NOTE: Morning peak hour traffic for passenger cars averages 35.0% of the 3-hour peak period volume for intersections other than E.C. Row Expressway. At the Extressway, values for 1994 volumes were obtained from MTO records.

A.M. PEAK HOUR AUTOMOBILE TRAFFIC

P.M. PEAK HOUR AUTOMOBILE TRAFFIC

NORTH
<——
TO TECUMSEH ROAD



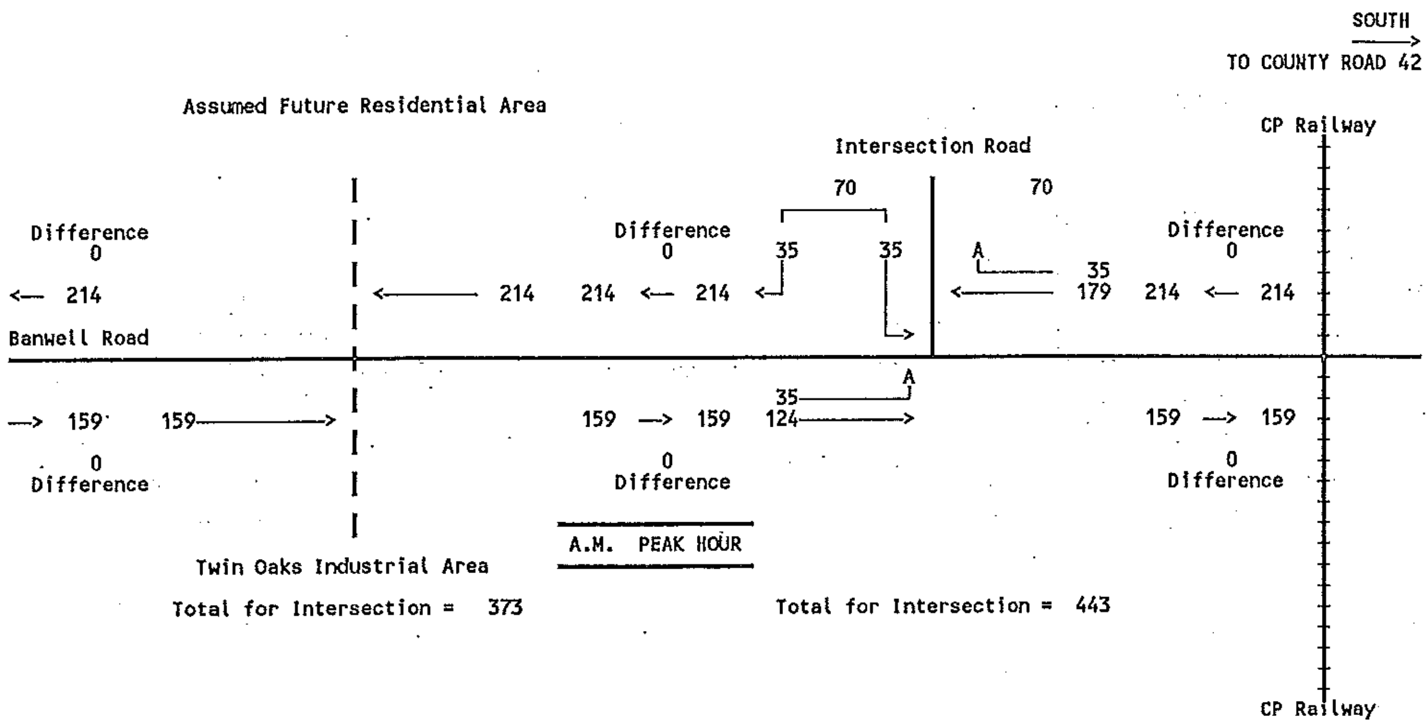
Total for Intersection = 4950

Total for Intersection = 537

NOTE: Evening peak hour traffic for passenger cars averages 37.5% of the 3-hour peak period volume for intersections other than E.C. Row Expressway. At the Extressway, values for 1994 volumes were obtained from MTO records.

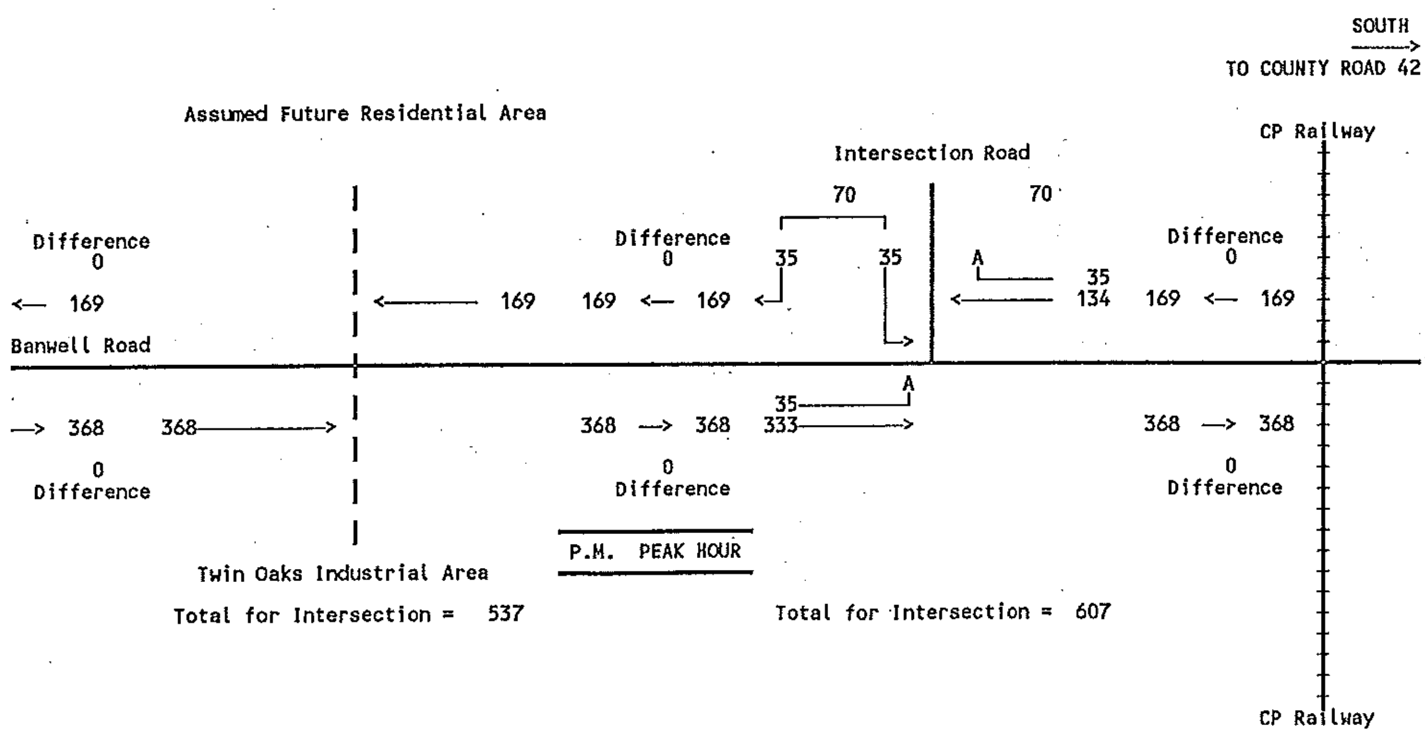
B A N W E L L   R O A D
P E A K   H O U R   A U T O M O B I L E   T R A F F I C

E . C .   R O W   E X P R E S S W A Y   T O   C A N A D I A N   P A C I F I C   R A I L W A Y



A.M. P E A K   H O U R   A U T O M O B I L E   T R A F F I C

P.M. P E A K   H O U R   A U T O M O B I L E   T R A F F I C

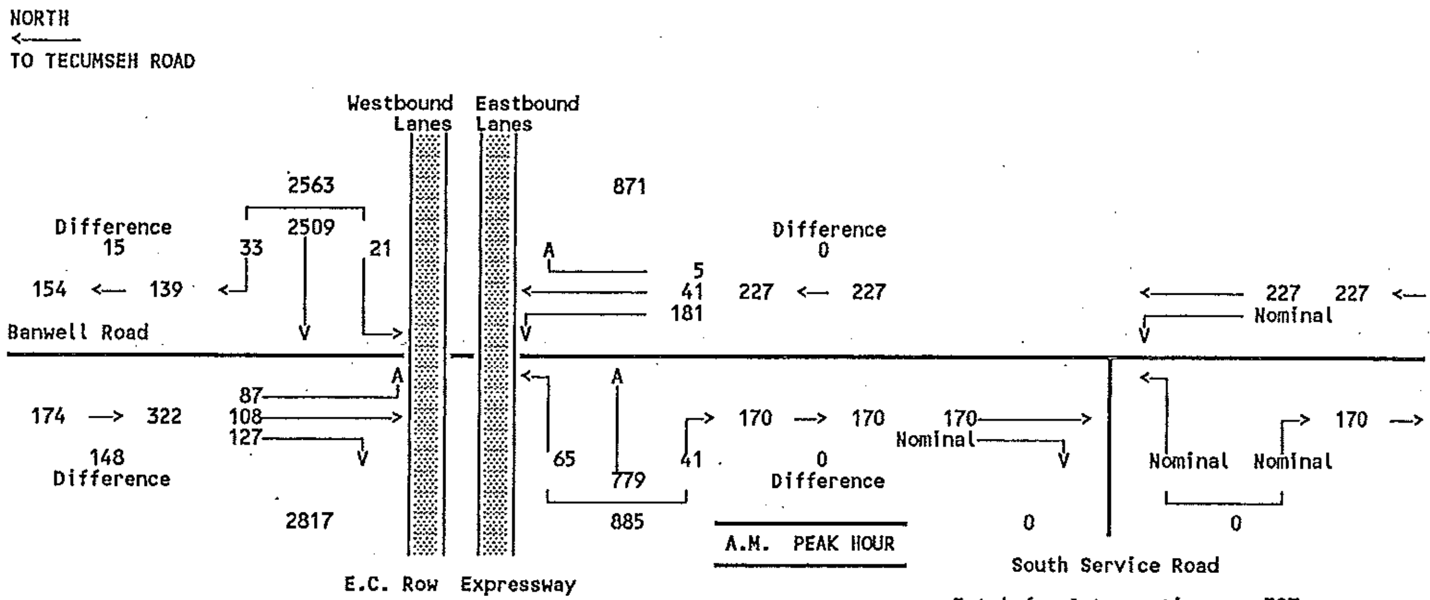


APPENDIX C.2 - FIGURE 5

BANWELL ROAD (a)
EXISTING PEAK HOUR TRAFFIC IN PASSENGER CARS PER HOUR

E.C. ROW EXPRESSWAY TO CANADIAN PACIFIC RAILWAY

File: C2
Directory: c:\TwinOaks\Rep\App

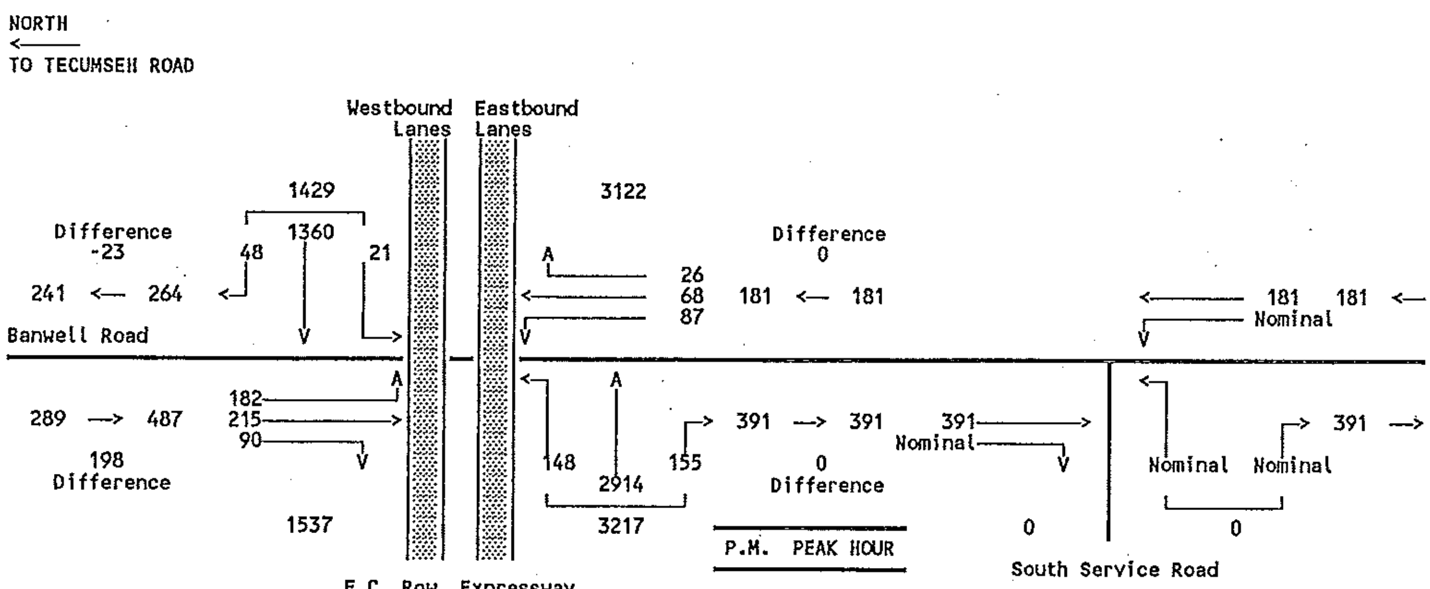


Total for Intersection = 3997

Total for Intersection = 397

A.M. EXISTING PEAK HOUR TRAFFIC IN PASSENGER CARS PER HOUR

P.M. EXISTING PEAK HOUR TRAFFIC IN PASSENGER CARS PER HOUR

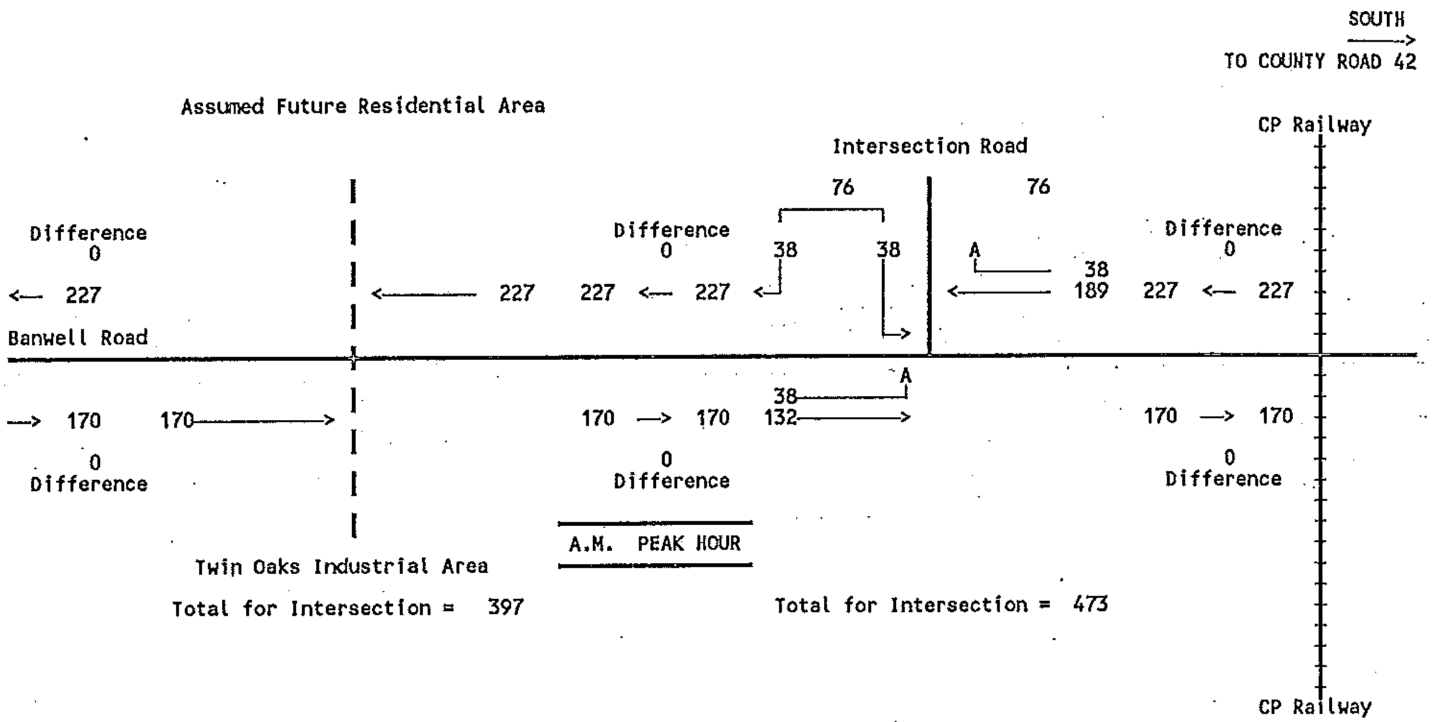


Total for Intersection = 5314

Total for Intersection = 572

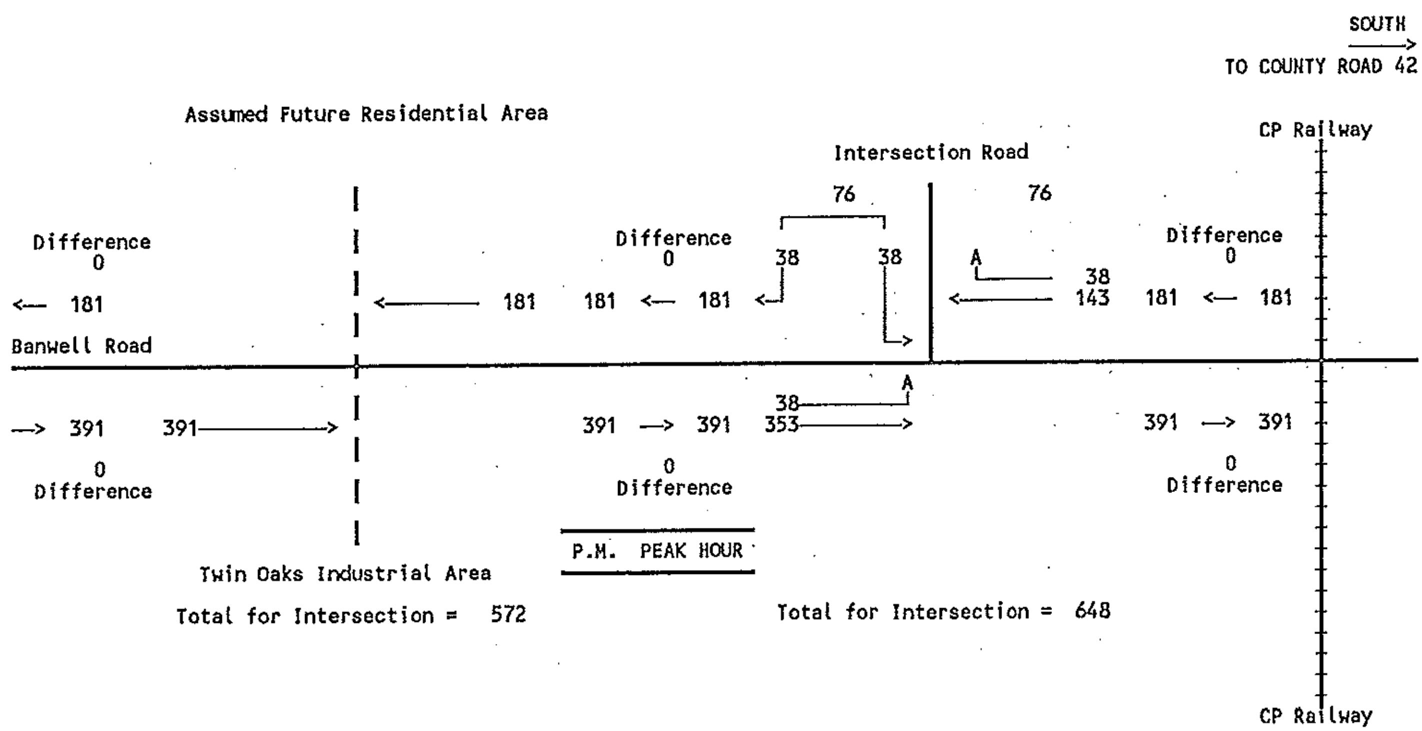
BANWELL ROAD
EXISTING PEAK HOUR TRAFFIC IN PASSENGER CARS PER HOUR

E.C. ROW EXPRESSWAY TO CANADIAN PACIFIC RAILWAY



A.M. EXISTING PEAK HOUR TRAFFIC IN PASSENGER CARS PER HOUR

P.M. EXISTING PEAK HOUR TRAFFIC IN PASSENGER CARS PER HOUR

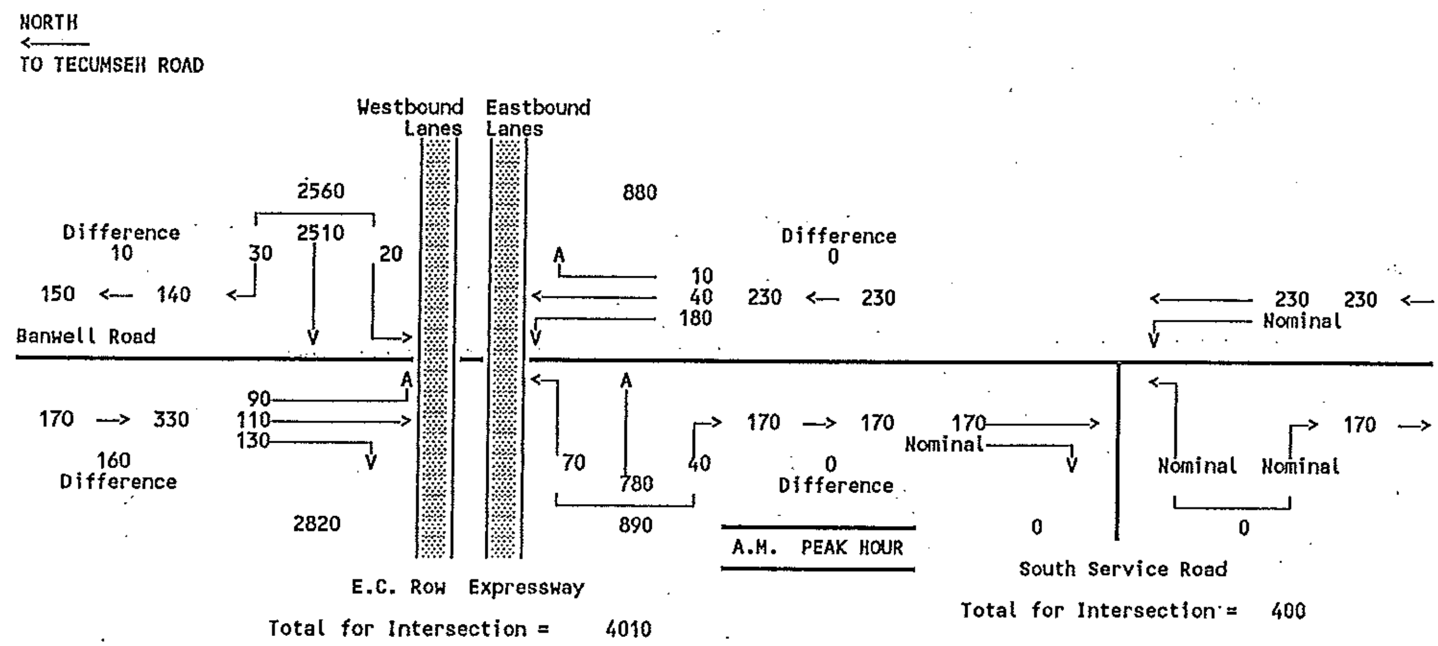


APPENDIX C.2 - FIGURE 6

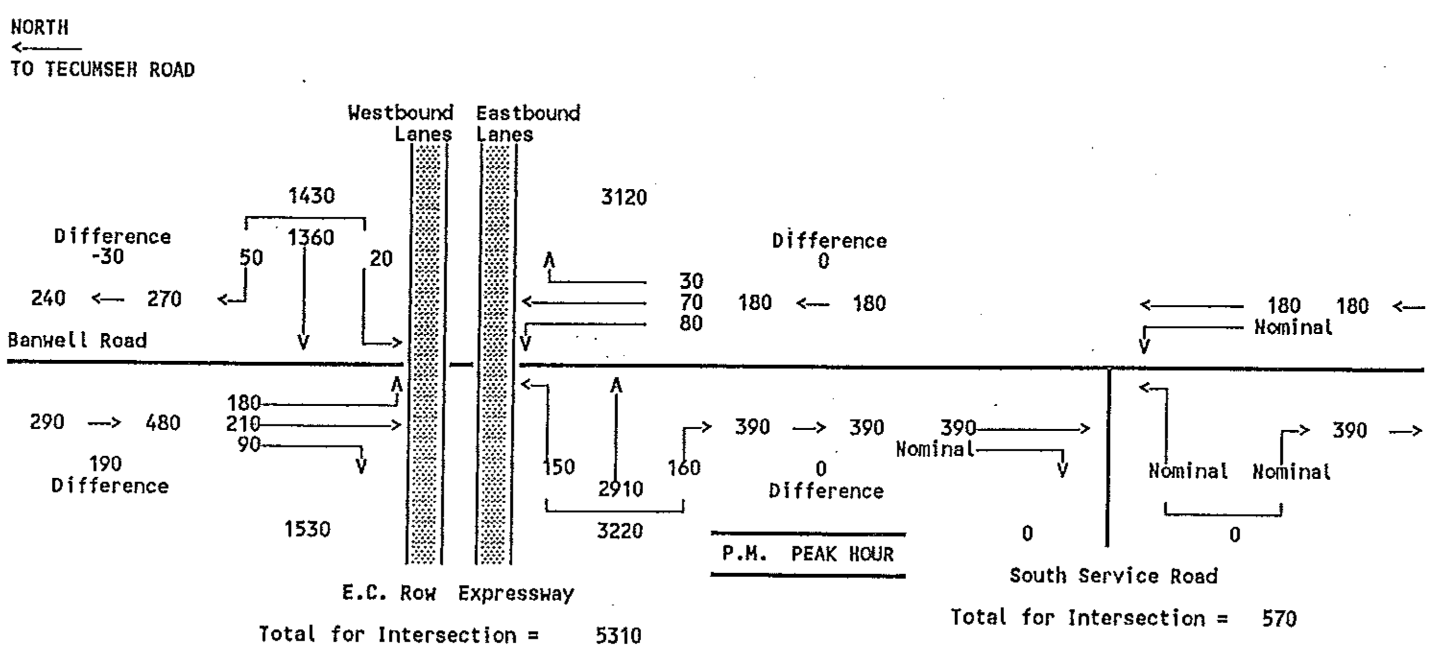
BANWELL ROAD (a)
ROUNDED/BALANCED EXISTING PEAK HOUR TRAFFIC FLOWS

E.C. ROW EXPRESSWAY TO CANADIAN PACIFIC RAILWAY

File: C2
Directory: c:\TwinOaks\Rep\App

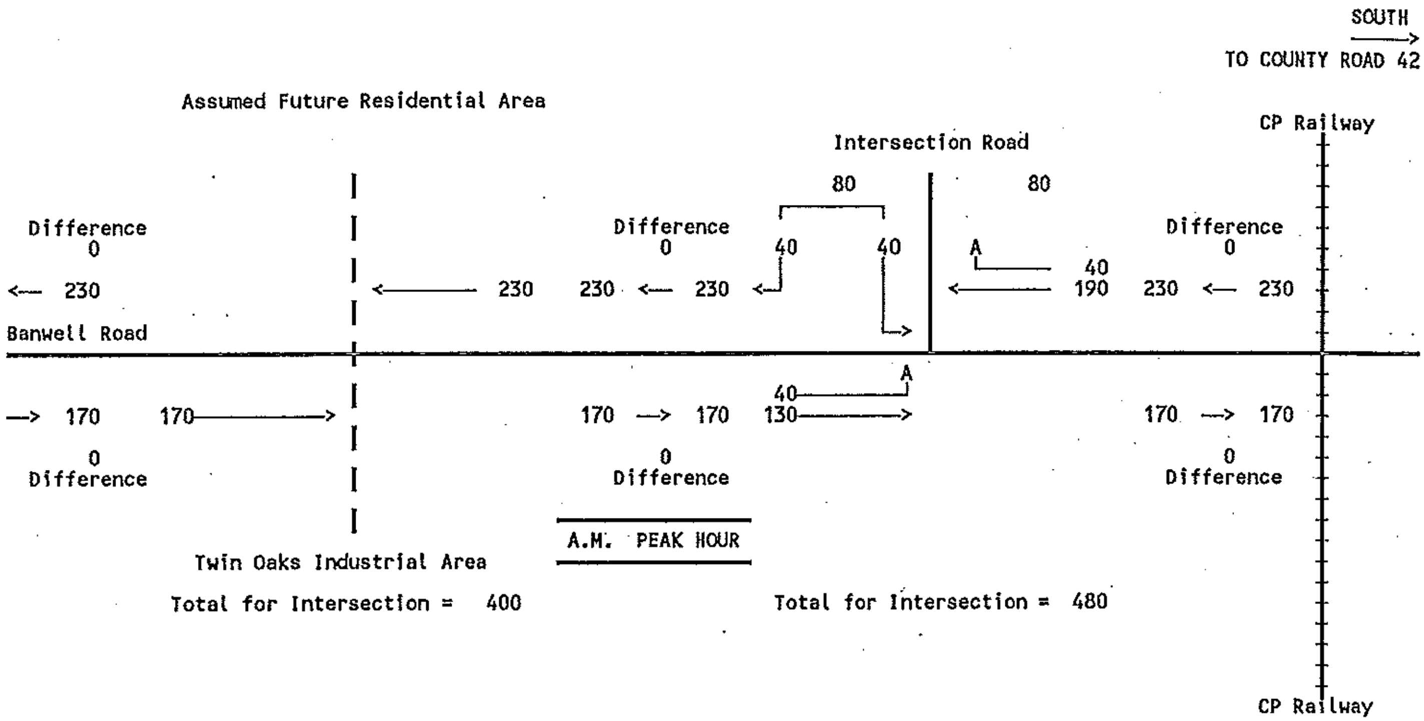


A.M. ROUNDED/BALANCED EXISTING PEAK HOUR TRAFFIC FLOWS
==
P.M. ROUNDED/BALANCED EXISTING PEAK HOUR TRAFFIC FLOWS



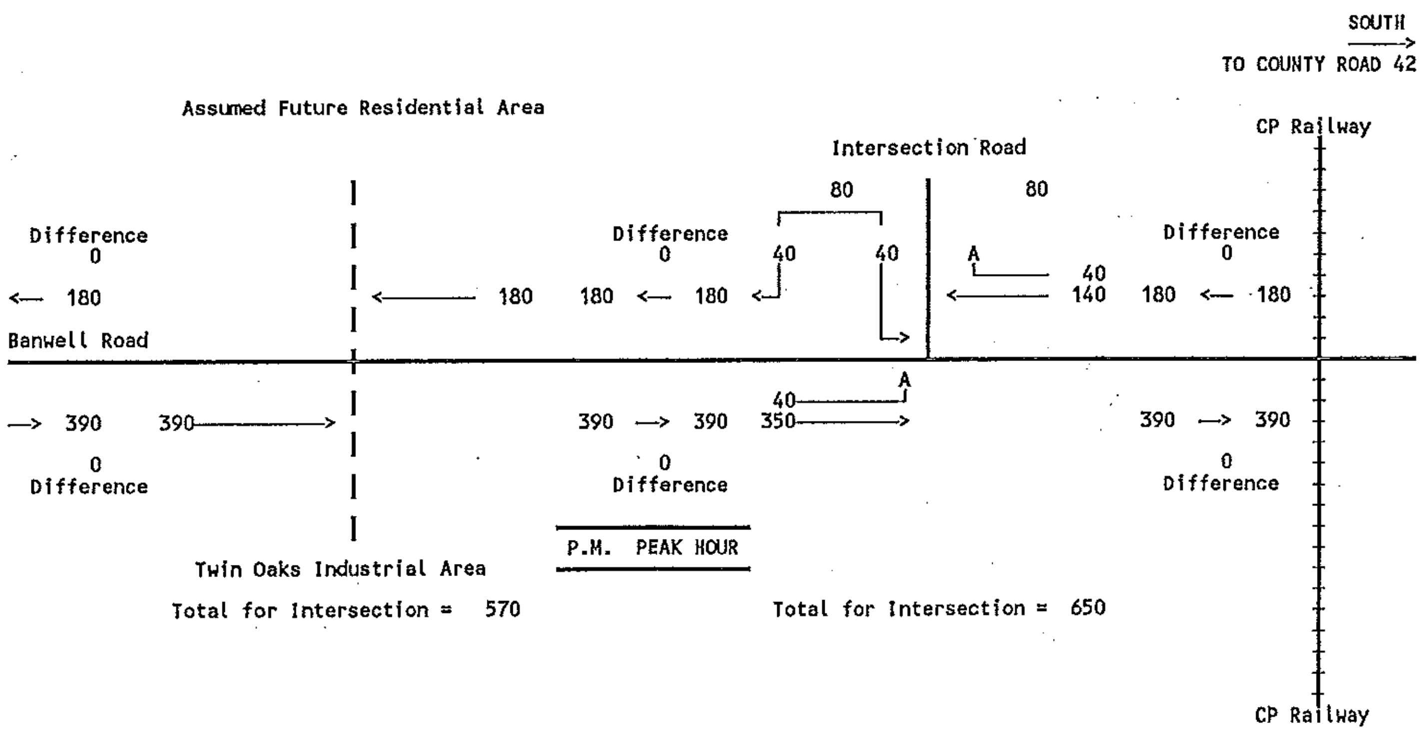
BANWELL ROAD
ROUNDED/BALANCED EXISTING PEAK HOUR TRAFFIC FLOWS

E.C. ROW EXPRESSWAY TO CANADIAN PACIFIC RAILWAY



A.M. ROUNDED/BALANCED EXISTING PEAK HOUR TRAFFIC FLOWS

P.M. ROUNDED/BALANCED EXISTING PEAK HOUR TRAFFIC FLOWS



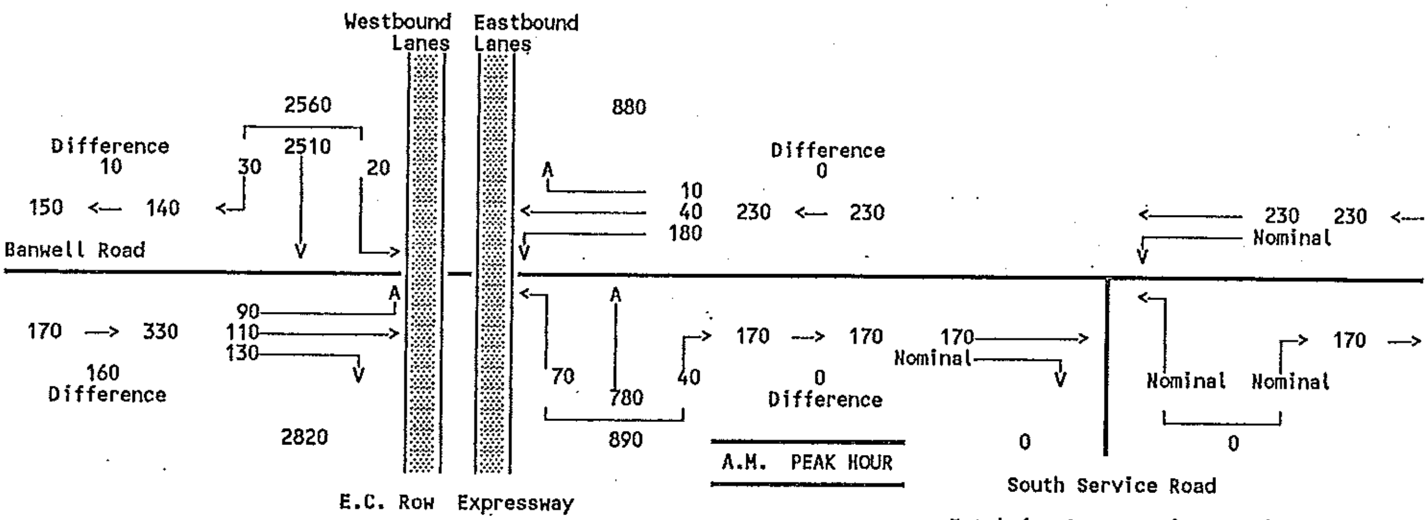
A P P E N D I X C.2 - F I G U R E 7

B A N W E L L R O A D
A D J U S T E D E X I S T I N G P E A K H O U R T R A F F I C F L O W S (a)

E . C . R O W E X P R E S S W A Y T O C A N A D I A N P A C I F I C R A I L W A Y

File: C2
Directory: c:\TwinOaks\Rep\App

NORTH
<———
TO TECUMSEH ROAD



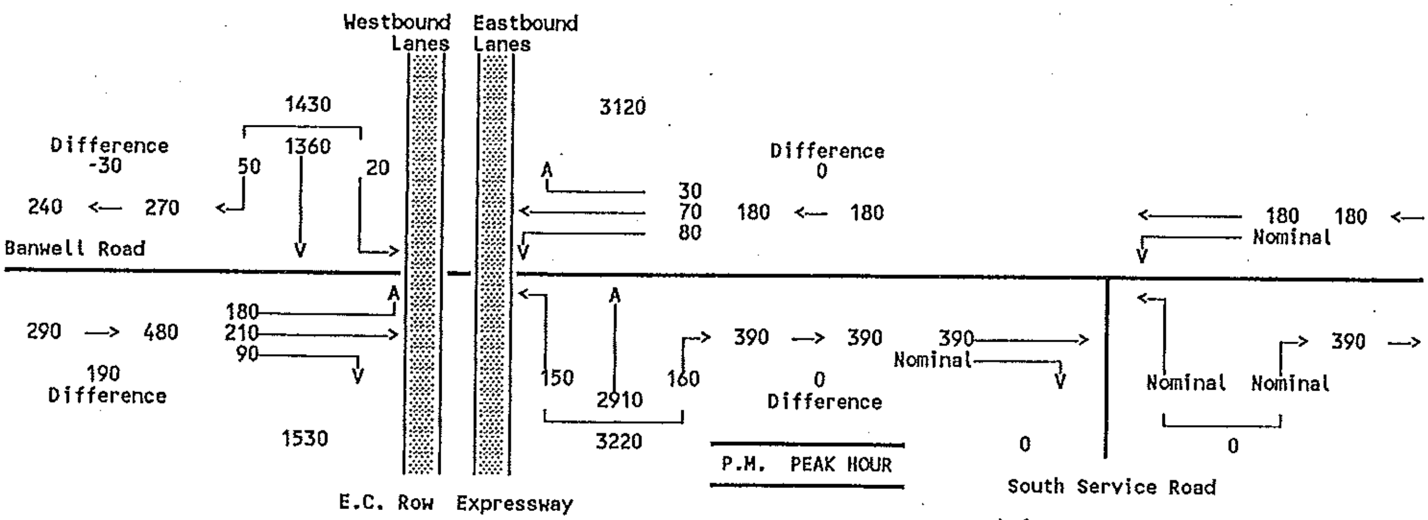
Total for Intersection = 4010

Total for Intersection = 400

****
NOTE: N O T R E Q U I R E D F O R B A N W E L L R O A D
****

A.M. A D J U S T E D E X I S T I N G P E A K H O U R T R A F F I C F L O W S
===
P.M. A D J U S T E D E X I S T I N G P E A K H O U R T R A F F I C F L O W S

NORTH
<———
TO TECUMSEH ROAD

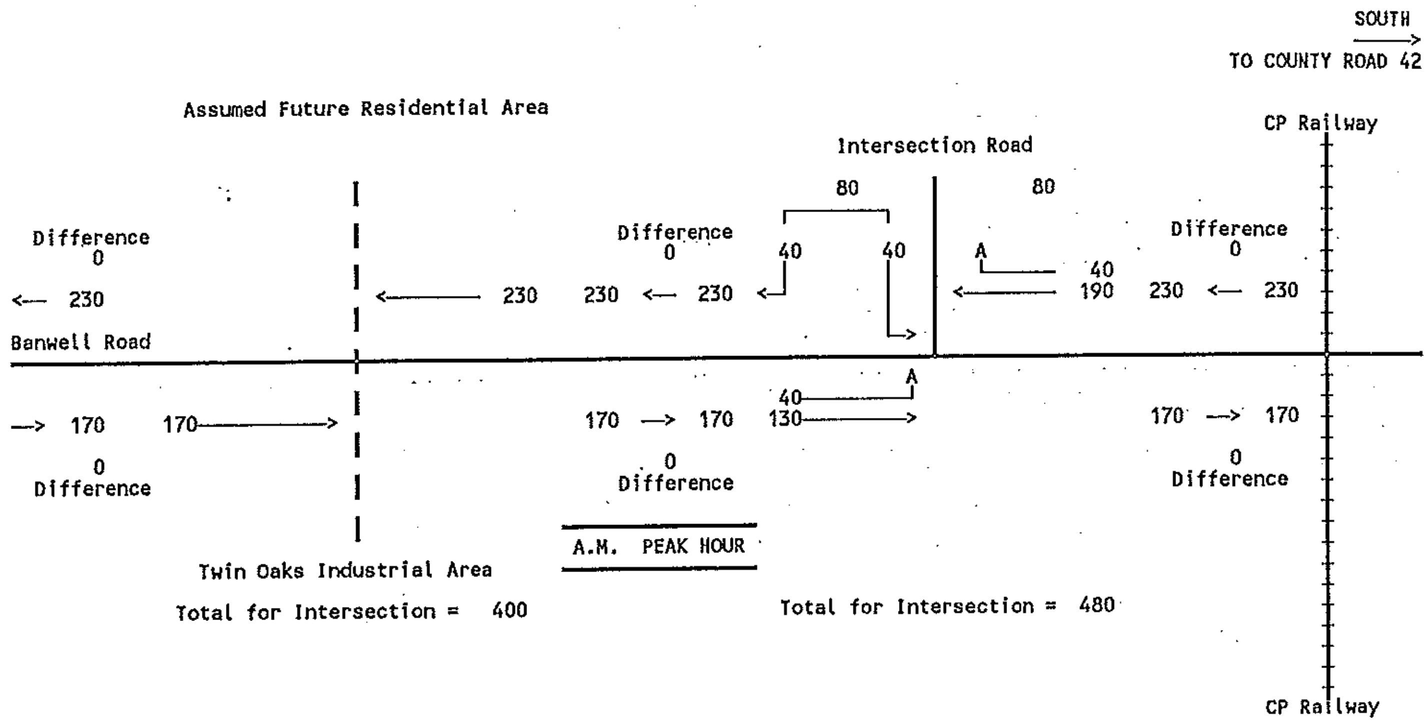


Total for Intersection = 5310

Total for Intersection = 570

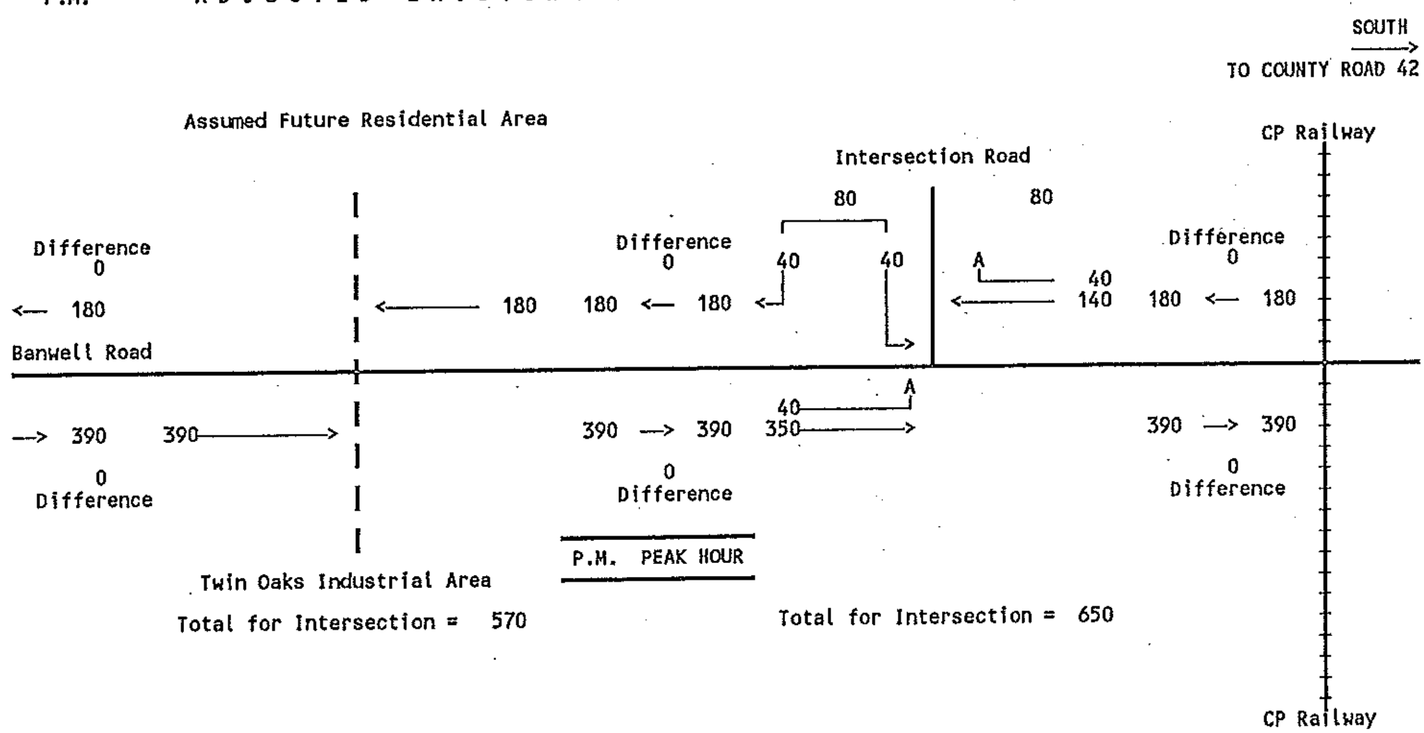
****
NOTE: N O T R E Q U I R E D F O R B A N W E L L R O A D
****

BANWELL ROAD
ADJUSTED EXISTING PEAK HOUR TRAFFIC FLOWS
E.C. ROW EXPRESSWAY TO CANADIAN PACIFIC RAILWAY



A.M. ADJUSTED EXISTING PEAK HOUR TRAFFIC FLOWS

P.M. ADJUSTED EXISTING PEAK HOUR TRAFFIC FLOWS



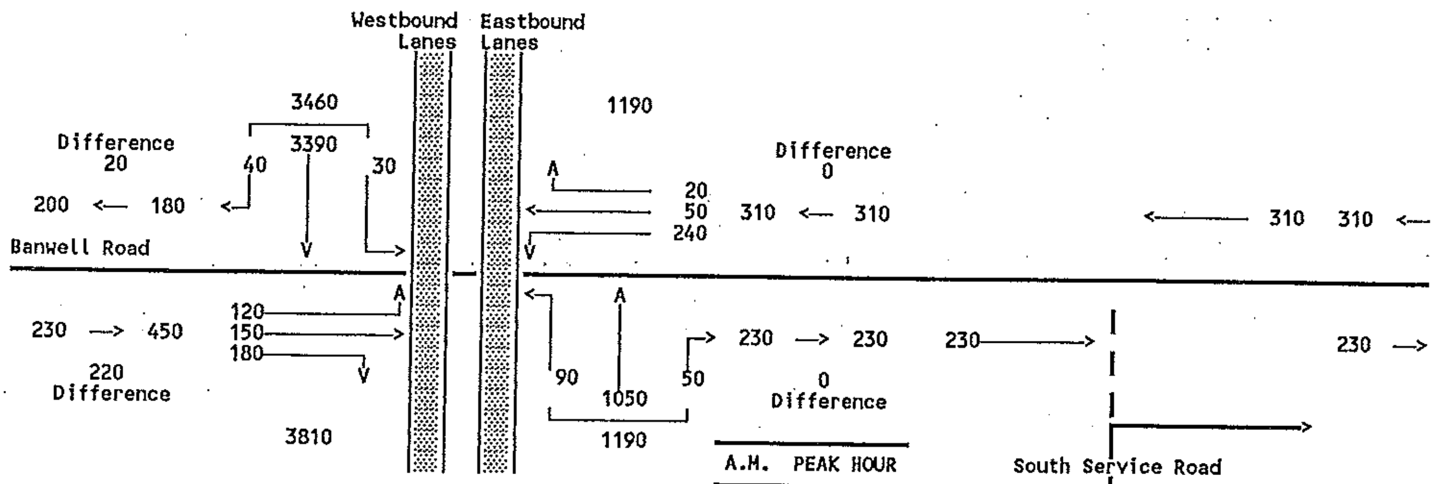
A P P E N D I X C.2 - F I G U R E 8

B A N W E L L R O A D
F U T U R E B A C K G R O U N D T R A F F I C : Y E A R 2 0 1 6 (a)

E . C . R O W E X P R E S S W A Y T O C A N A D I A N P A C I F I C R A I L W A Y

File: C2
Directory: c:\TwinOaks\Rep\App

NORTH
<——
TO TECUMSEH ROAD



Total for Intersection = 5410

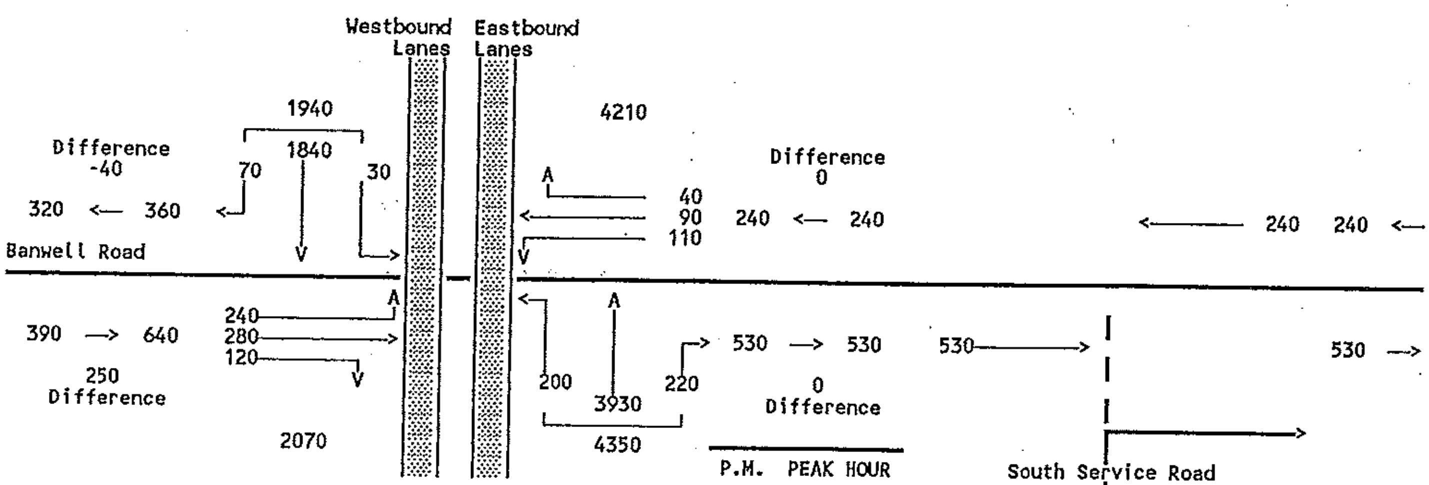
* No longer connected to Banwell Road. *
* Turned south to intersect with the new *
* collector road in the Twin Oaks area *
* west of the Banwell Road intersection. *

NOTE: (a) Background traffic factored for growth at
1.50 percent per year for -> 20 years, gives
1.35 as an over-all growth factor.

A.M. F U T U R E B A C K G R O U N D T R A F F I C : Y E A R 2 0 1 6

P.M. F U T U R E B A C K G R O U N D T R A F F I C : Y E A R 2 0 1 6

NORTH
<——
TO TECUMSEH ROAD



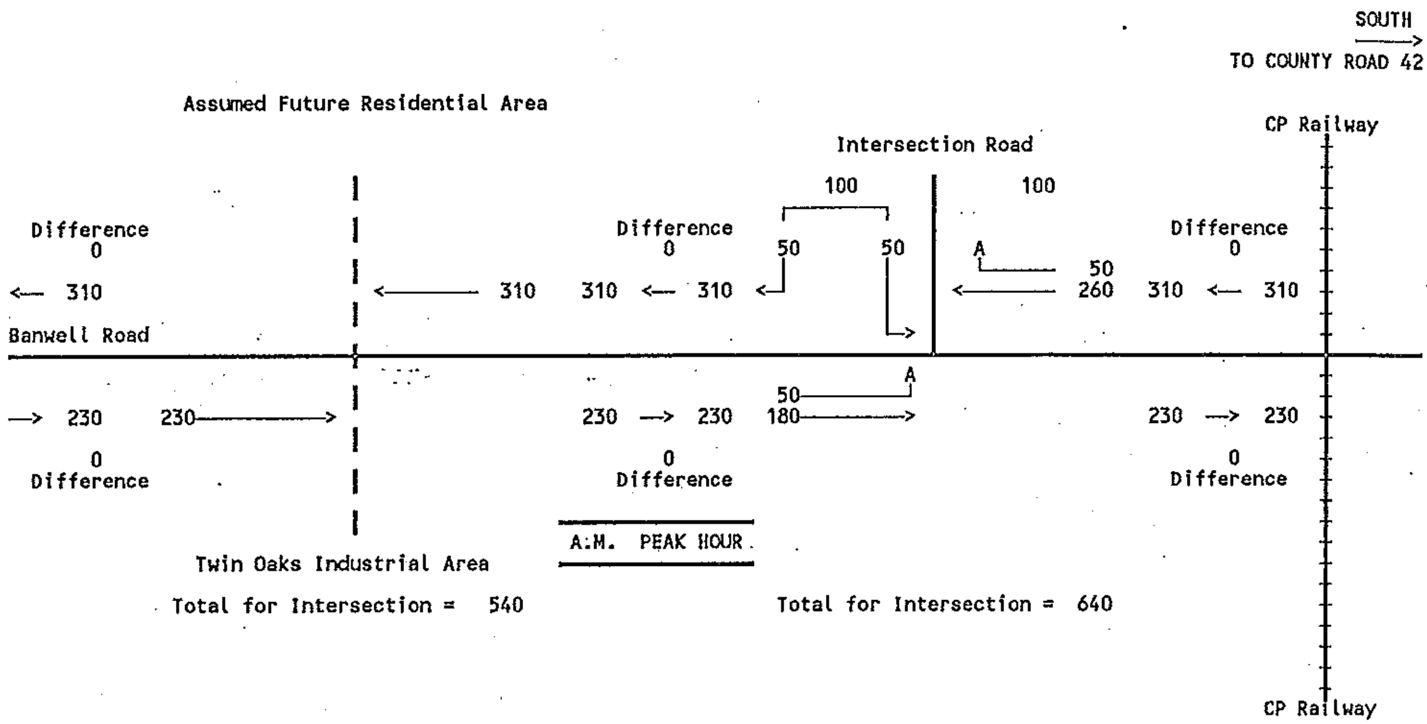
Total for Intersection = 7170

* No longer connected to Banwell Road. *
* Turned south to intersect with the new *
* collector road in the Twin Oaks area *
* west of the Banwell Road intersection. *

NOTE: (a) Background traffic factored for growth at
1.5 percent per year for -> 20 years, gives
1.35 as an over-all growth factor.

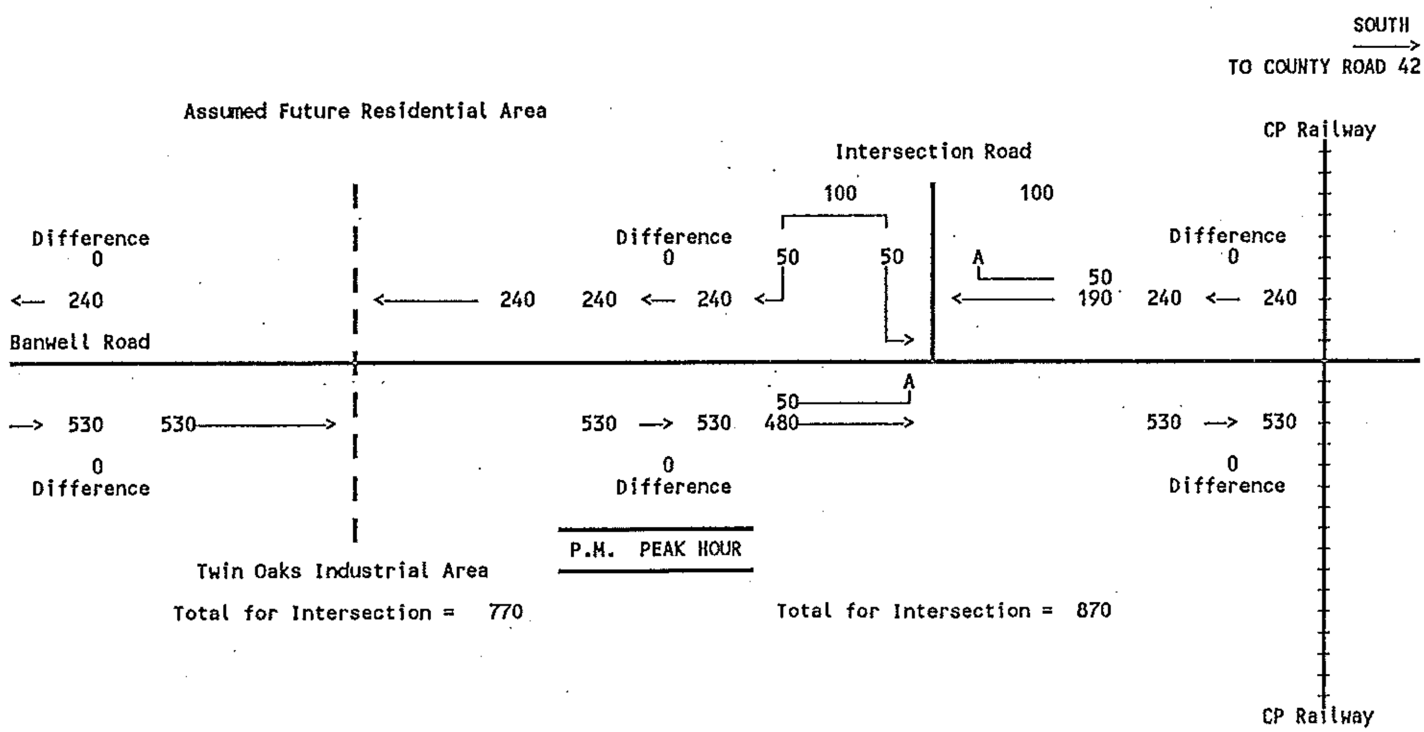
B A N W E L L   R O A D
F U T U R E   B A C K G R O U N D   T R A F F I C :   Y E A R   2 0 1 6

E . C .   R O W   E X P R E S S W A Y   T O   C A N A D I A N   P A C I F I C   R A I L W A Y



A.M.   F U T U R E   B A C K G R O U N D   T R A F F I C :   Y E A R   2 0 1 6

P.M.   F U T U R E   B A C K G R O U N D   T R A F F I C :   Y E A R   2 0 1 6



APPENDIX C.2 - FIGURE 9

BANWELL ROAD (a)
FUTURE SITE-GENERATED TRAFFIC

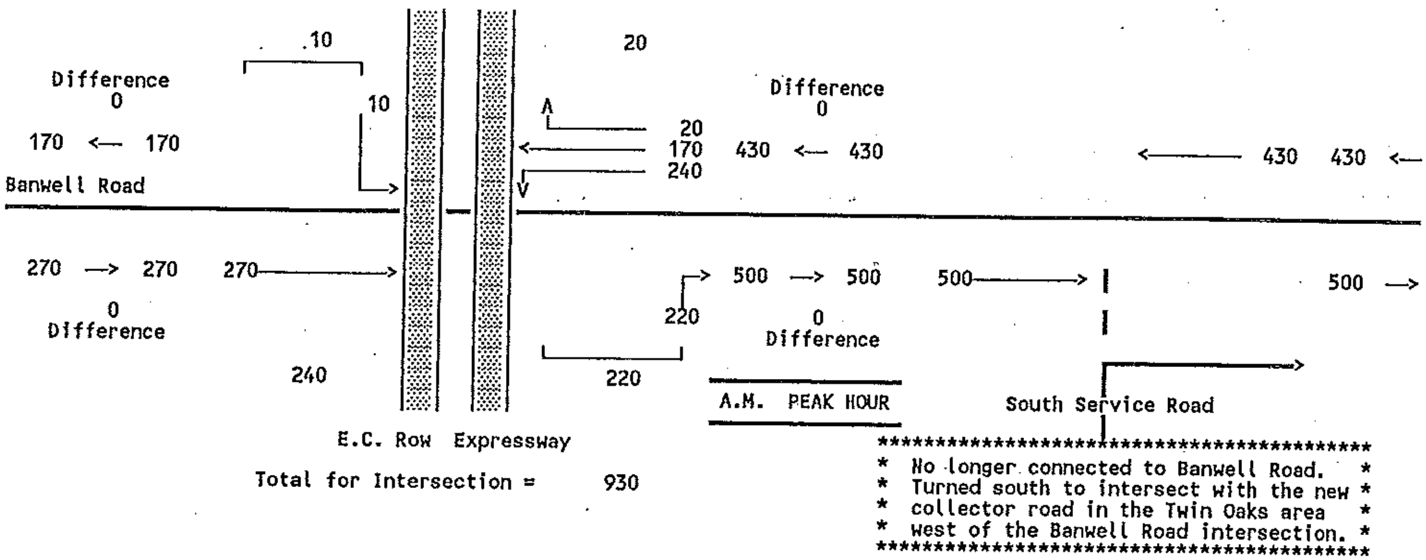
E.C. ROW EXPRESSWAY TO CANADIAN PACIFIC RAILWAY

File: C2
Directory: c:\TwinOaks\Rep\App

DISTRIBUTION OF TWIN OAKS SITE-GENERATED TRAFFIC

Corridor	North	South	East	West	Total	Check
Banwell Road to EC Row + South	na	.05	.05	.10	.20	
Banwell Road to Tecumseh Road	.15	na	na	na	.15	.35
Lauzon Parkway	.20	.05	na	.28	.53	
South Service Rd (to Jefferson Bl	.12	na	na	na	.12	
Total	.47	.10	.05	.38	1.00	1.00

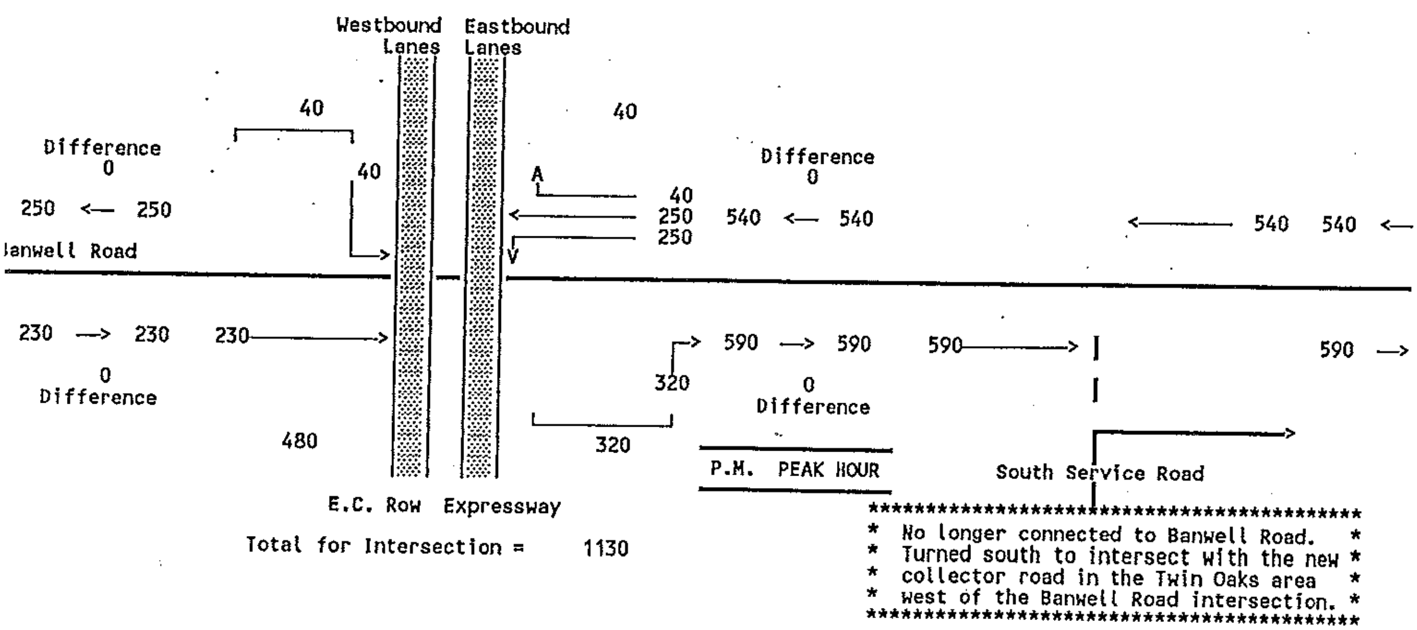
NORTH
<—
TO TECUMSEH ROAD



A.M. FUTURE SITE-GENERATED TRAFFIC

P.M. FUTURE SITE-GENERATED TRAFFIC

NORTH
<—
TO TECUMSEH ROAD



BANWELL ROAD
FUTURE SITE-GENERATED TRAFFIC

E.C. ROW EXPRESSWAY TO CANADIAN PACIFIC RAILWAY

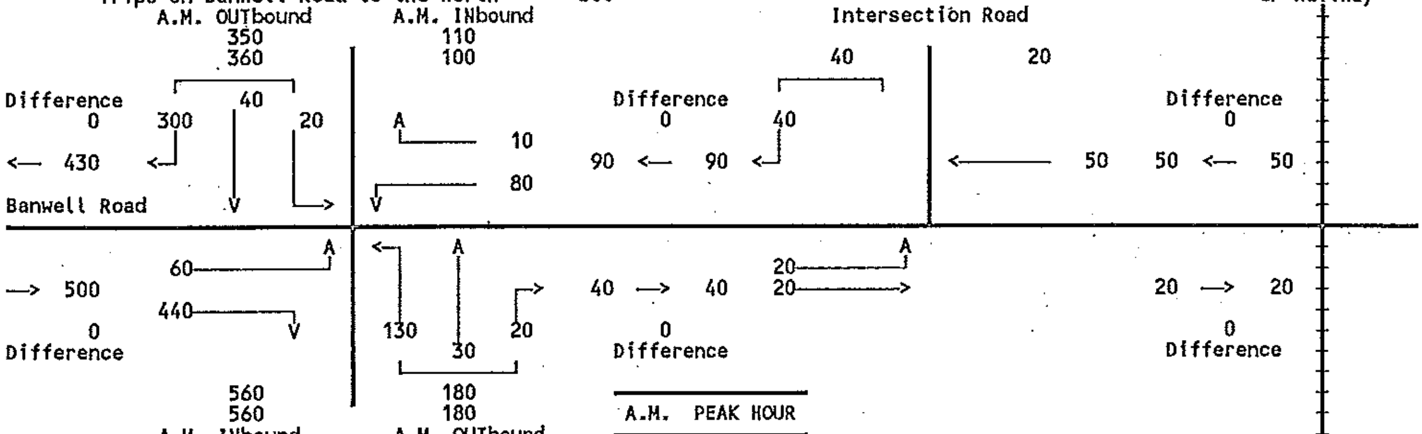
DISTRIBUTION: Corridor	ASSUMED RESIDENTIAL TRAFFIC North	West	East	South	Total
Tecumseh Rd. E.	.10	.10	.05	na	.25
Twin Oaks Road	na	.10	na	na	.10
E.C. Row Expway	na	.55	.05	na	.60
Banwell Road	na	na	na	.05	.05
Total	.10	.75	.10	.05	1.00

ASSUMED FUTURE RESIDENTIAL AREA
Area Developed in 2014 = 125 Acres

SOUTH
TO COUNTY ROAD 42

Trip Generation Rate: 3.70 vph/Acre
Total Site-generated Vehicle Trips = 460
Trips on Banwell Road to the North = 300**

CP Railway



Trips on Banwell Road to North and South = 740
Total Site-generated Vehicle Trips = 2100
Trip Generation Rate: 5.00 vph/Acre

Total for Intersection = 130

Area: 420 Acres
Twin Oaks Industrial Area

CP Railway

Total for Intersection = 1130

A.M. FUTURE SITE-GENERATED TRAFFIC

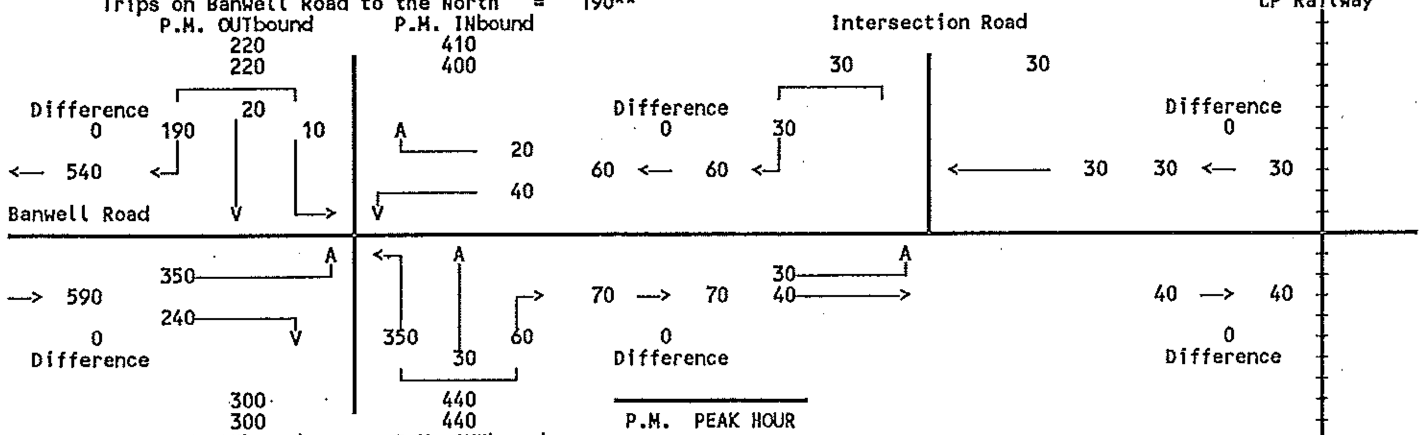
P.M. FUTURE SITE-GENERATED TRAFFIC

ASSUMED FUTURE RESIDENTIAL AREA
Area Developed in 2014 125 Acres

SOUTH
TO COUNTY ROAD 42

Trip Generation Rate: 5.00 vph/Acre
Total Site-generated Vehicle Trips = 630
Trips on Banwell Road to the North = 190**

CP Railway



Trips on Banwell Road to North and South = 740
Total Site-generated Vehicle Trips = 2100
Trip Generation Rate: 5.00 vph/Acre

Total for Intersection = 130

Area: 420 Acres
Twin Oaks Industrial Area

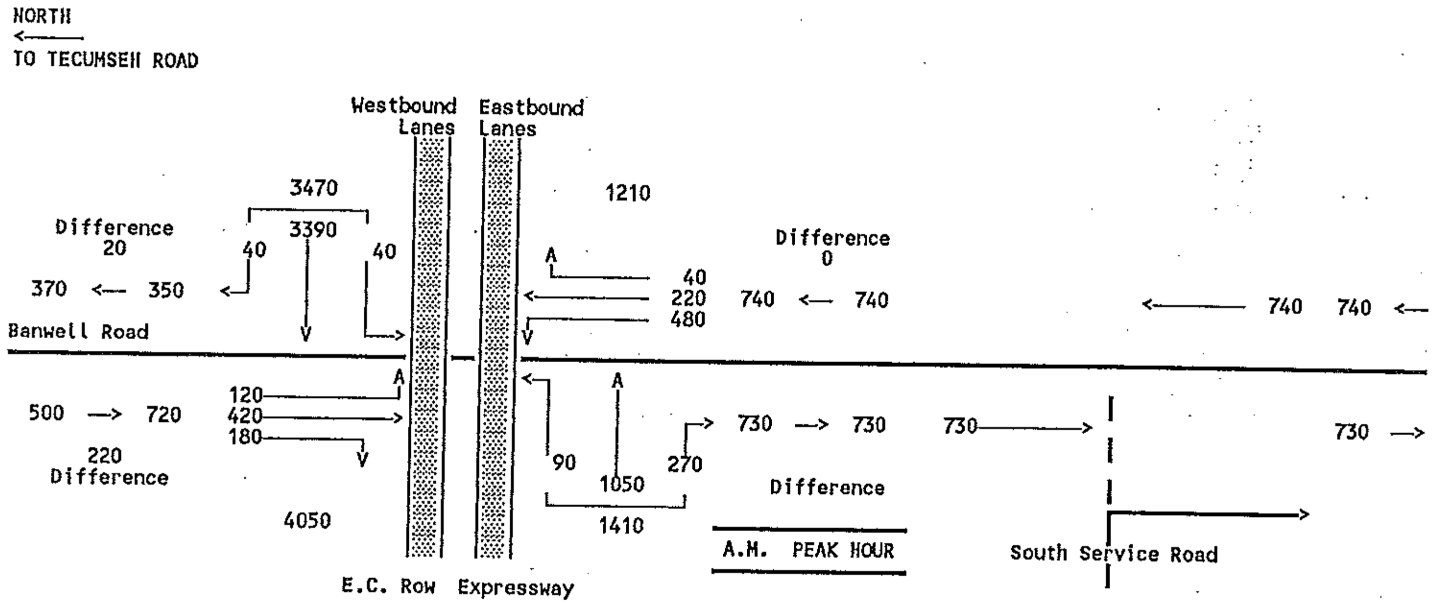
CP Railway

Total for Intersection = 1310

APPENDIX C.2 - FIGURE 10

BANWELL ROAD
FUTURE TRAFFIC: YEAR 2014 DESIGN HOUR VOLUMES (a)
E.C. ROW EXPRESSWAY TO CANADIAN PACIFIC RAILWAY

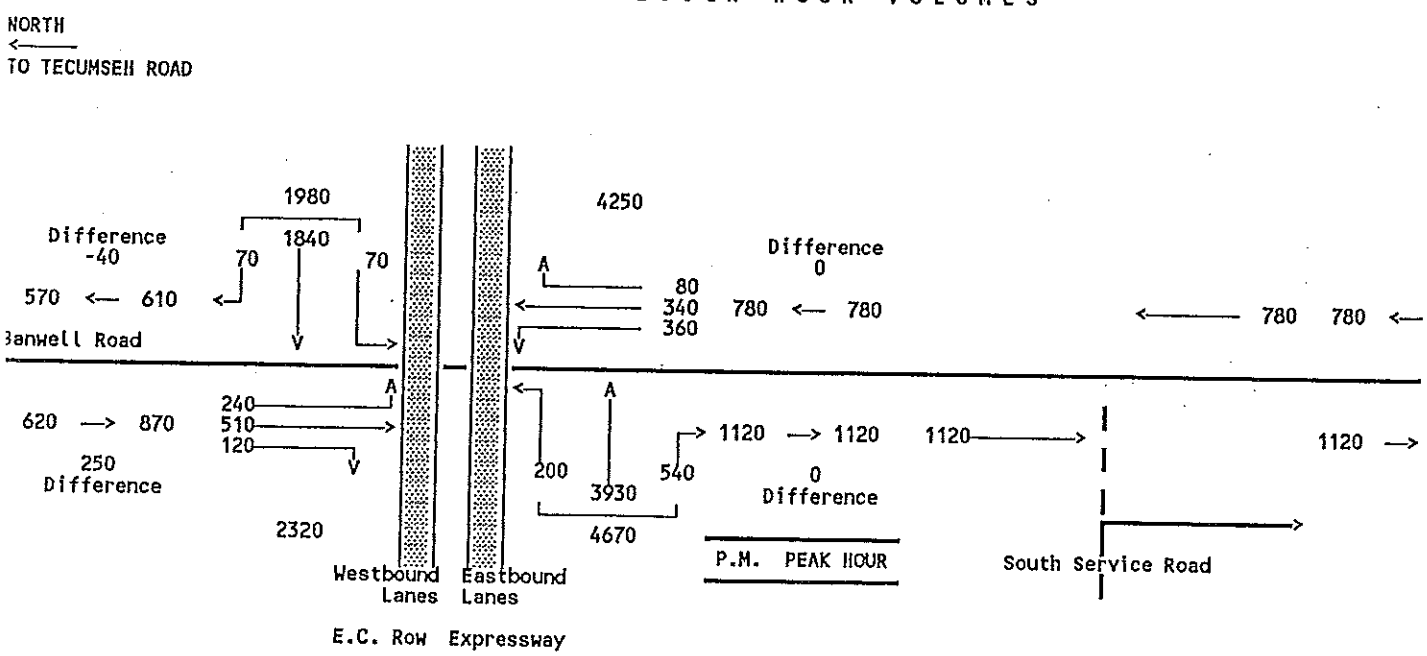
File: C2
Directory: c:\TwinOaks\Rep\App



Total for Intersection = 6340

FUTURE TRAFFIC: YEAR 2014 DESIGN HOUR VOLUMES

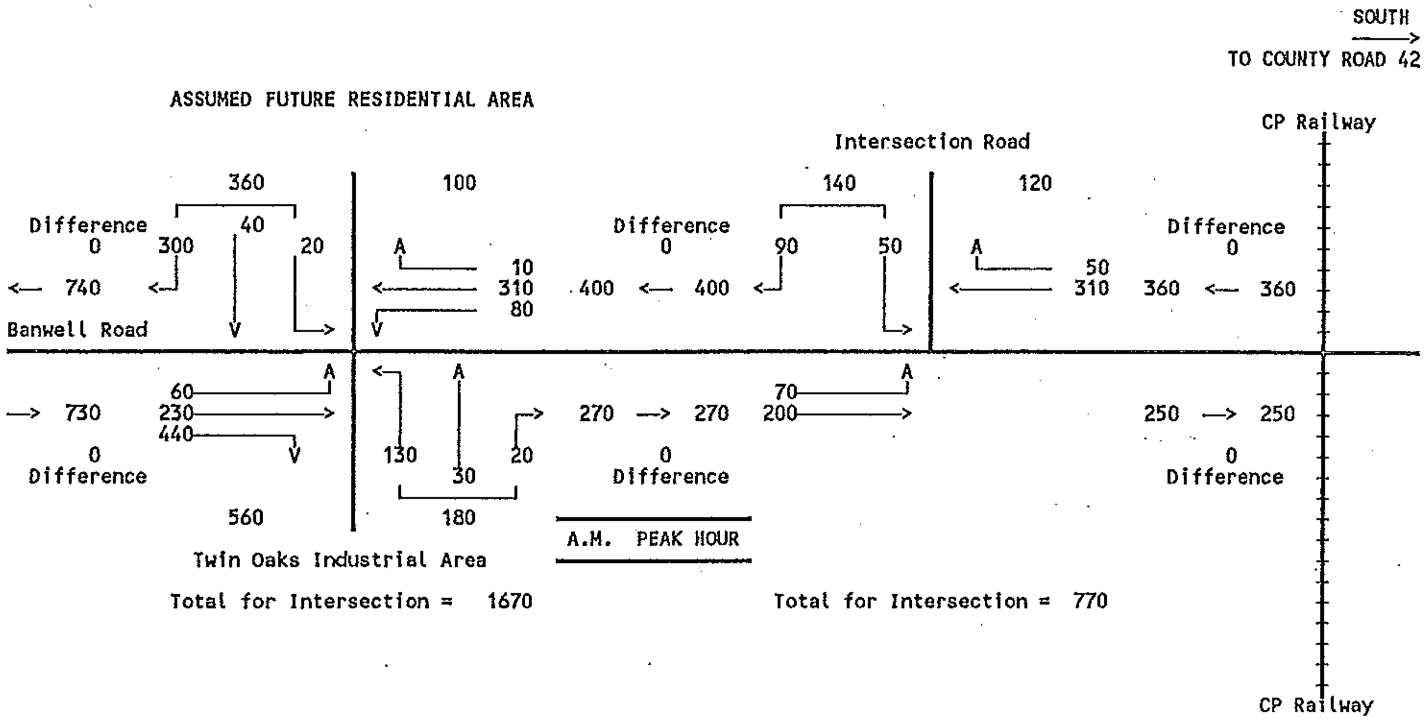
FUTURE TRAFFIC: YEAR 2014 DESIGN HOUR VOLUMES



Total for Intersection = 8300

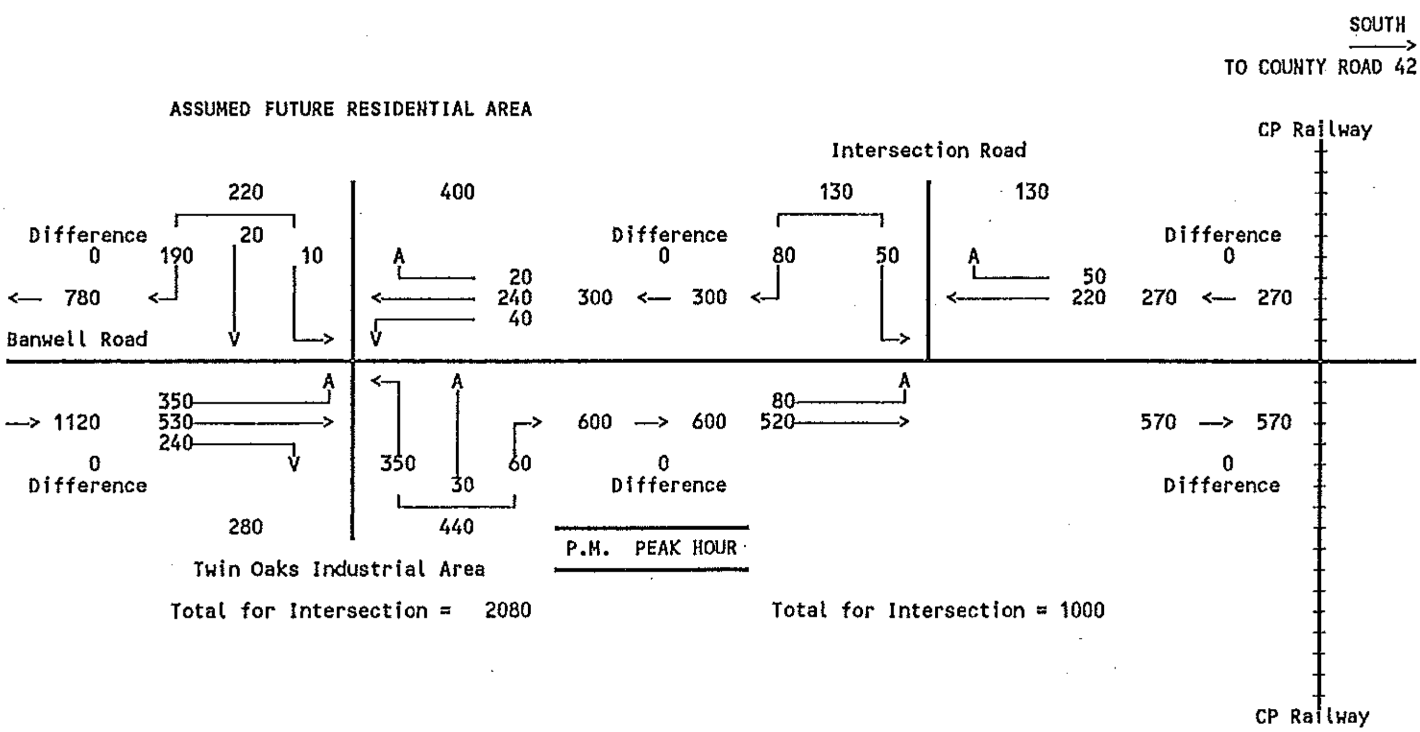
B A N W E L L   R O A D
F U T U R E   T R A F F I C :   Y E A R   2 0 1 4   D E S I G N   H O U R   V O L U M E S

E . C .   R O W   E X P R E S S W A Y   T O   C A N A D I A N   P A C I F I C   R A I L W A Y



F U T U R E   T R A F F I C :   Y E A R   2 0 1 4   D E S I G N   H O U R   V O L U M E S

F U T U R E   T R A F F I C :   Y E A R   2 0 1 4   D E S I G N   H O U R   V O L U M E S



APPENDIX D

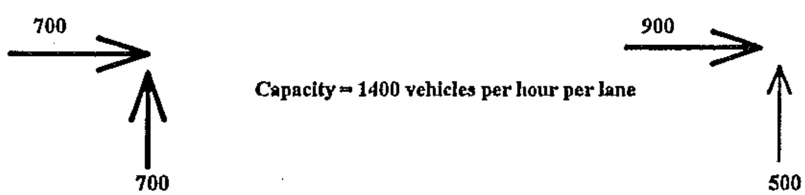
FUTURE TRAFFIC VOLUME vs EXISTING ROAD CAPACITY

FUTURE TRAFFIC VOLUME vs EXISTING ROAD CAPACITY

The double-page exhibits Figures 3.1 and 3.7 illustrate the anticipated future traffic volumes (future background traffic in Figure 3.1 and design hour volumes or DHVs in Figure 3.7). Values are shown on schematic drawings of the lane arrangement for existing roads.

To illustrate the extent to which existing roads are either capable of accommodating, or unable to accommodate future traffic, an approximate v/c ratio is determined for each intersection that is either signalized now or will be in the future. Values are framed near each intersection in the report exhibits.

The determination of these ratios is based on approximate capacity values for single intersecting lanes. This compensates for conditions where traffic volumes on one road have to be allotted greater green signal time than those on a crossroad. For example, in a previous study, 700 vph per lane was determined as a capacity value for the eastbound traffic flow on Tecumseh Road at Jefferson Boulevard[1]. This translates into a total of 1400 vph per lane at major intersections - 700 vph per lane on each of the intersecting roads. At locations where a low-volume road might only have a flow of 500 vph per lane the major road could then accommodate 900 vph per lane and would be given sufficient green signal time to do so.



Using the 1400 vph per lane as a capacity for two major roads where left turns are great enough to require advanced left turn signals, minor modifications were made for other conditions. For example, in areas where advanced left-turn signals would be required on only one of the intersecting roads, or where no advanced green would be needed on either road, the values used were 1300 and 1200 vph per lane respectively.

This service volume is applied to the total volume of traffic approaching an intersection in the peak direction of travel on the basis of an average volume per lane. For example, in the morning peak hour, on the single-lane westbound approach to the intersection on the South Service Road the total future traffic volume is 470 vehicles per hour. For the 2-lane

1. **Traffic Analysis and Planning Report,** Tecumseh Road East Re-construction Project, Jefferson Boulevard to Banwell Road, E. Fearnley Limited, March 1996.

approach on the Lauzon Parkway, 1770 vph southbound. The 'per lane' average for the existing road widths is:

	1770 / 2 + 470 / 1	= 1355 vph per lane
The v/c ratio is:	1355 / 1300 -------	= 1.04

This v/c figure is shown to the nearest decimal on Figure 3.7.A as 1.00. In this example, some widening of one of the roads is essential to maintain proper levels of service.

Other examples might show that the existing road configuration is adequate to accommodate future traffic volumes. However, this does not preclude consideration of other improvements. That is, **the v/c relationship deals primarily with the determination of the number of lanes for a road and whether or not it will be necessary them to be increased.**

Other factors are taken into account before the concept for an over-all improvement program is finalized. For example, the discussion on accidents and safety noted that left-turn bays and auxiliary lanes are desirable to protect turning vehicles and lessen the potential for accidents. Such improvements should still be considered.

The process outlined above is a modification of one used for many years by engineers involved in functional planning. A sensitivity analysis using the procedure was tested against results from a capacity analysis carried out for future traffic volumes on the Passer 2 program[1]. The accuracy attained for 11 intersections was found to be: 10% 8.5% and 6% at three locations, and less than 4% at the remaining eight.

1. Ibid.

APPENDIX E

ALTERNATIVES FOR ACCESS FROM THE WEST TO TWIN OAKS

Note: Exhibits for the initial level of evaluation for each alternative are laid out in this manner.

Traffic Turning Volumes

A.M. Peak

P.M. Peak

Comments

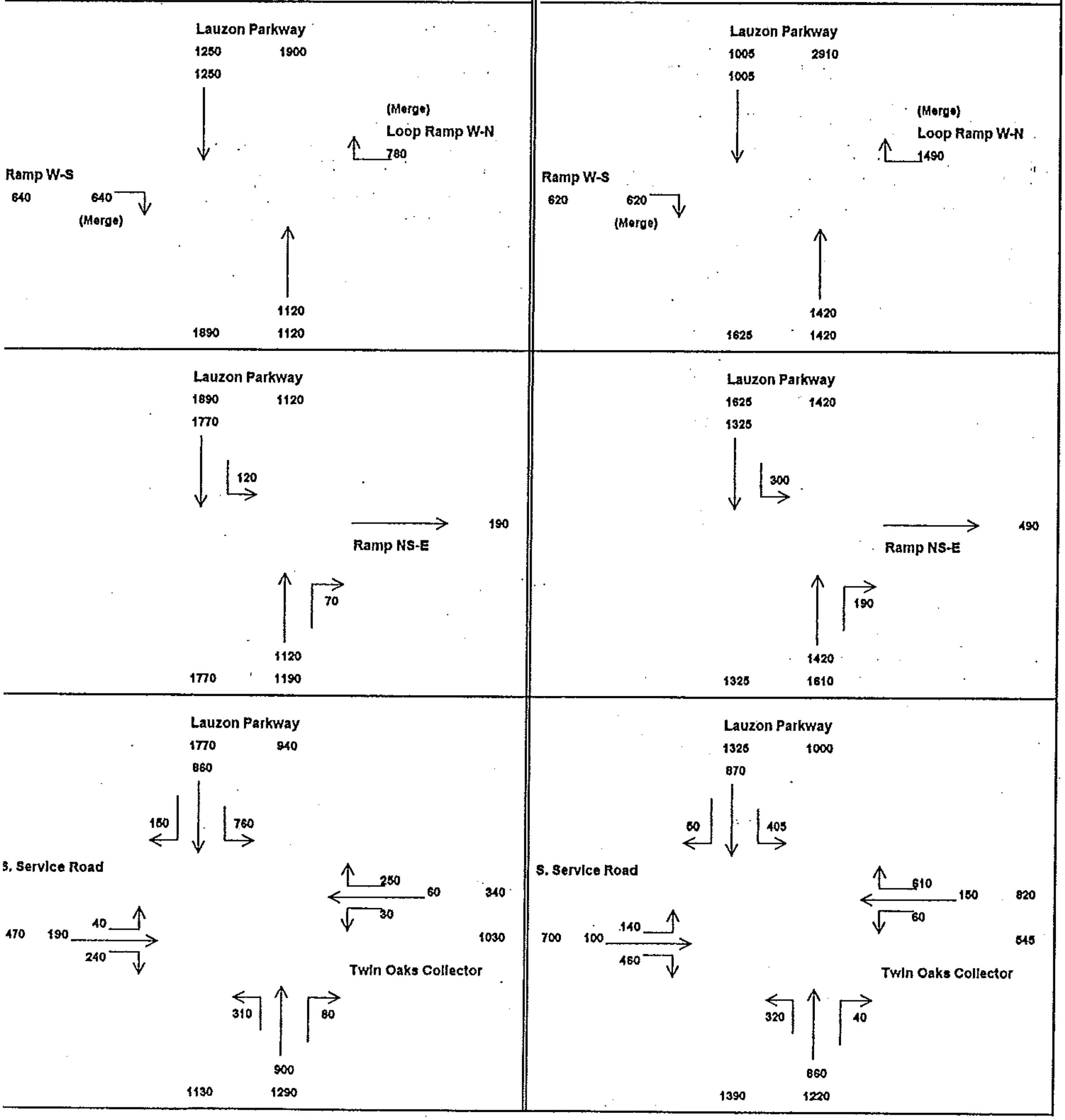
Traffic Operation Characteristics

Conclusions

Diagram

ALTERNATIVE A.1 - Ramp Geometry Adjusted To Increase Distance Required for Weaving On Lauzon Parkway

A.M. Peak Hour Traffic | **P.M. Peak Hour Traffic**



PRIME FEATURES

1. Terminus of ramp W-S re-constructed with smaller radius curve to lengthen weaving distance for left turns into Twin Oaks at the S. Service Rd.
2. Merge lane extended as full lane to S. Service Rd. to improve traffic flow.
3. Lane depleted by taper between the S. Service Rd. and the CPR overpass.

CRITICAL TRAFFIC OPERATION CONSIDERATIONS

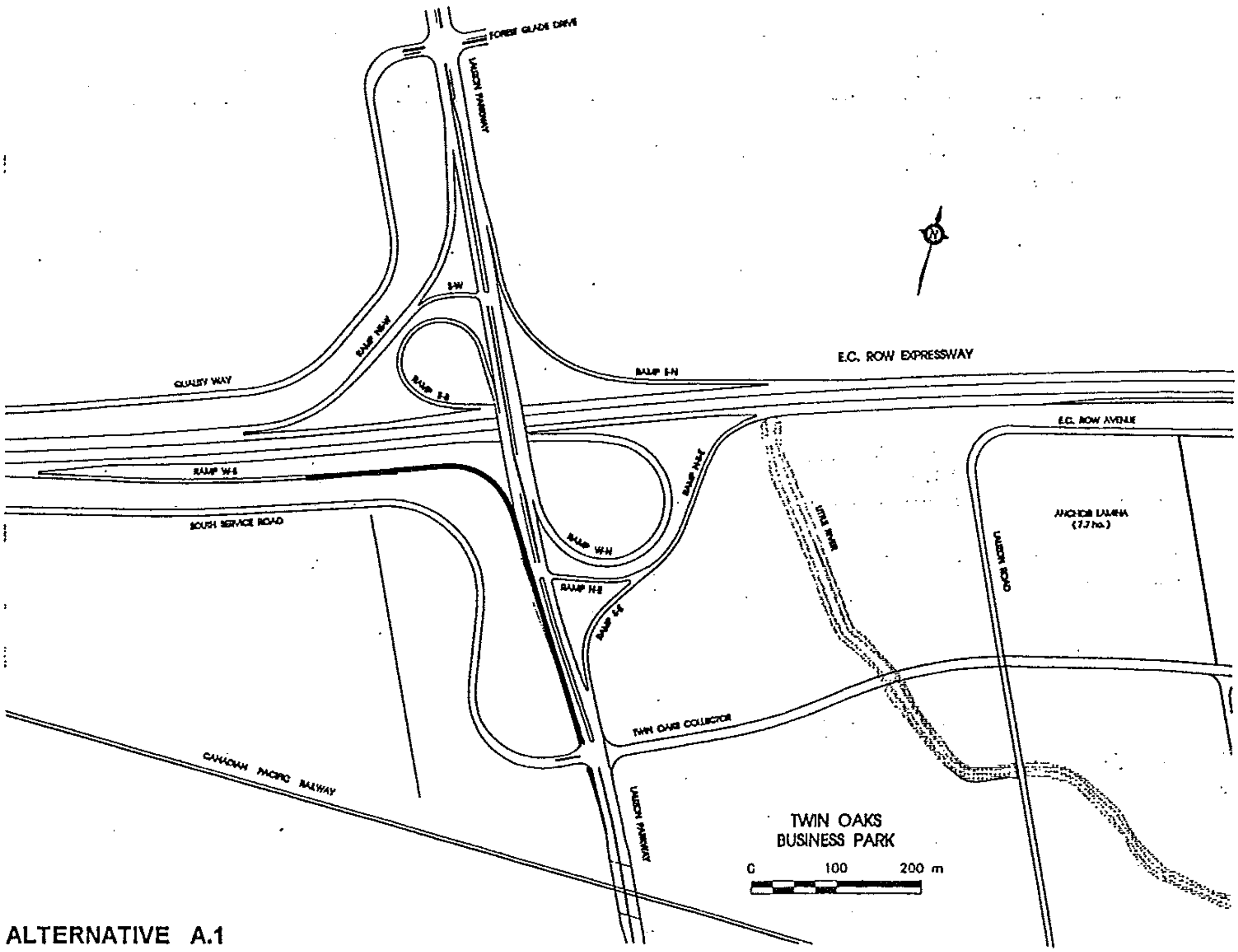
1. Left-turn storage just barely adequate for morning turn into Twin Oaks and for return movement to Ramp S-W in the afternoon.
2. Weaving distance between Ramp W-S terminus and queue of vehicles in left-turn bay would STILL be INADEQUATE. Speed of weaving vehicles would likely be less than 25 kilometres per hour.
3. Curve at ramp terminus is sub-standard.

CONSTRUCTION REQUIREMENTS

Item	Comment	Assessment
Grading	Excluded from further consideration because Alternative A.1 does not meet basic functional requirements	
Drainage Costs		
Structure Costs		
Pavement Area		
Property Acquisition		

OTHER COMMENTS

Provision of adequate weaving, stopping, and storage distances is critic for a safe design.

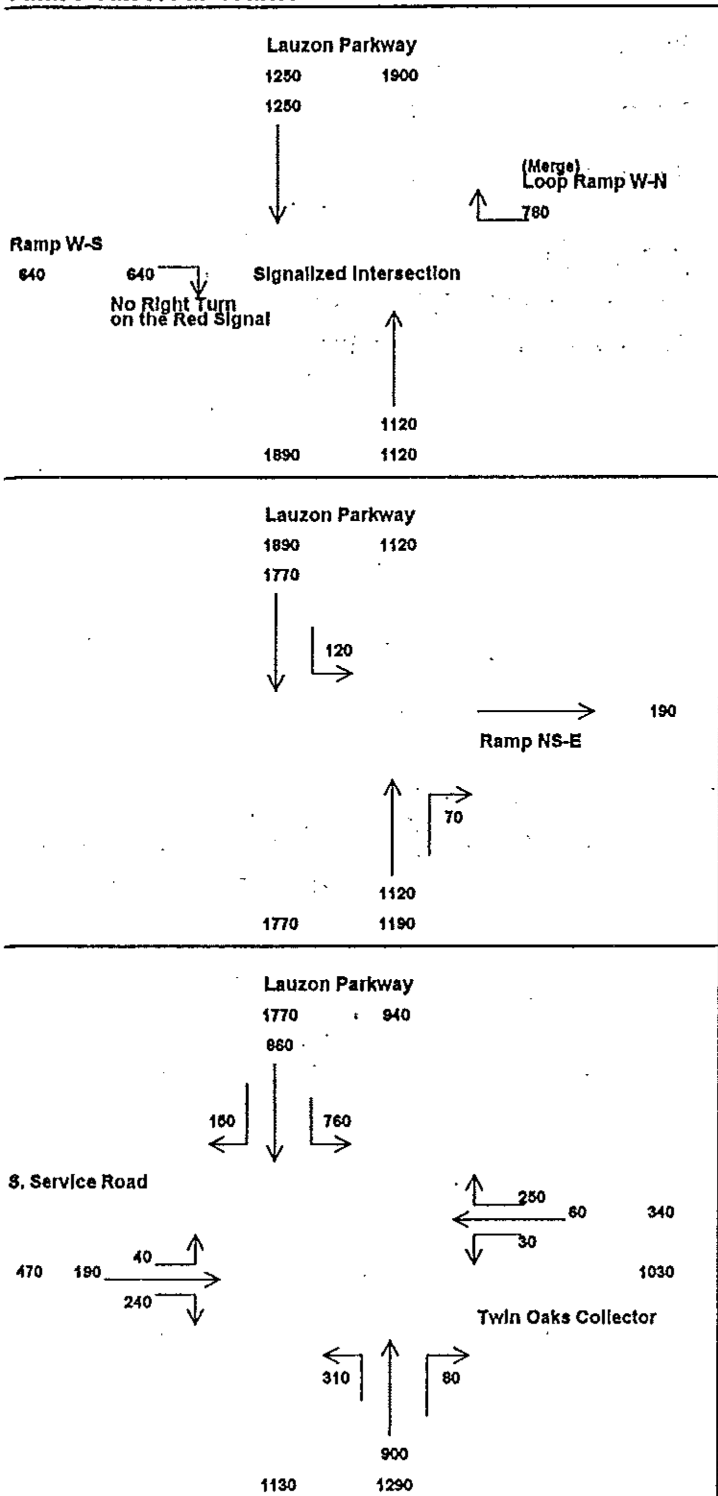


ALTERNATIVE A.1

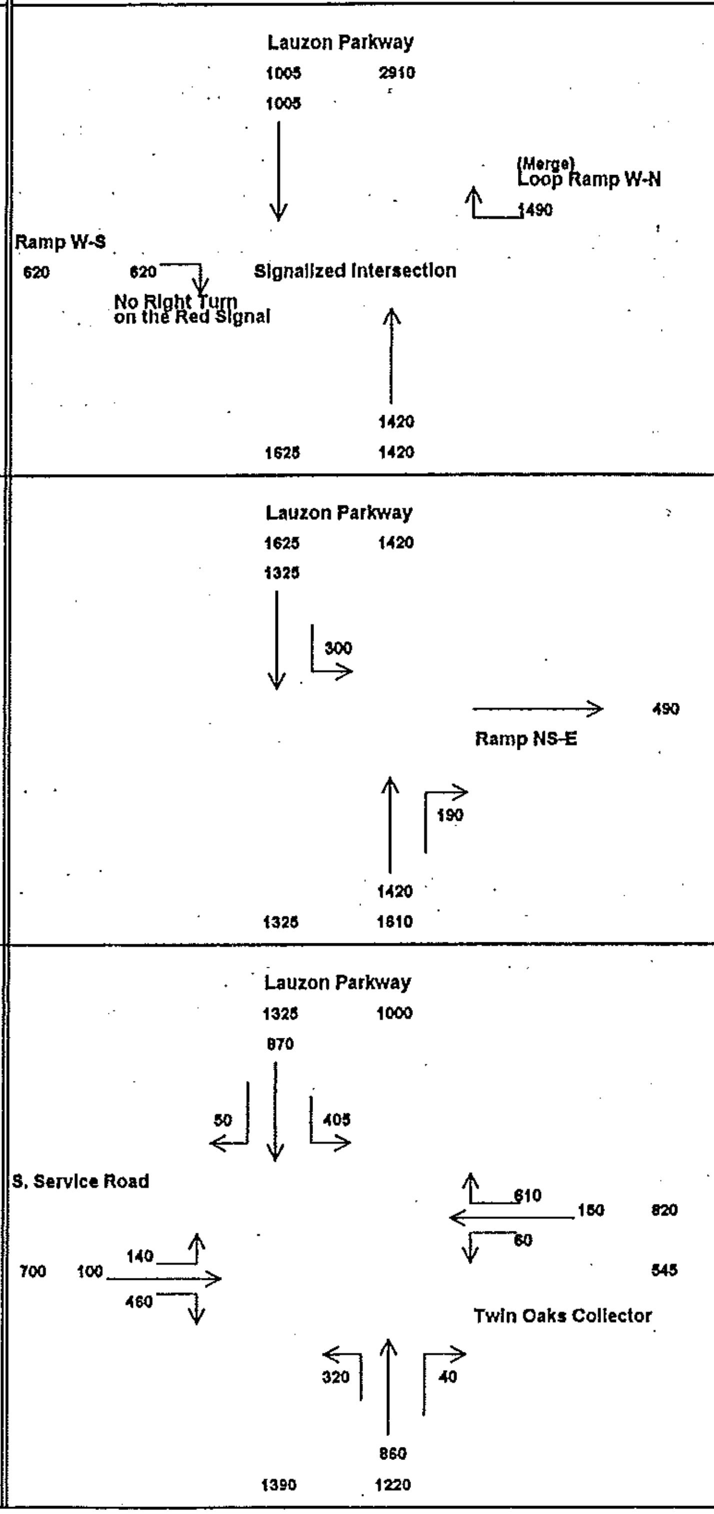
APPENDIX E: ALTERNATIVES FOR ACCESS FROM THE WEST TO TWIN OAKS

ALTERNATIVE A.2 - Geometry of Ramp W-S Altered so as to Eliminate the Weaving Manoeuvre by means of a Signalized Intersection at Lauzon Parkway

A.M. Peak Hour Traffic



P.M. Peak Hour Traffic



PRIME FEATURES

1. Terminus of ramp W-S re-constructed as a signalized intersection.
2. No right turns to be allowed on the red signal since the purpose of the signal is to interrupt the weaving flows (the ramp traffic crossing southbound traffic on Lauzon Parkway). This concept requires a high degree of compliance by motorist.

CRITICAL TRAFFIC OPERATION CONSIDERATIONS

1. Available left-turn storage is just barely adequate to store future traffic turning into Twin Oaks.
2. This concept requires a high degree of compliance by motorists.
3. Provision of adequate vehicle storage distance at the S. Service Rd. is critical for a safe design because vehicles will not encroach on the through traffic movements.
4. This design cannot accommodate all of the future traffic anticipated for this movement from the west to Twin Oaks.

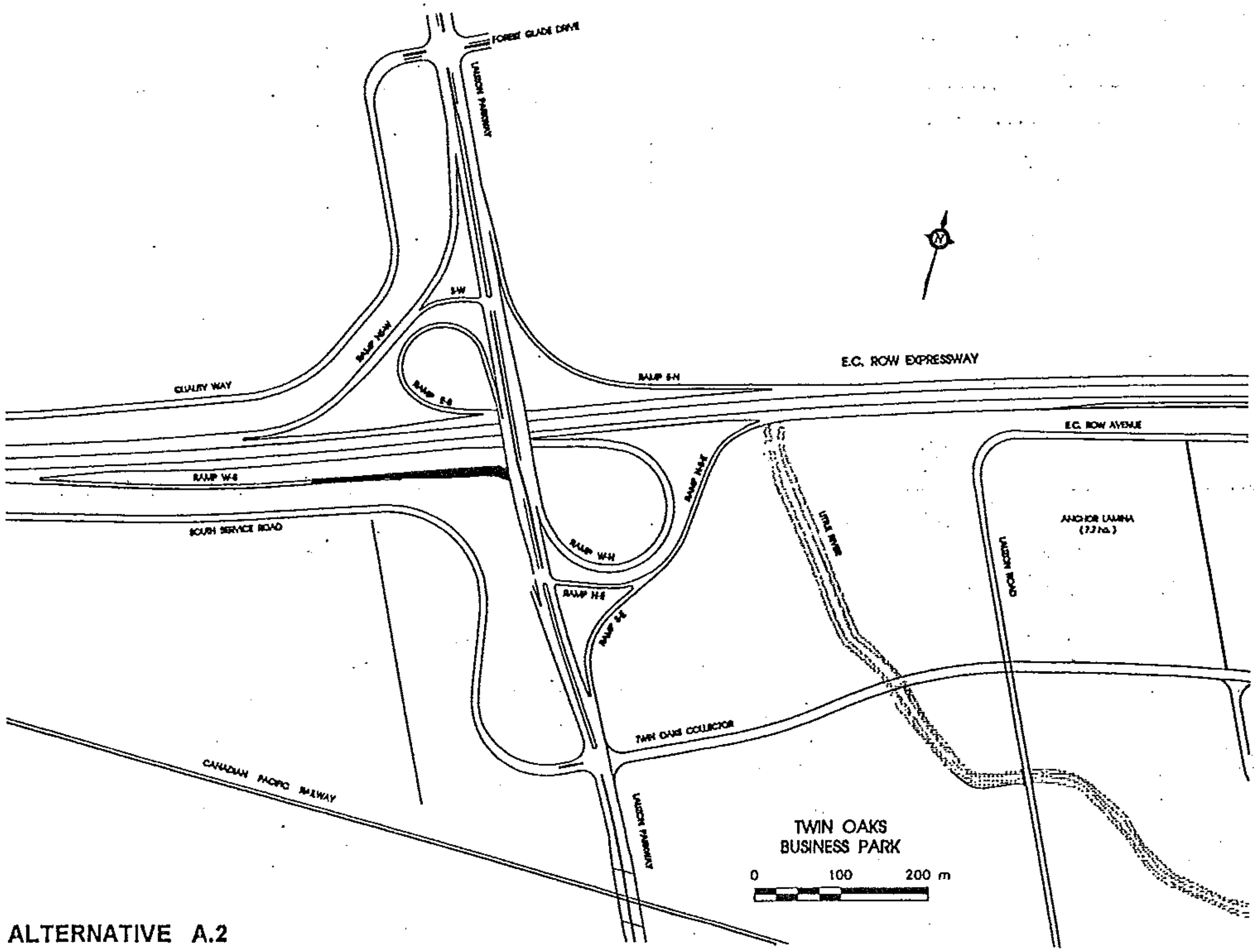
CONSTRUCTION REQUIREMENTS

Item	Comment	Assessment
Grading	Fill material would be shifted from existing ramp.	Minimal
Drainage Costs	$ 150,000	Moderate
Structure Costs	None	Nil
Pavement Area	2038 SM	Nominal
Property Acquisition	None	Nil

OTHER COMMENTS

Traffic signal will cost $ 50,000 in 1997 dollars.

<u>Alternative A.2 to be considered further</u>

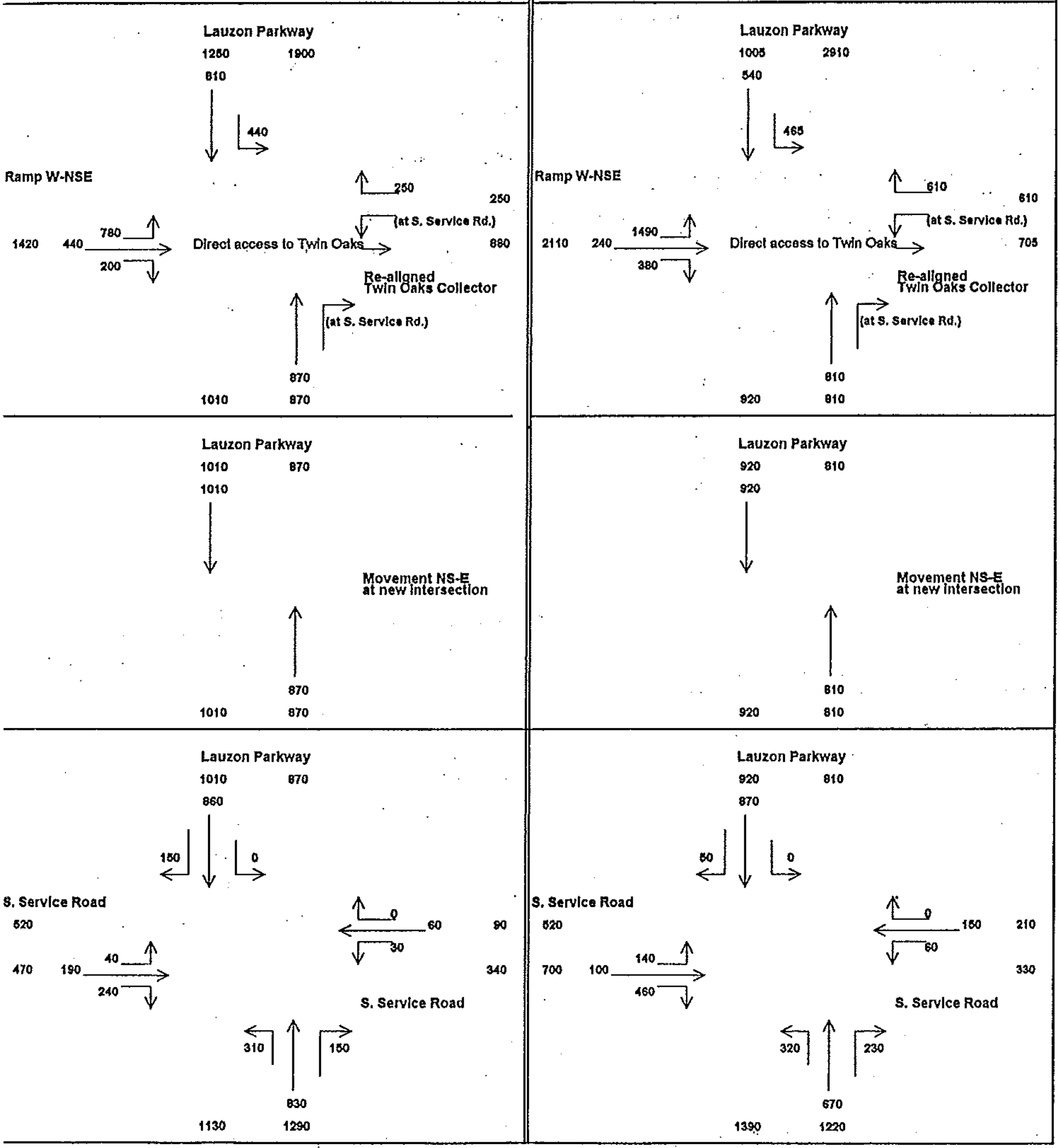


ALTERNATIVE A.2

APPENDIX E: ALTERNATIVES FOR ACCESS FROM THE WEST TO TWIN OAKS

ALTERNATIVE B.1 **Geometry of Ramp W-S Revised (to Ramp W-NSE) to Meet a Realigned Twin Oaks Collector on a Continuous Alignment Across Lauzon Parkway**

A.M. Peak Hour Traffic | **P.M. Peak Hour Traffic**



PRIME FEATURES

1. Direct access into Twin Oaks via new Ramp W-NSE.
2. Loop Ramp W-N removed. (Area could be used for development.)
3. The S-E movement is accommodated by the extension of the South Service Rd. to meet existing Ramp NS-E at an intersection with the new collector.
4. The N-E movement turns left at the new collector location and left again at the former Ramp NS-E where it now intersects the new collector.

CRITICAL TRAFFIC OPERATION CONSIDERATIONS

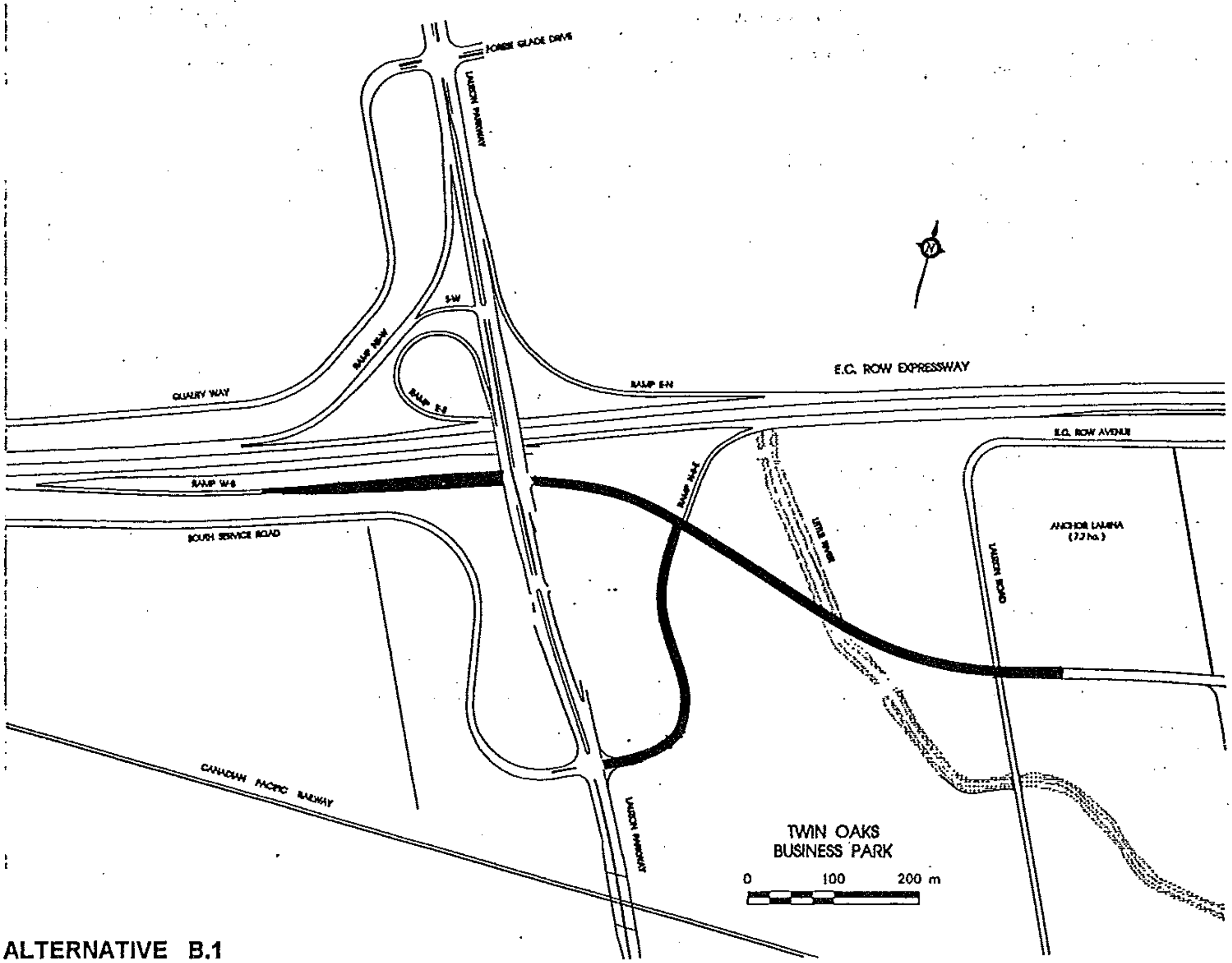
1. Insufficient intersection capacity because of large left-turn volumes (both W-N and N-E). Possible to accommodate the traffic volume on a triple left turn.

CONSTRUCTION REQUIREMENTS

Item	Comment	Assessment
Grading	Excluded from further consideration because Alternative B.1 does not meet basic functional requirements	
Drainage		
Structures		
Pavement Area		
Property Acquisition		

OTHER COMMENTS

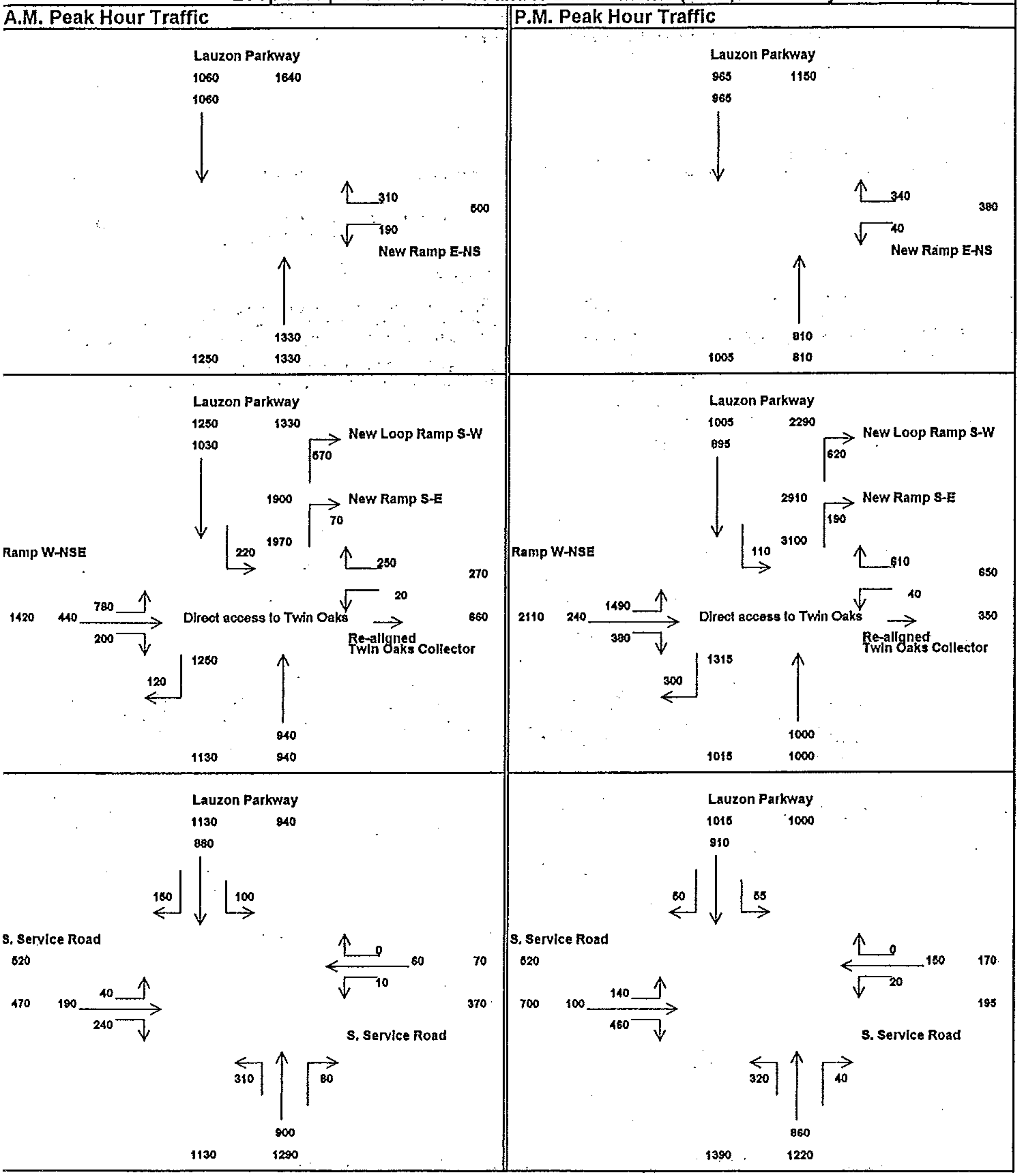
Loop ramp required to lessen requirements for back-to-back left turns



ALTERNATIVE B.1

APPENDIX E: ALTERNATIVES FOR ACCESS FROM THE WEST TO TWIN OAKS

ALTERNATIVE B.3 Geometry of Ramp W-S Revised (to Ramp W-NSE) to Meet a Realigned Twin Oaks Collector on a Continuous Alignment Across Lauzon Parkway
Loop Ramps Added for S-W and N-E Movements (Both, Previously Left Turns)



PRIME FEATURES

1. Direct access into Twin Oaks via new Ramp W-NSE.
2. Loop Ramp W-N removed. (Area could be used for development.)
3. Loop Ramp S-W constructed
4. Loop Ramp E-S removed.
5. Loop Ramp N-E constructed
6. Area where Loop Ramp W-N and Ramp NS-E removed - 2.0 ha (5.0 acres) - added to the area being developed.

CONSTRUCTION REQUIREMENTS

Item	Comment	Assessment
Grading	5 new ramps plus a realignment of the S. Service Rd.	Extensive
Drainage	$ 400,000 +	Extensive
Structures	None	Nil
Pavement Area	23,225 SM	Extensive
Property Acquisition	South-west and North-east quadrants	Extensive

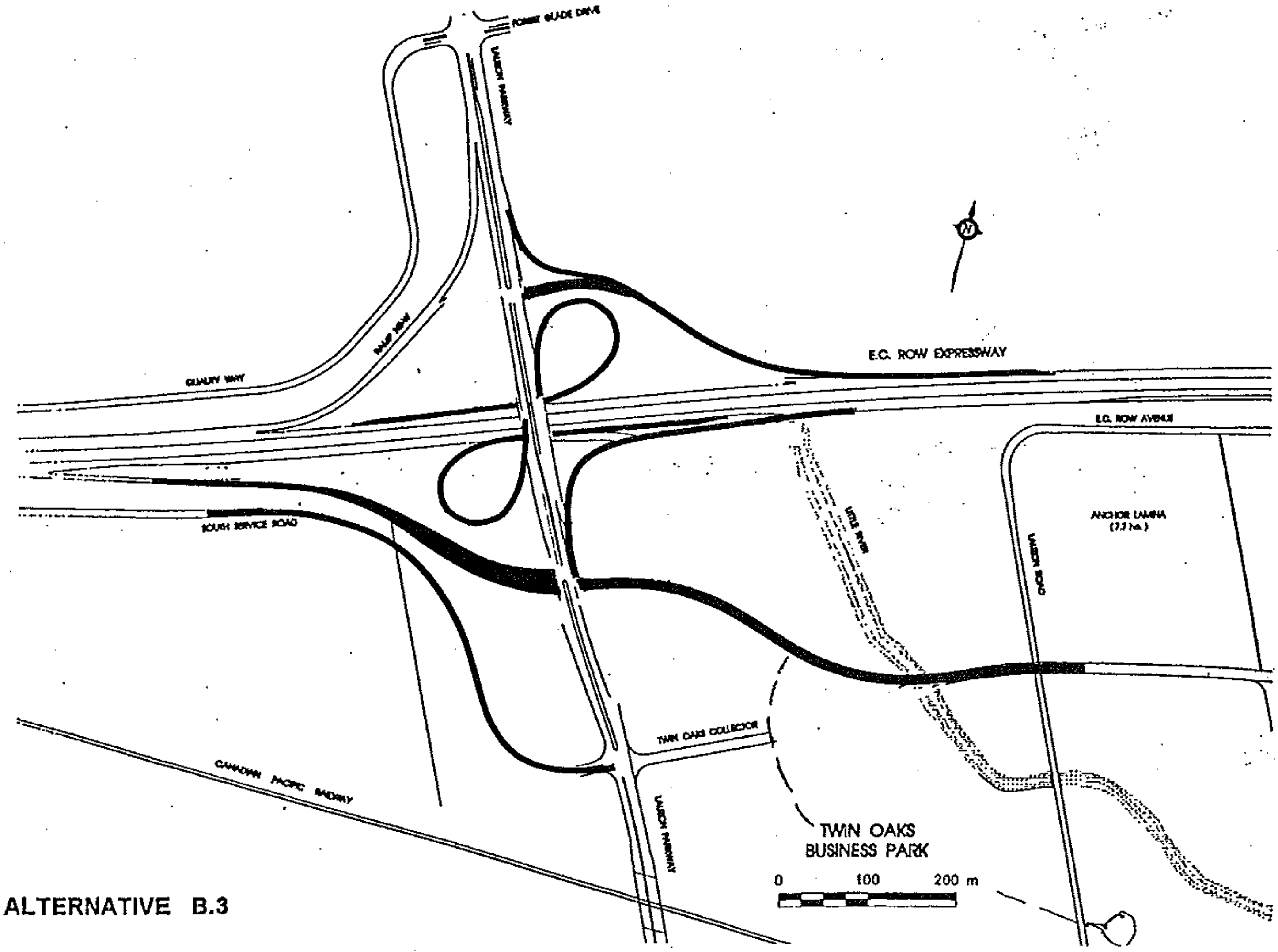
CRITICAL TRAFFIC OPERATION CONSIDERATIONS

1. Construction of Ramp N-E minimizes the conflicting movements at the intersection with Ramp W-NSE
2. Interchange would operate smoothly under the projected traffic load.

OTHER COMMENTS

A loop ramp for movement N-E would remove part of the north-to-east left turn volume at the collector road intersection. This would allow a greater use of the signal time for the large W-N movement on Ramp W-NSE

Alternative B.3 NOT to be considered further:
Considerable expense without any redeeming features.

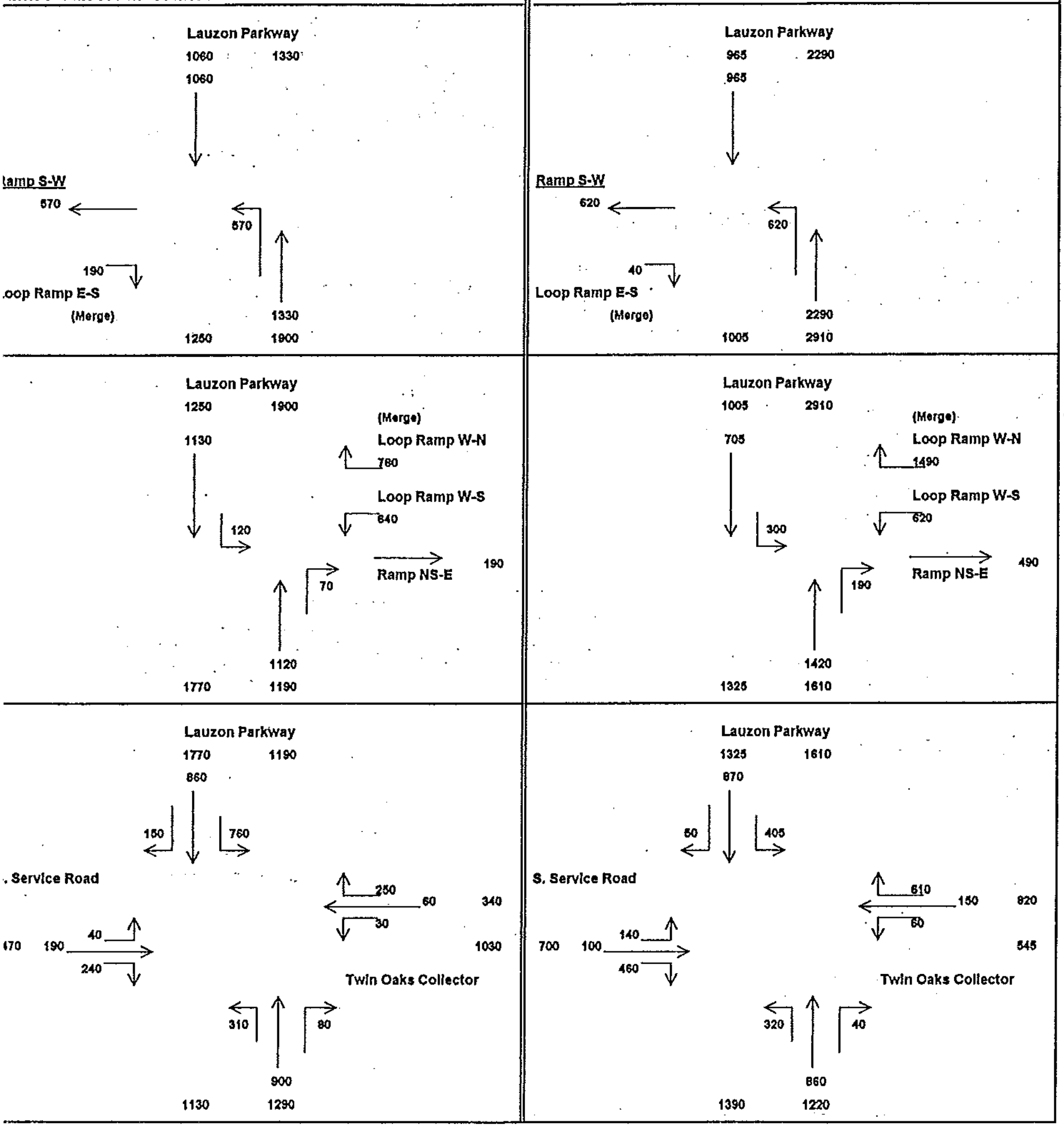


ALTERNATIVE B.3

APPENDIX E: ALTERNATIVES FOR ACCESS FROM THE WEST TO TWIN OAKS

ALTERNATIVE C - The West-to-south Movement is Added to the Existing Two-lane Loop Ramp W-N by Widening Around the Outside of the Loop

A.M. Peak Hour Traffic	P.M. Peak Hour Traffic



PRIME FEATURES

1. Loop ramp W-N is widened around the outside of the loop to provide for a double left turn at the Lauzon Parkway.
2. Existing Ramp W-S is removed.
3. Ramp NS-E would be realigned to form a single intersection with the double left-turn lane at the terminus of Ramp W-S.

CRITICAL TRAFFIC OPERATION CONSIDERATIONS

1. The Loop Ramp W-N has a greater number of accidents than any equivalent length of road in this area and a traffic volume less than most.
2. Accidents are concentrated at two locations on the ramp - both are obviously where motorists have lost control and run off the outside edge of the loop.
3. The queue of vehicles waiting to turn left would back up around the loop and the end of the queue would be partially hidden from motorists exiting the E.C. Row Expressway.
4. Vehicles waiting to make a left turn would extend back into one of the accident prone areas on the loop and those stopped in the queue could be struck 'side-on' by errant vehicles.
5. The location for the new intersection would be just at the end of the queue for the left turn at the South Service Road. According to the Canadian Highway Capacity Manual, there is a high probability that the queue would extend beyond the left-turn storage available into the new intersection.

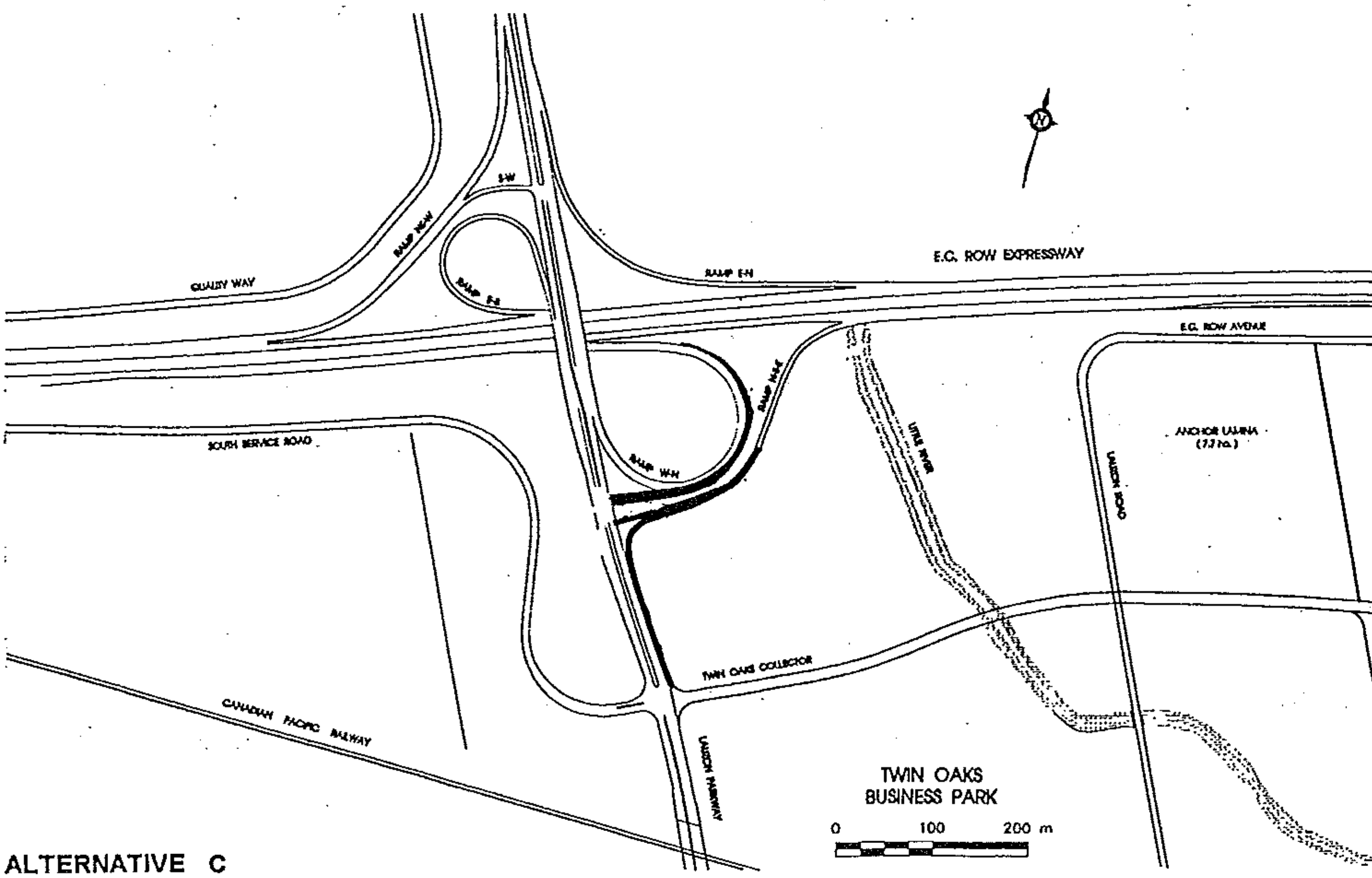
CONSTRUCTION REQUIREMENTS

Item	Comment	Assessment
Grading	Alternative C was excluded from further consideration because the loop ramp configuration for an exit from a high-speed road has a high potential for accidents.	
Drainage Costs		
Structure Costs	Traffic will double in the future, and with this alternative, there would be a long queue of vehicles waiting to turn left just where errant vehicles run off the ramp.	
Pavement Area		
Property Acquisition	In the future the potential for accidents can only be greater than at present.	

OTHER COMMENTS

The potential for collisions would be quite high considering the accident history and the fact that future traffic will be at least double the existing volume.

Alternative C does not improve the very low level of service at the South Service Road intersection.

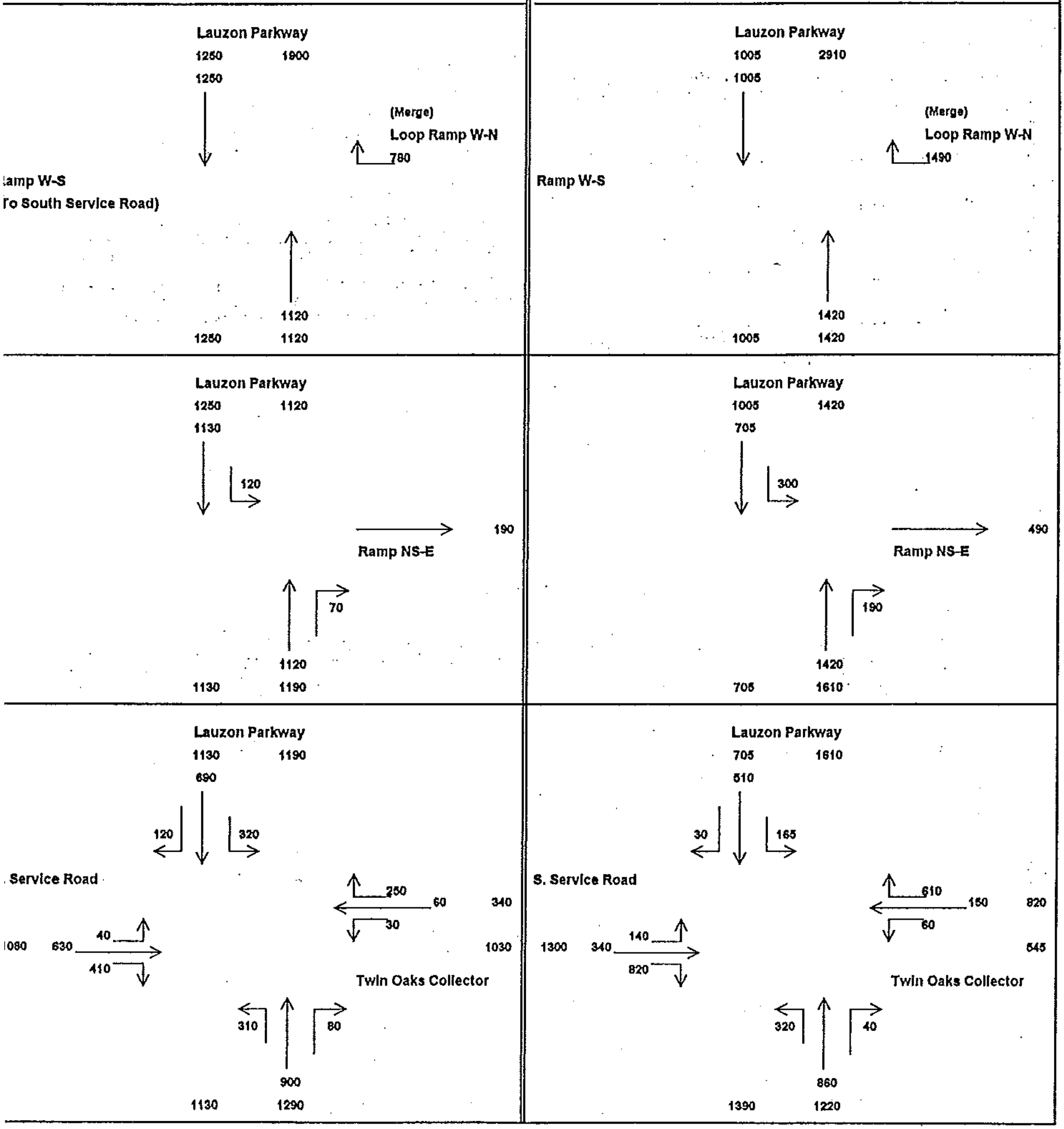


ALTERNATIVE C

APPENDIX E: ALTERNATIVES FOR ACCESS FROM THE WEST TO TWIN OAKS

ALTERNATIVE D.1 - Ramp W-S from the Expressway
Configured as a 'Braid' with the Westbound lanes of the South Service Road

A.M. Peak Hour Traffic | P.M. Peak Hour Traffic



PRIME FEATURES

1. Ramp W-S modified to merge with eastbound traffic on S. Service Rd. (Now the ramp would be labelled Ramp W-SSR that is, Ramp 'West to South Service Road'.)

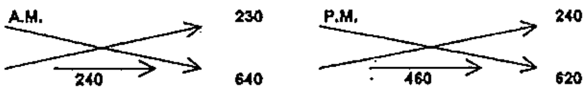
2. Westbound lane on S. Service Rd. re-constructed as a one-lane roadway to meet Ramp W-SSR at-grade. Westbound traffic would be controlled by a stop sign or by a traffic signal that would give priority to ramp traffic.

3. Geometry very restricted to limit property requirements. This results in the use of small-radius curves.

3. The left turn at the South Service Road is decreased and the traffic to Twin Oaks would cross the Parkway as a through movements eastbound on the Service Road.

CRITICAL TRAFFIC OPERATION CONSIDERATIONS

1. Weaving distance for the mixing of service road and ramp traffic is INSUFFICIENT given the geometry and the anticipated traffic



2. The move from the Expressway to westbound on the South Service Rd. is impossible to locate so that motorists would have sufficient time to make the manoeuvre in safety. It is very likely that this condition would result in erratic manoeuvres and possibly backing-up manoeuvres on the ramp.

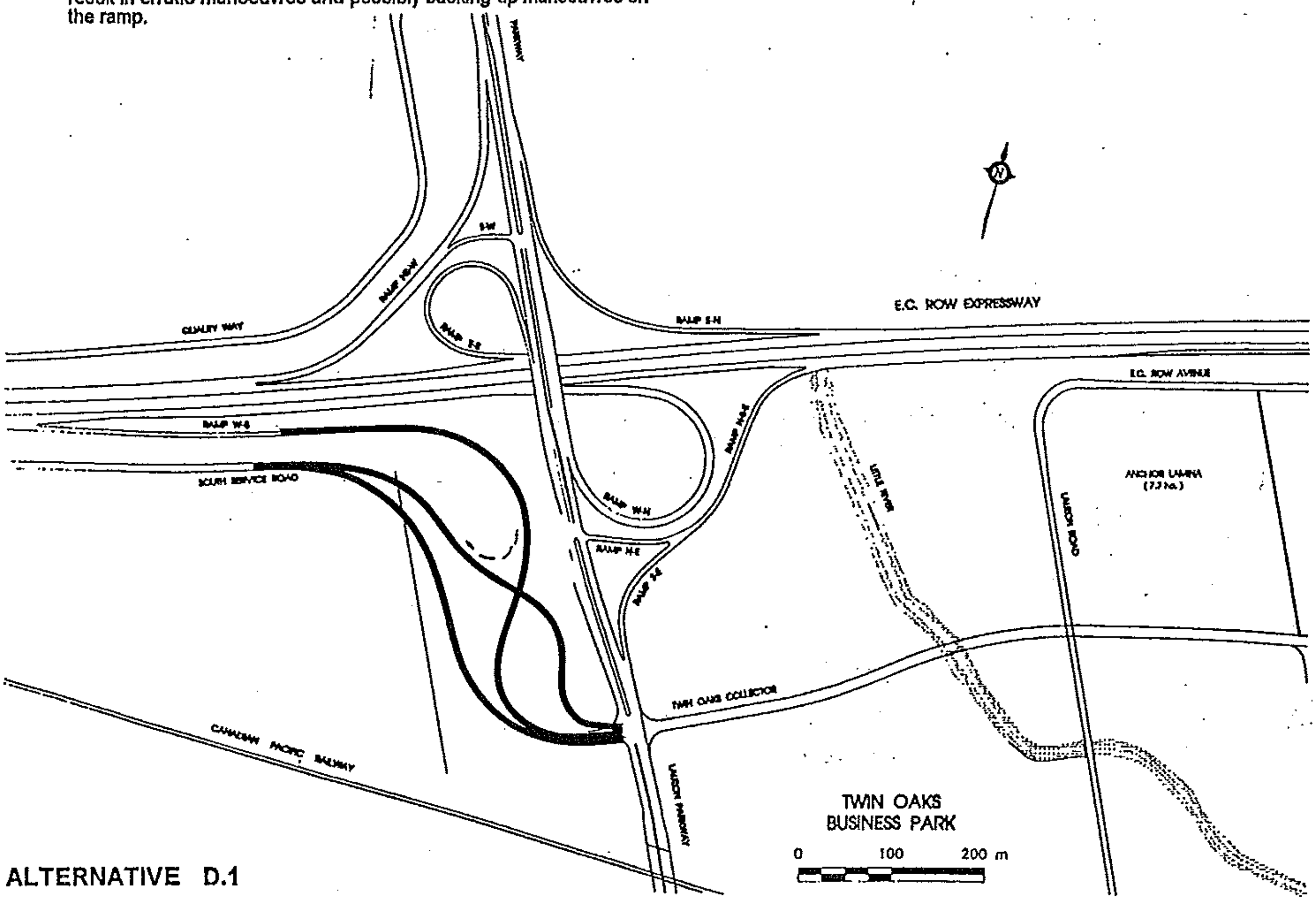
CONSTRUCTION REQUIREMENTS

Item	Comment	Assessmen
Grading	Excluded from further consideration because Alternative D.1 does not meet basic functional requirements	
Drainage		
Structures		
Pavement Area		
Property Acquisition		

OTHER COMMENTS

Although the traffic flow from the Expressway to westbound on the Service Road is small, there is no other possibility to accommodate this movement. (The Jefferson Blvd. exit is oriented to the north.)

It would be a mistake not to provide for the Expressway-to-westbound-Service-Road movement since that would jeopardize future development of properties in this area served by both road and rail.

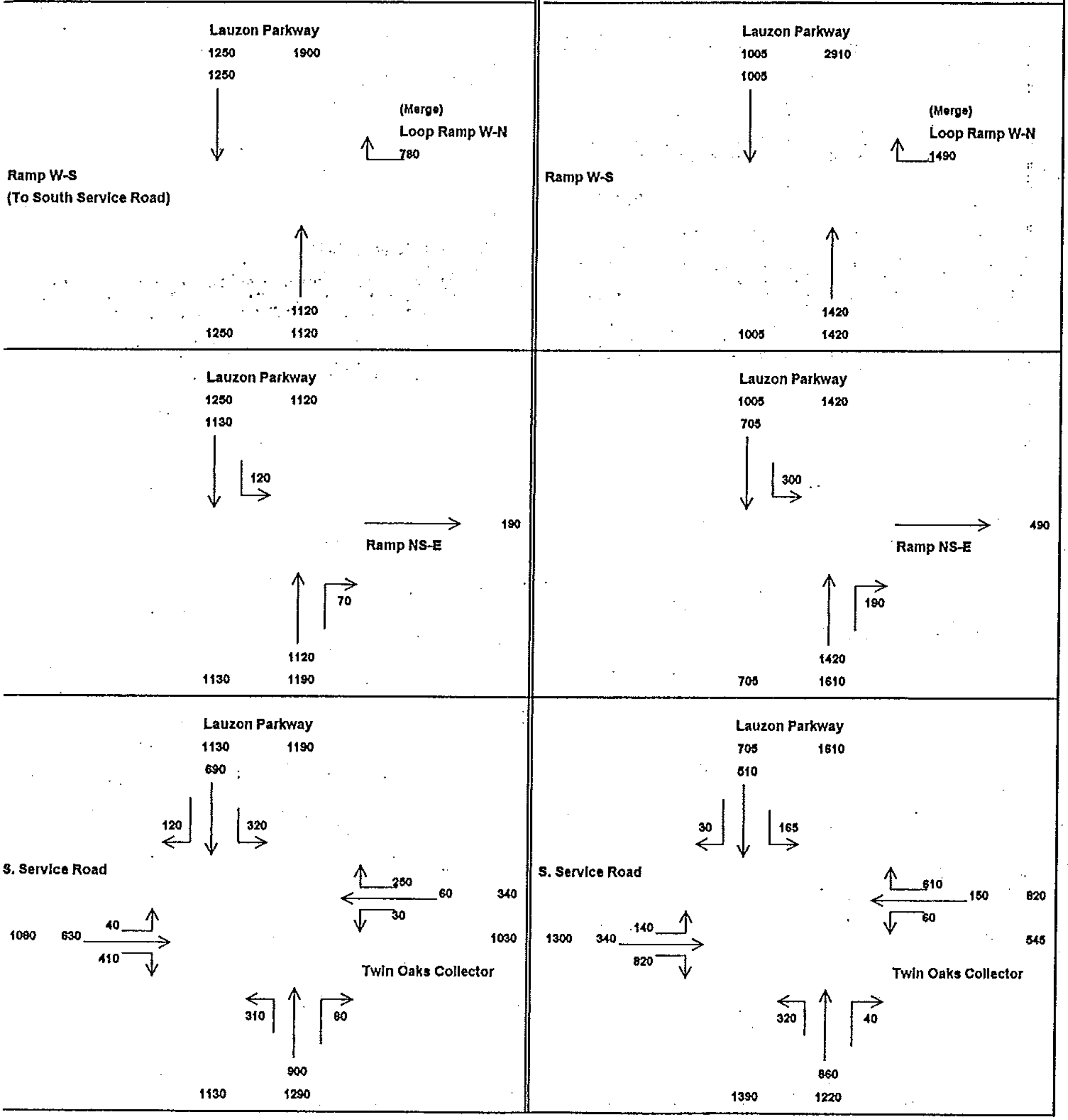


ALTERNATIVE D.1

APPENDIX E: ALTERNATIVES FOR ACCESS FROM THE WEST TO TWIN OAKS

ALTERNATIVE D.2 - Ramp W-S from the Expressway Configured as a 'Braid' with the Westbound lanes of the South Service Road

A.M. Peak Hour Traffic | **P.M. Peak Hour Traffic**

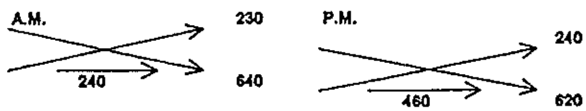


PRIME FEATURES

1. Ramp W-S modified to merge with eastbound traffic on S. Service Rd. (Now the ramp would be labelled Ramp W-SSR that is, Ramp 'West to South Service Road'.)
2. Westbound lane on S. Service Rd. re-constructed as a one-lane roadway grade-separated from Ramp W-SSR. Westbound traffic would not interfere with ramp traffic thereby improving safety.
3. Geometry very restricted to limit property requirements. This results in the use of small-radius curves.
4. The left turn at the South Service Road is decreased and the traffic to Twin Oaks would cross the Parkway as a through movement eastbound on the Service Road.

CRITICAL TRAFFIC OPERATION CONSIDERATIONS

1. Weaving distance for the mixing of service road and ramp traffic is INSUFFICIENT given the geometry and the anticipated traffic



2. Construction of bridge would separate westbound traffic from ramp traffic improving safety and considerably reducing the potential for accidents. However, it adds an estimated $360,000 to project costs.
3. The movement from eastbound on the Expressway to westbound on the South Service Road cannot be accommodated because of the grade differences between the Ramp W-SSR and the lanes for westbound traffic on the service road.

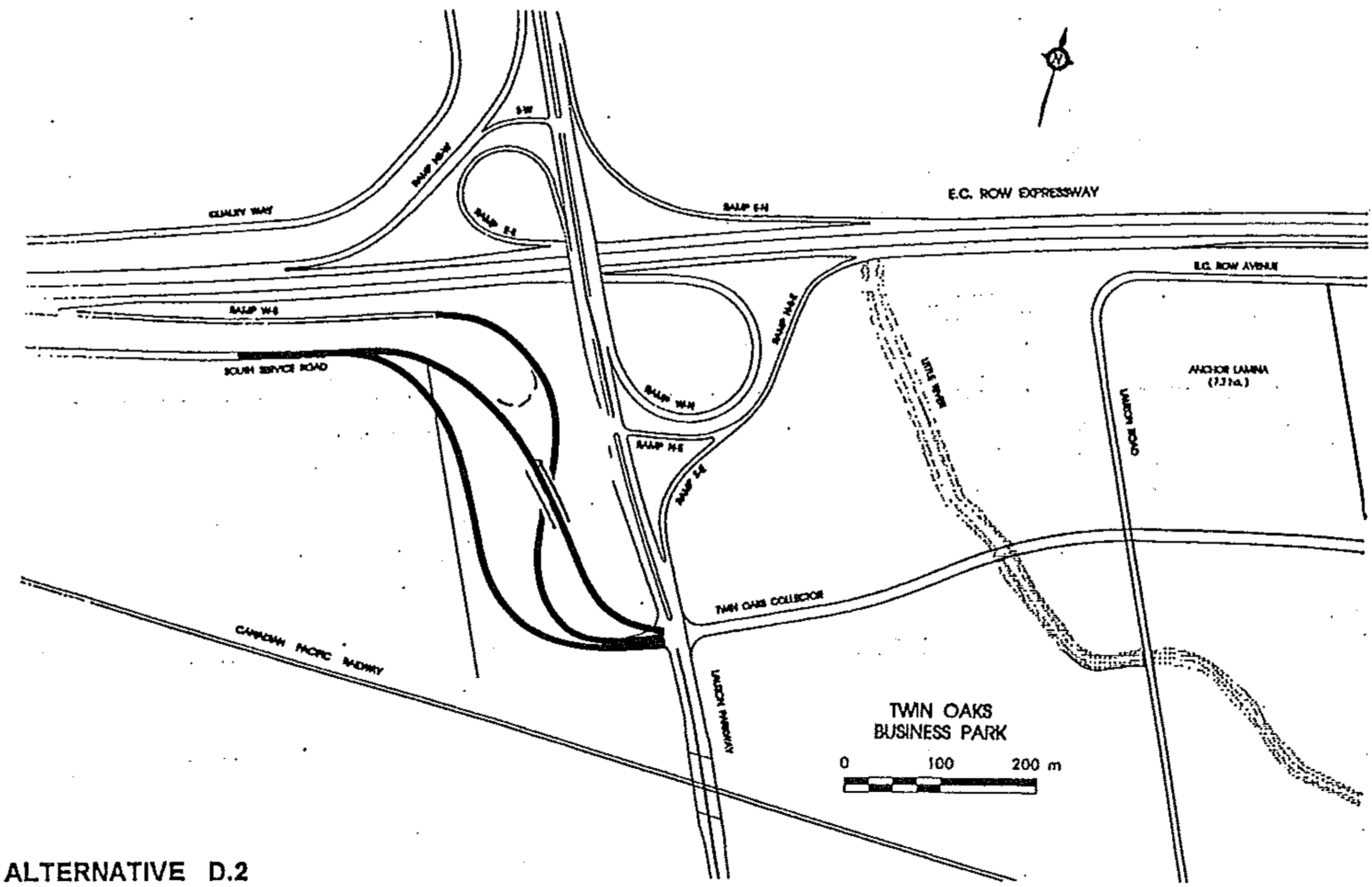
CONSTRUCTION REQUIREMENTS

Item	Comment	Assessmen
Grading	Excluded from further consideration because Alternative D.2 does not meet basic functional requirements and the structure adds greatly to costs	
Drainage		
Structures		
Pavement Area		
Property Acquisition		

OTHER COMMENTS

Although the traffic flow from the Expressway to westbound on the Service Road is small, there is no other possibility to accommodate this movement. (The Jefferson Blvd. exit is oriented to the north.)

It would be a mistake not to provide for the Expressway-to-westbound-Service-Road movement since that would jeopardize future development of properties in this area served by both road and rail.

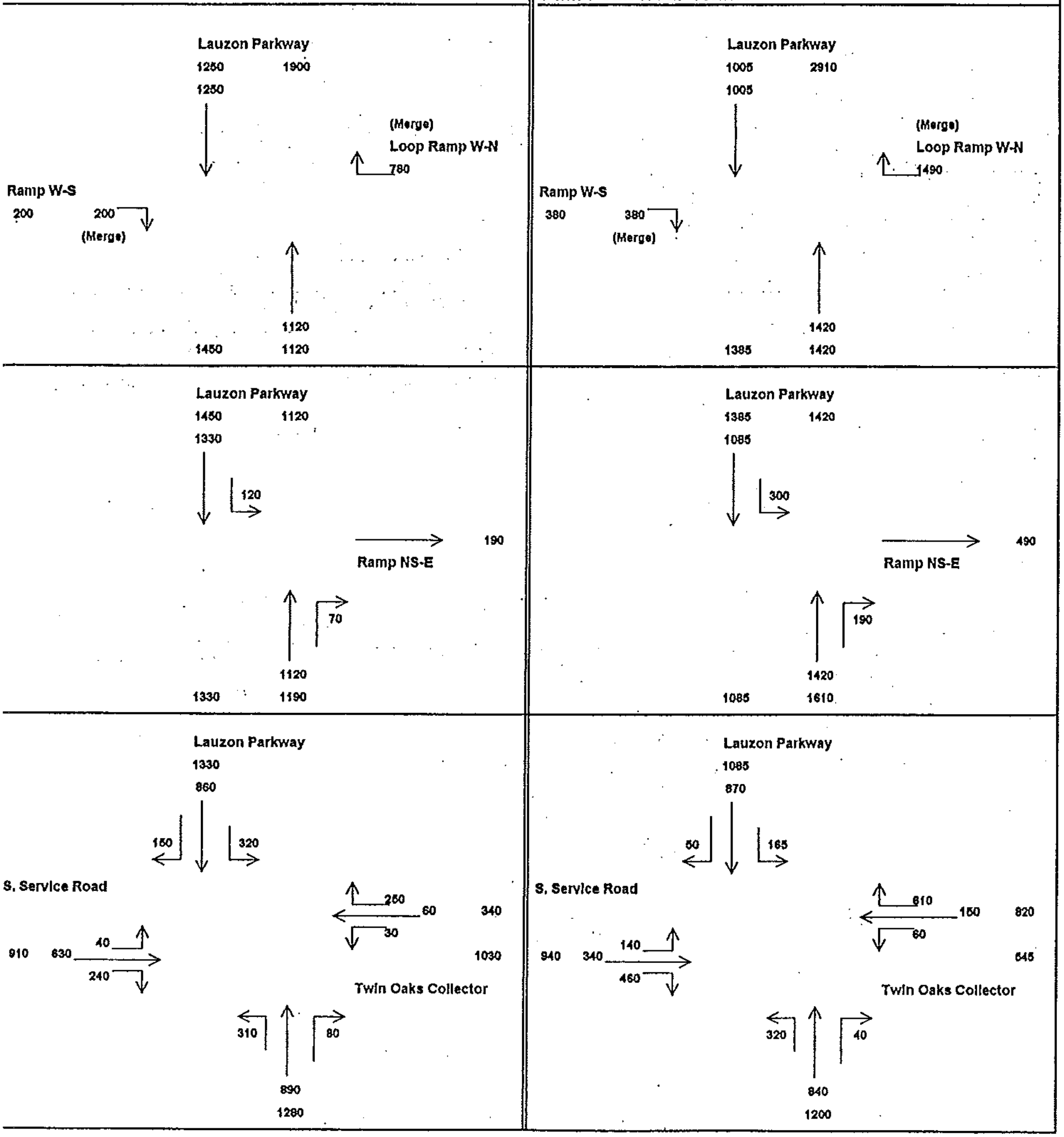


ALTERNATIVE D.2

APPENDIX E: ALTERNATIVES FOR ACCESS FROM THE WEST TO TWIN OAKS

ALTERNATIVE E - A New Ramp would Diverge from Ramp W-S and be Configured as a 'Braid' with the Westbound lanes of the South Service Road

A.M. Peak Hour Traffic | P.M. Peak Hour Traffic

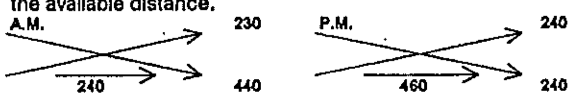


PRIME FEATURES

1. Ramp W-S modified to split Twin Oaks traffic from the W-S move ment. New Ramp W-SSR diverges from Ramp W-S and merges with eastbound lanes on the service road.
2. Westbound lane on S. Service Rd. re-constructed as a one-lane roadway to meet Ramp W-SSR at-grade. Westbound traffic controlled by a stop sign or by a traffic signal that would give priority to ramp traffic
3. Traffic destined for points south on Lauzon Parkway signed via Ramp W-S.
4. Geometry very restricted to limit property requirements.

CRITICAL TRAFFIC OPERATION CONSIDERATIONS

1. Weaving volumes for the mixing of ramp and service road traffic are less than for Alternative D.1 since the W-S movement travels directly to the Parkway on the existing Ramp W-S. Despite this, the critical weaving volumes are still too great to be accommodated in the available distance.



2. The direct access to the Parkway allows motorists to access Twin Oaks by weaving across Parkway traffic. It is certain that motorists would take advantage of this and hence, at times,such traffic would the flow on the Parkway.
3. Sight distances on Ramp W-SSR to crossing westbound traffic on the S. Service Rd. is limited.

CONSTRUCTION REQUIREMENTS

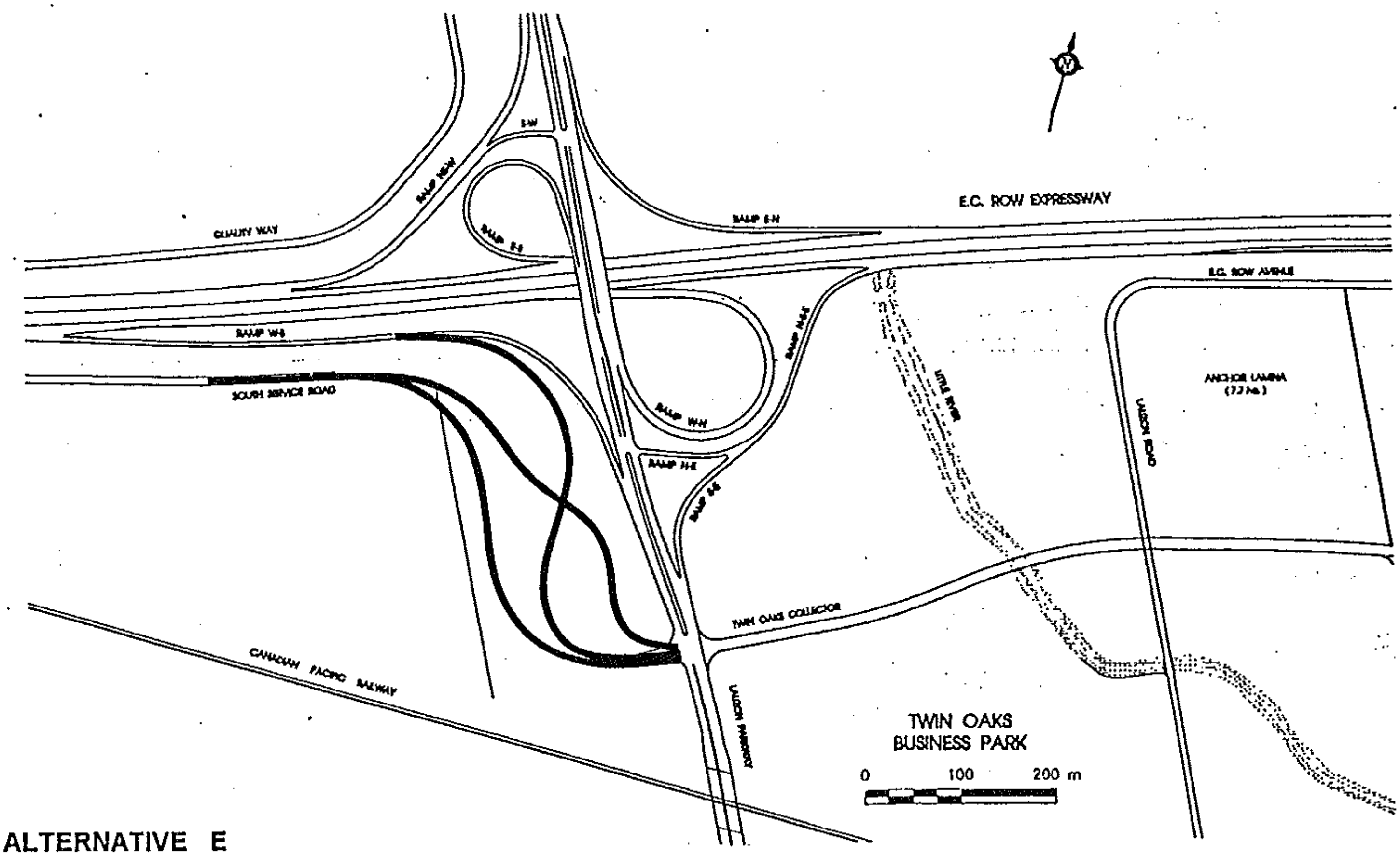
Item	Comment	Assessment
Grading	Service road realigned; new ramp; and Wbd lane of service road.	Extensive
Drainage	$350,000	Severe
Structures	None	Nil
Pavement Area	9426 SM	Considerable
Property Acquisition	One complete parcel One severance.	Moderate

OTHER COMMENTS

Traffic from the Expressway would access the South Service Road via Ramp W-S and Lauzon Parkway .

This concept could have been noted as Alternative E.1 with E.2 being basket weave from Ramp W-S (similar to Alternative D.2). However, as noted in the evaluation of Alternatve D.2, the structure adds considerable cost and hence the Alternative E.2 possibility was not formally assessed.

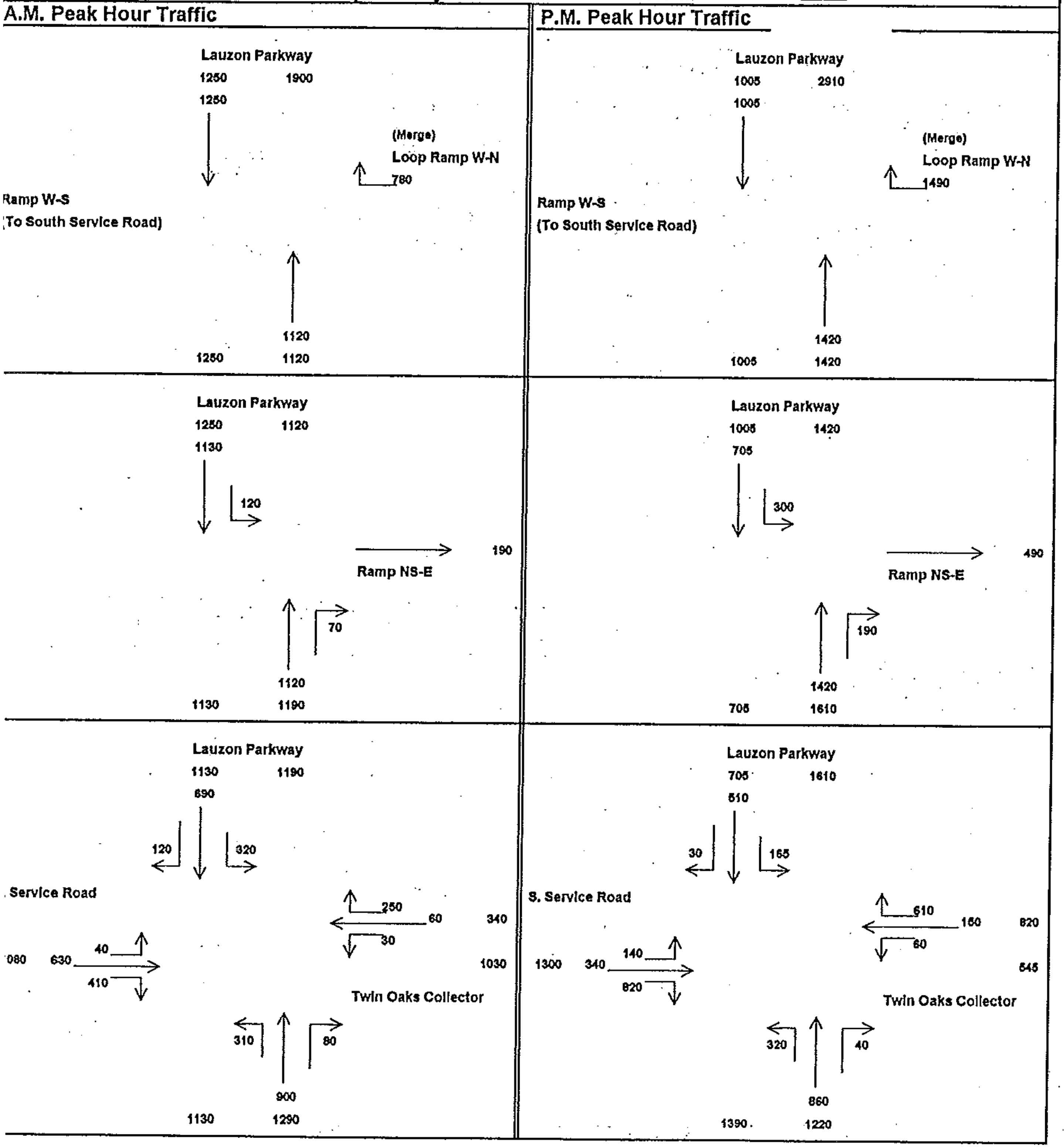
Alternative E not to be considered further



ALTERNATIVE E

APPENDIX E: ALTERNATIVES FOR ACCESS FROM THE WEST TO TWIN OAKS .

ALTERNATIVE F.1 - Ramp W-S Re-configured as a 'Buttonhook' Ramp from the Expressway to the South Service Road



PRIME FEATURES

1. Ramp W-S re-constructed to meet the South Service Road at a 'T' intersection. (Now Ramp W-SSR.) Ramp W-S connection to the Parkway would be removed.
2. 'T' intersection to be signalized thereby avoiding weaving problems inherent with Alternatives D.1, D.2, and E.

CRITICAL TRAFFIC OPERATION CONSIDERATIONS

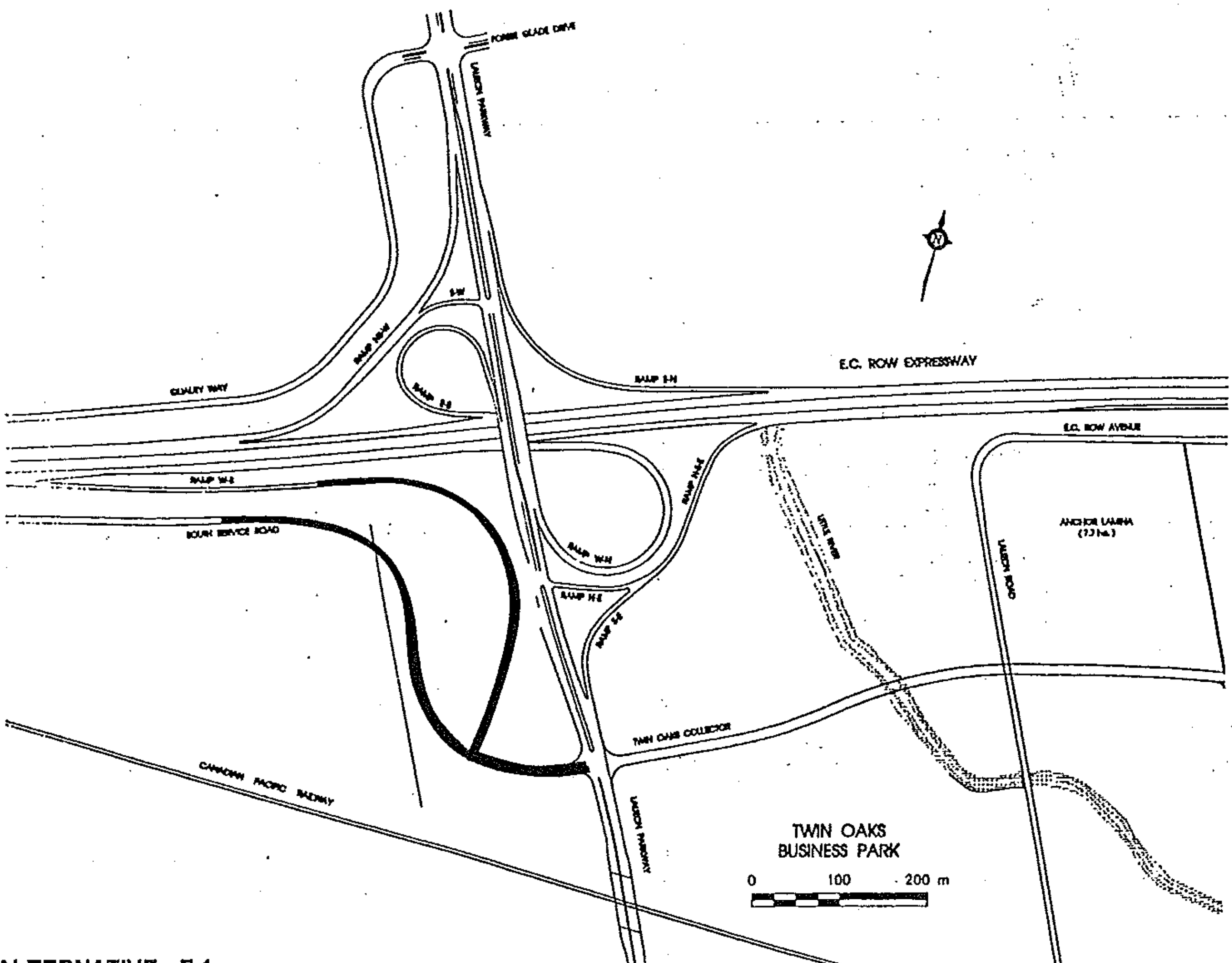
1. Awkward location on a small-radius curve where Ramp W-SSR intersects the S. Service Rd. Hence, sight distances somewhat restricted for ramp traffic.
2. Sighting eastbound traffic on the S. Service Rd. would be difficult for motorists at the Ramp W-SSR 'T' intersection. Eastbound service road traffic would be to the right but towards the rear of a stopped vehicle.
3. Two lanes are required on the South Service Road between the ramp intersection and the Parkway. Otherwise, traffic will backup onto the new ramp W-SSR.

CONSTRUCTION REQUIREMENTS

Item	Comment	Assessment
Grading	Ramp W-S and service road realigned	Moderate
Drainage	Little	Minimal
Structures	None	Nil
Pavement Area	8980 SM	Moderate
Property Acquisition	One complete parcel One severance.	Moderate

OTHER COMMENTS

Alternative F.1 to be considered further.

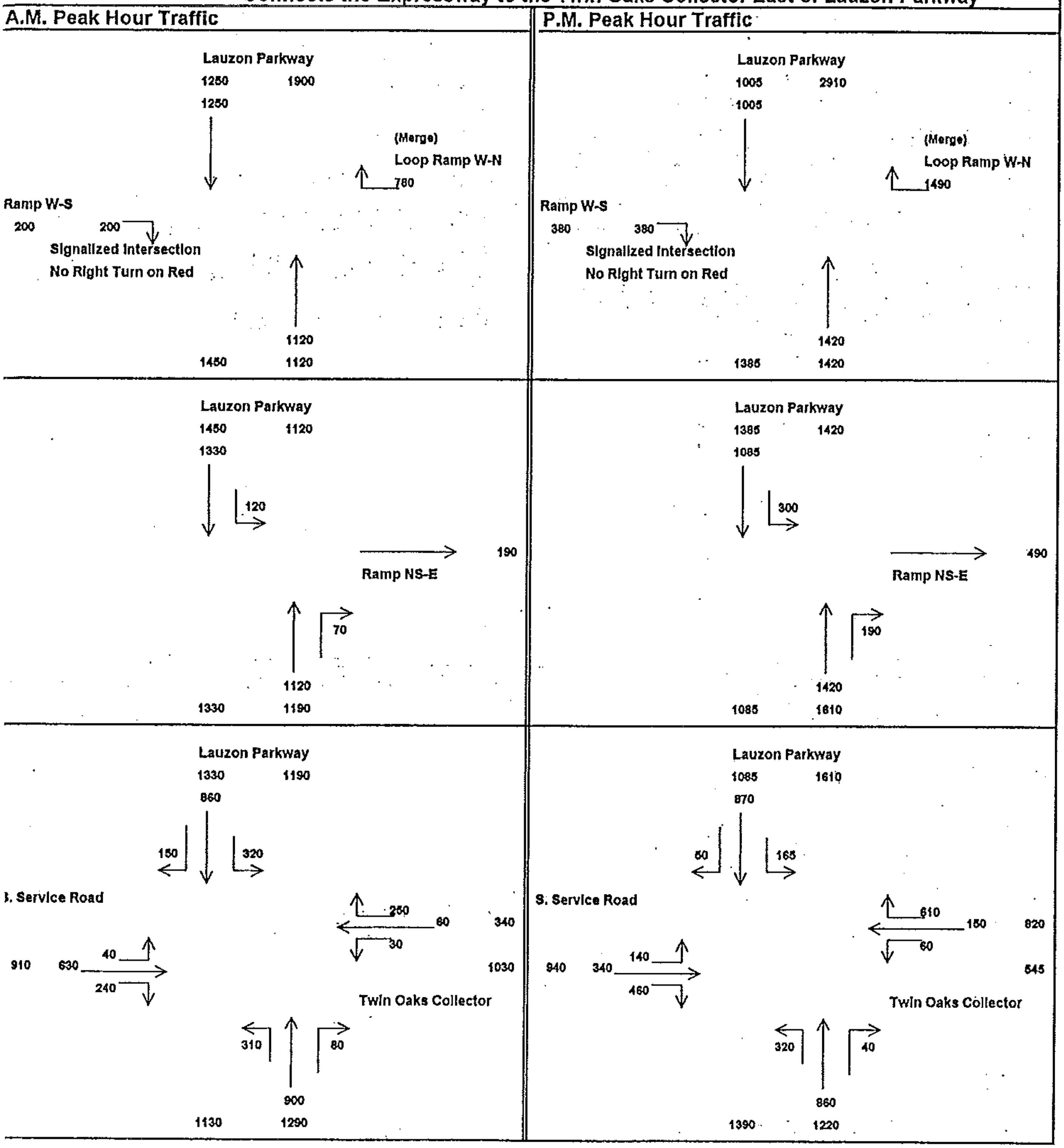


ALTERNATIVE F.1

APPENDIX E: ALTERNATIVES FOR ACCESS FROM THE WEST TO TWIN OAKS.

ALTERNATIVE F.2 - A New Buttonhook Ramp W-TO

Connects the Expressway to the Twin Oaks Collector East of Lauzon Parkway



PRIME FEATURES

1. New ramp W-TO (Twin Oaks) constructed from the E. C. Row Expressway between Lauzon Parkway and Banwell Road - far enough east to prevent weaving problems on the Expressway.

2. Speed-change lane from Ramp NS-E at the Lauzon Parkway interchange (adjacent to the through lanes of the E.C. Row Expressway) would be extended to form a continuous lane between Ramp NS-E and the new Ramp W-TO. Merging traffic from Ramp NS-E would weave with diverging traffic exiting the Expressway at Ramp W-TO.

CRITICAL TRAFFIC OPERATION CONSIDERATIONS

1. To have the new ramp "out of the realm of weaving", the required distance between the point where Ramp NS-E from Lauzon Parkway meets the Expressway and the location of the new ramp was determined as: 750 metres (2460 feet).

2. Level of service was determined as B+ for the distance noted. The highest level of service attainable is Level A (Highway 401 in a rural area).

3. Left turns from the north into Twin Oaks would be reduced by 440 vph in the morning peak and by 240 vph in the afternoon peak (traffic from the west on the Expressway destined for Twin Oaks). Resulting left turn volumes are 320 and 165 respectively from the Parkway corridor.

CONSTRUCTION REQUIREMENTS

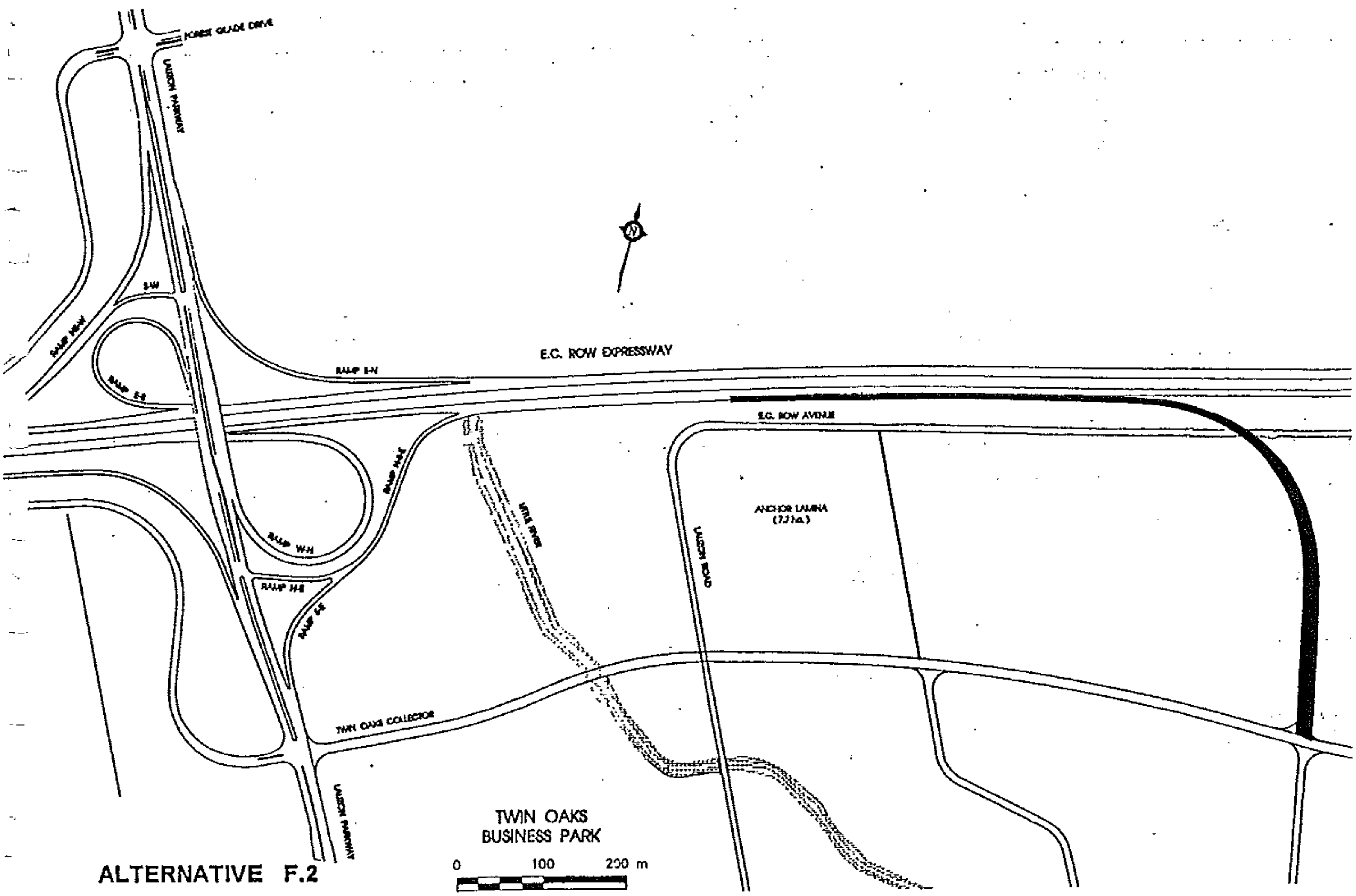
Item	Comment	Assessmen
Grading	Roadbed only	Minimal
Drainage	Minor ditching	Minimal
Structures	None	Nil
Pavement Area	8730 SM	Moderate
Property Acquisition	None	Nil

OTHER COMMENTS

Under no condition can business driveways or other access be allowed from Ramp W-TO (the buttonhook ramp(.

The intersection of Ramp W-TO at the Twin Oaks collector needs to be carefully designed to prevent the possibility of wrong-way traffic on on the ramp.

<u>Alternative F.2 to be considered further</u>

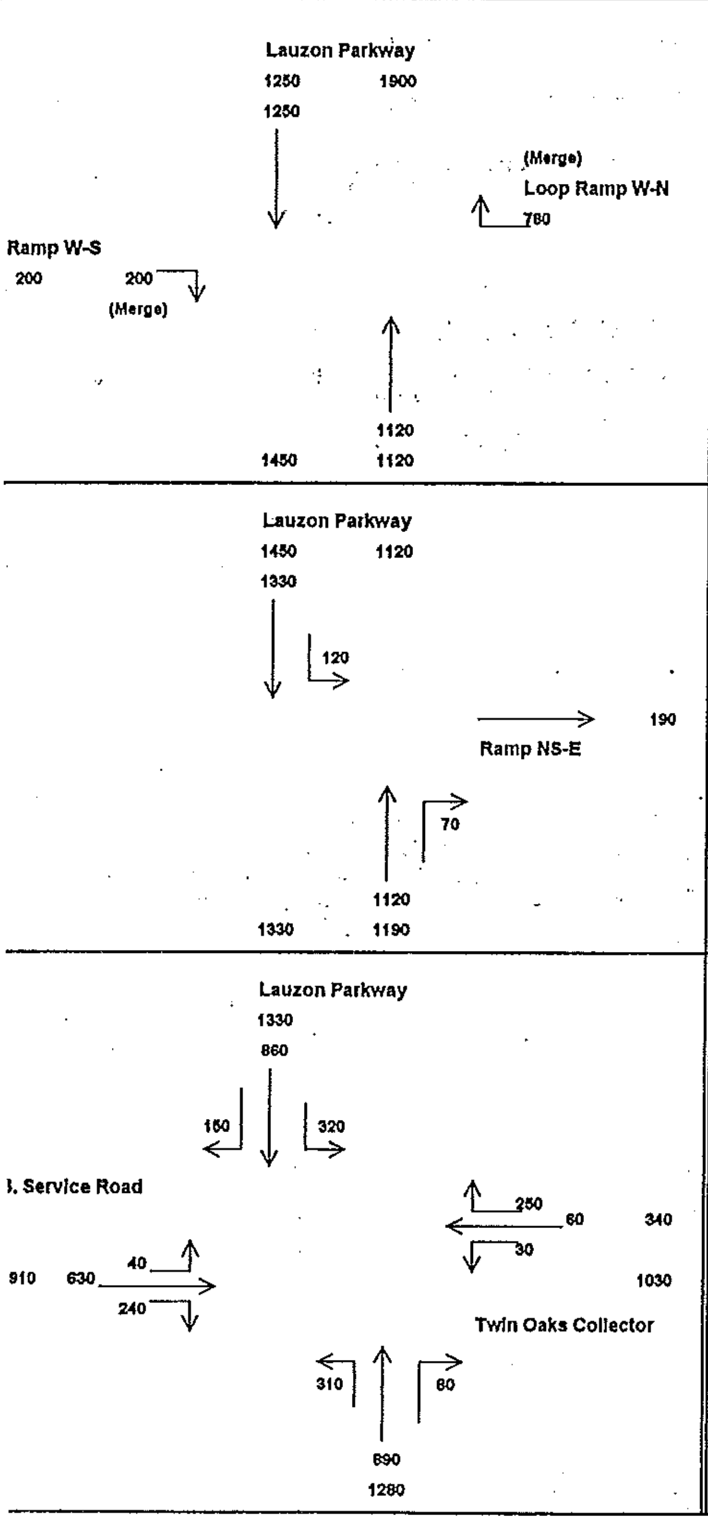


ALTERNATIVE F.2

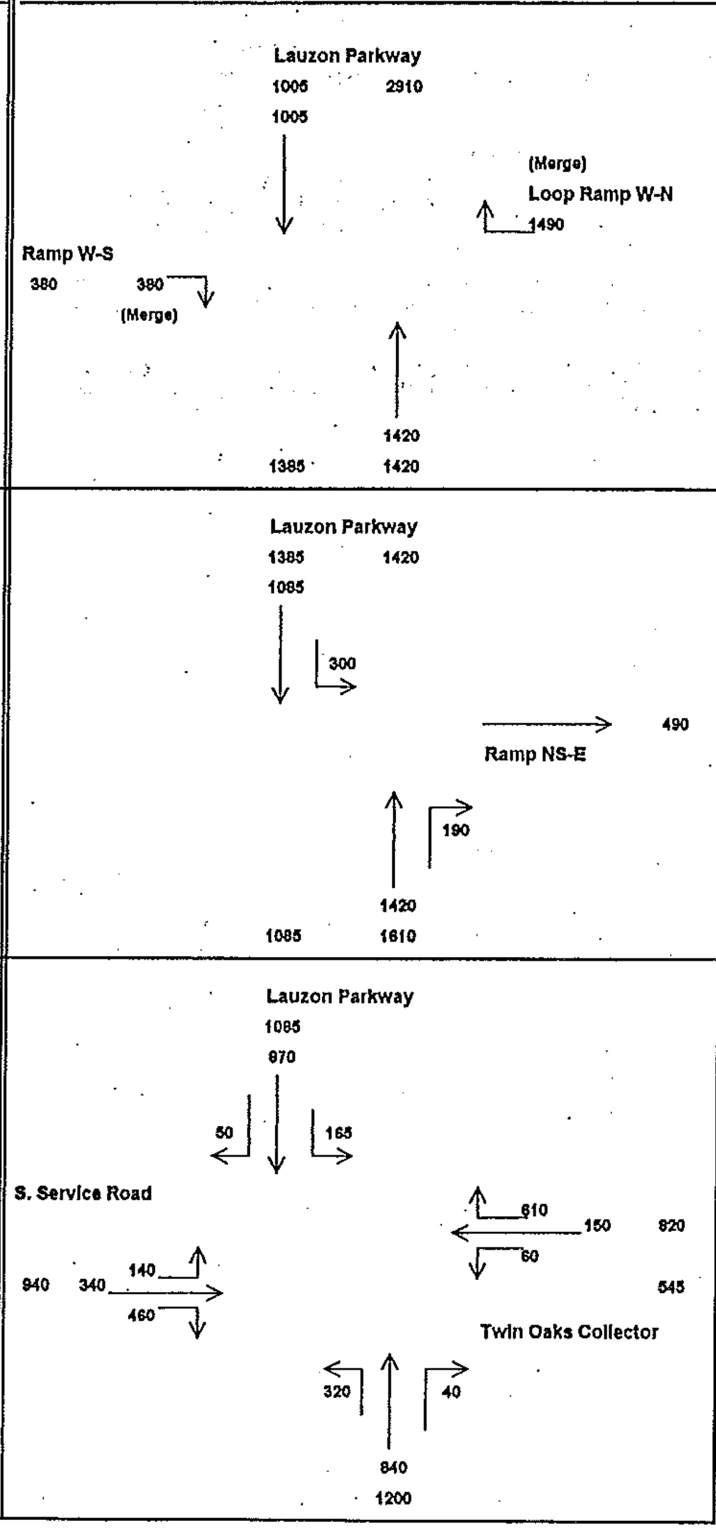
APPENDIX E: ALTERNATIVES FOR ACCESS FROM THE WEST TO TWIN OAKS

ALTERNATIVE G.1 - A New Ramp would Diverge from Ramp W-S and be Configured as a 'Buttonhook to the South Service Road

A.M. Peak Hour Traffic



P.M. Peak Hour Traffic



PRIME FEATURES

1. Ramp W-S modified to split Twin Oaks traffic from the W-S move ment. New Ramp W-SSR diverges from Ramp W-S and forms a 'T' intersection with the South Service Road.
2. T' intersection to be signalized thereby avoiding weaving problems inherent with Alternatives D.1, D.2, and E.
3. Traffic destined for points south on Lauzon Parkway signed via Ramp W-S.
4. Geometry restricted to limit property requirements.

CRITICAL TRAFFIC OPERATION CONSIDERATIONS

1. The direct access to the Parkway allows motorists to access Twin Oaks by weaving across Parkway traffic. It is certain that some motorists would take advantage of this and hence, at times,such traffic would hinder traffic flow on the Parkway.
2. The location of the intersection where Ramp W-SSR meets the South Service Road is on a small-radius curve. Hence, sight distances are somewhat restricted for ramp traffic.
3. Two lanes are required on the South Service Road between the ramp intersection and the Parkway. Otherwise, traffic will backup onto the new ramp W-SSR.

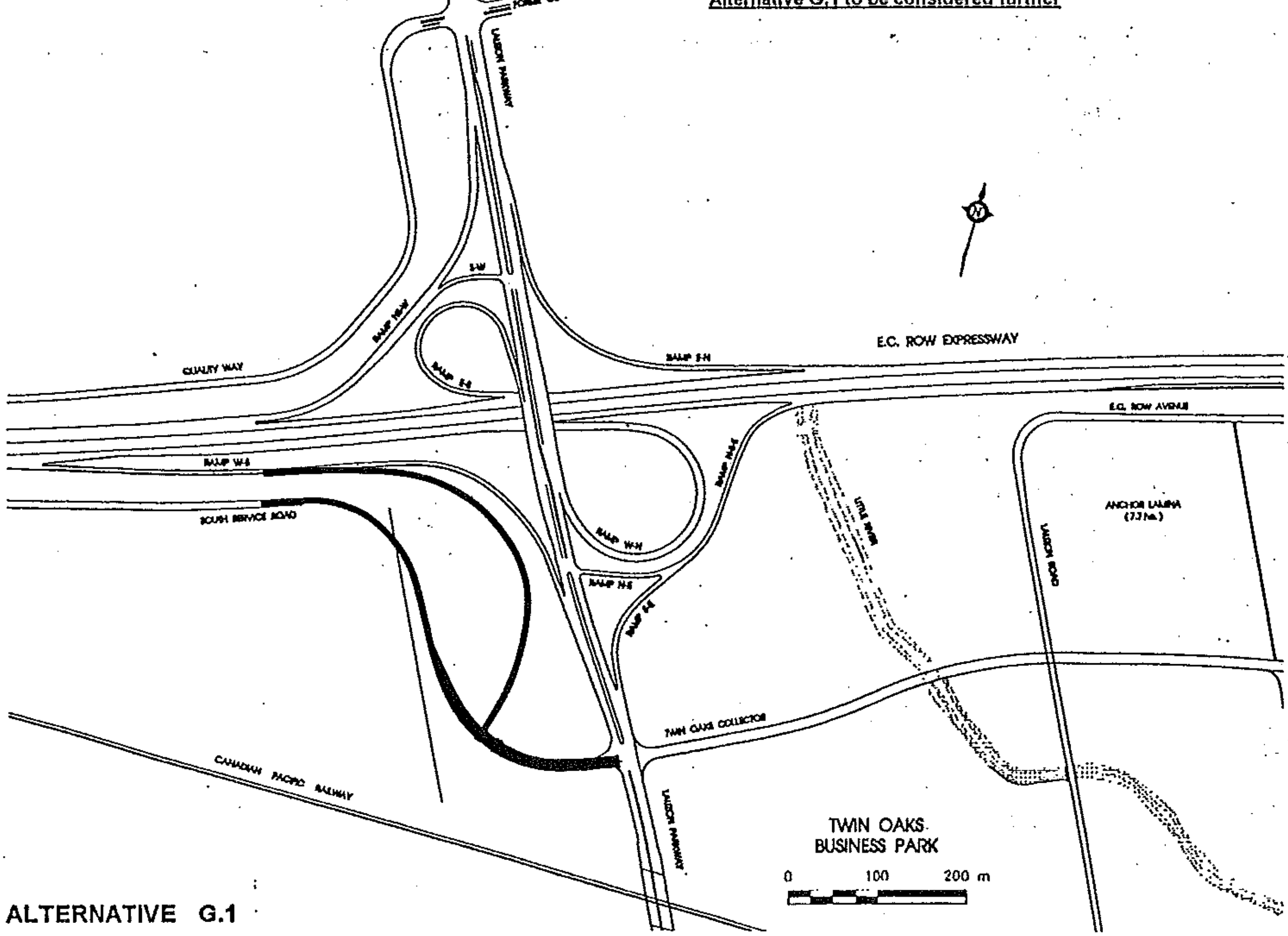
CONSTRUCTION REQUIREMENTS

Item	Comment	Assessment
Grading	Service road realigned; new ramp; and Wbd lane of service road.	Extensive
Drainage	$350,000	Severe
Structures	None	Nil
Pavement Area	9426 SM	Considerable
Property Acquisition	One complete parcel One severance.	Moderate

OTHER COMMENTS

Traffic from the Expressway would access the South Service Road via Ramp W-S and Lauzon Parkway .

<u>Alternative G.1 to be considered further</u>

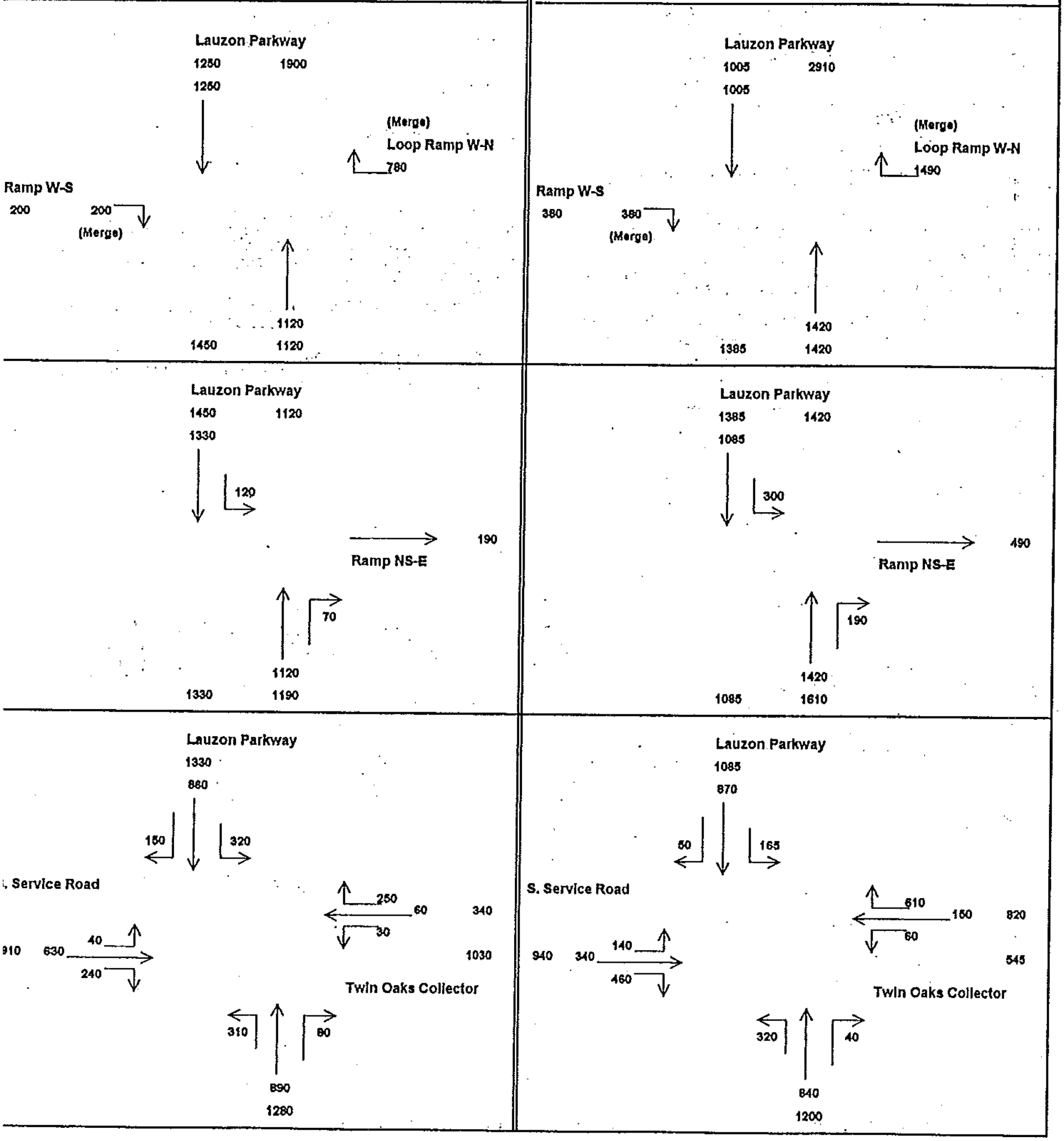


ALTERNATIVE G.1

APPENDIX E: ALTERNATIVES FOR ACCESS FROM THE WEST TO TWIN OAKS

ALTERNATIVE G.2 - A New Ramp would Diverge from Ramp W-S and be Configured as a 'Buttonhook' to the South Service Road. The Service Road would be Relocated Adjacent to the Railway

A.M. Peak Hour Traffic | **P.M. Peak Hour Traffic**



PRIME FEATURES

1. The South Service Road would be re-located along the CPR right-of-way
2. Ramp W-S modified to split Twin Oaks traffic from the W-S move ment. New Ramp W-SSR diverges from Ramp W-S and forms a 'T' intersection with the South Service Road.
3. T' intersection to be signalized thereby avoiding weaving problems inherent with Alternatives D.1, D.2, and E.
4. Traffic destined for points south on Lauzon Parkway signed via Ramp W-S.
5. Curve geometry is not restricted by property requirements.

CONSTRUCTION REQUIREMENTS

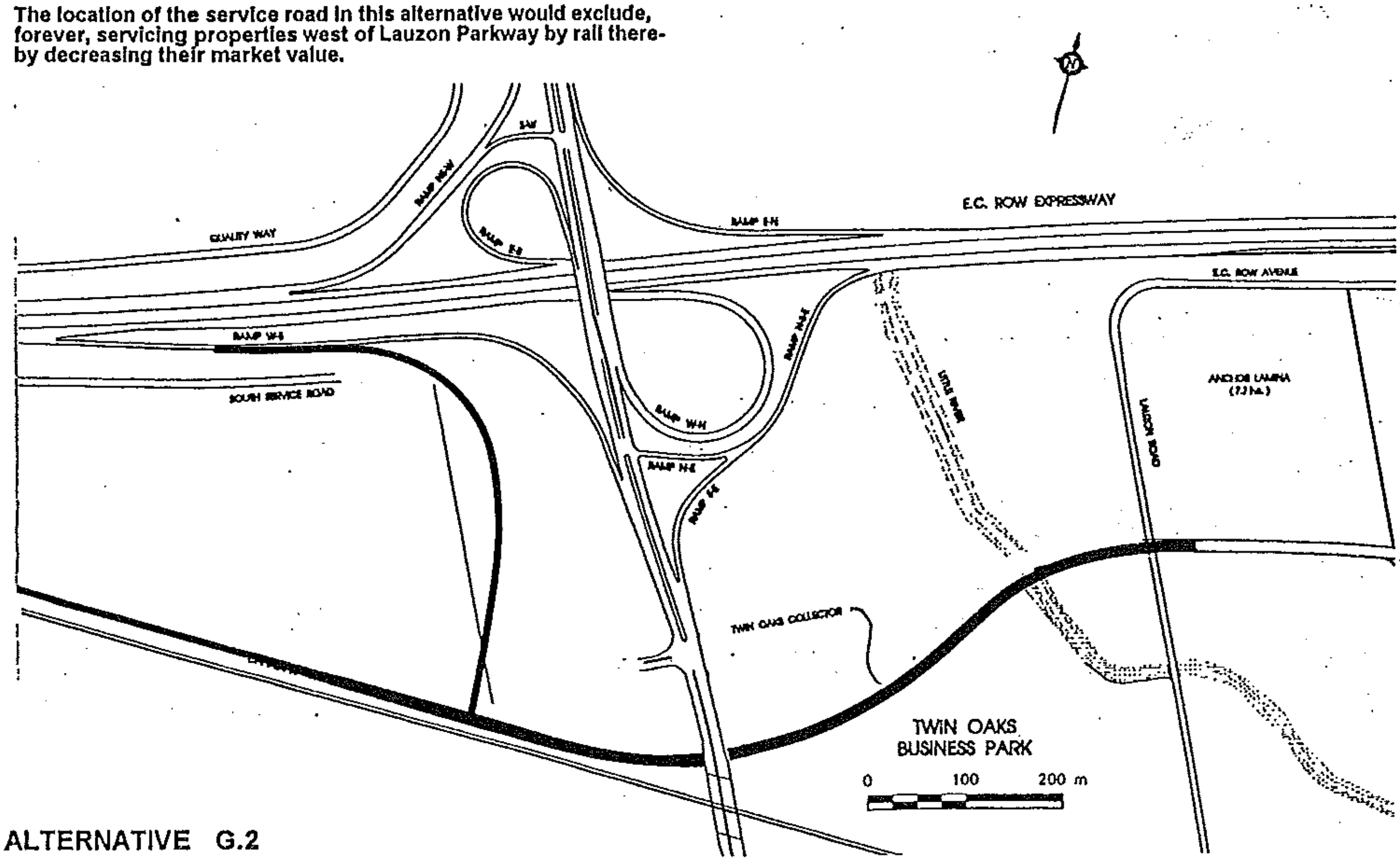
Item	Comment	Assessment
Grading	Excluded from further consideration because Alternative G.2 seriously affects long-term property values.	
Drainage		
Structures		
Pavement Area		
Property Acquisition		

CRITICAL TRAFFIC OPERATION CONSIDERATIONS

1. The direct access to the Parkway via Ramp W-S allows motorists to access Twin Oaks by weaving across Parkway traffic. There is a strong likelihood that some motorists will make this manoeuvre and on occasion obstruct traffic flow on the Parkway. However, because extra weaving distance is provided with this alternative, this is not as critical as is the case for other alternatives (A, D.2 and F.2).
2. The location of the intersection where Ramp W-SSR meets the South Service Road is on a tangent with clear sight distances for all motorists at that intersection.
3. Distances available for storing vehicles are more than adequate.
4. The location of the S. Service Rd. closer to the bridge over the CPR may allow signal heads to be seen by northbound motorists. As well, the southernmost cars in a queue at a red signal will be more visible by northbound motorists on Lauzon Parkway since the queue will extend over the crest of the road.
5. The bridge over the CPR was constructed with an long left-turn lane for the south-to-west traffic flow at the South Service Road.
6. The weaving distance between the merging end of Ramp W-S and the intersection of the re-located S. Service Road would be greater than existing by 105 metres (345 feet).

OTHER COMMENTS

The location of the service road in this alternative would exclude, forever, servicing properties west of Lauzon Parkway by rail thereby decreasing their market value.

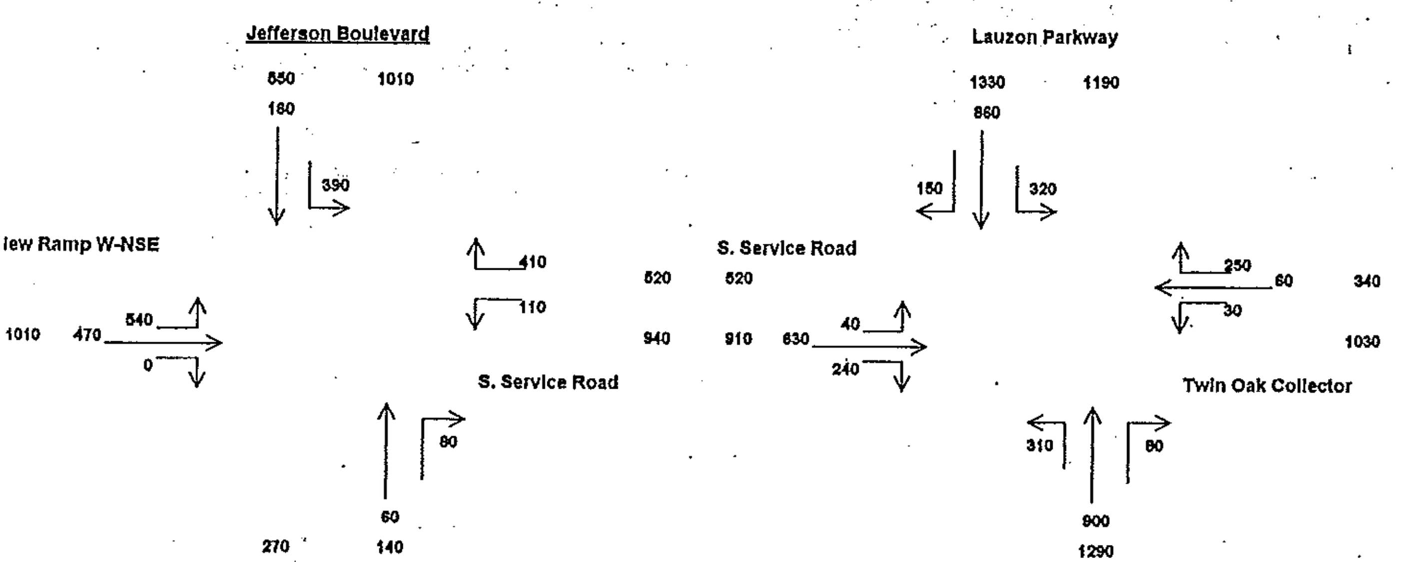


ALTERNATIVE G.2

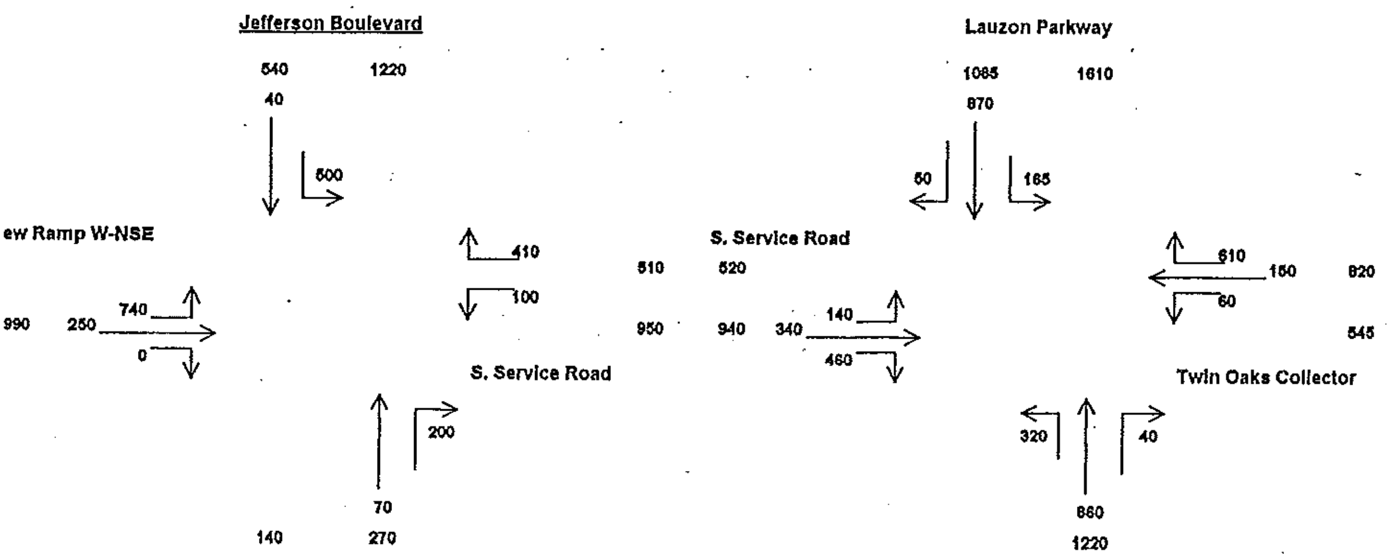
APPENDIX E: ALTERNATIVES FOR ACCESS FROM THE WEST TO TWIN OAKS

ALTERNATIVE H — A New Direct Ramp at Jefferson Boulevard Would Provide Access Directly to the South Service Road and Hence, to the Twin Oaks Industrial Park

A.M. Peak Hour Traffic



P.M. Peak Hour Traffic



PRIME FEATURES

1. New Ramp W-SSR from the E.C. Row Expressway would be connected to the South Service Rd. at its intersection with JEFFERSON BOULEVARD between the level crossing at the CPR tracks and the Expressway overpass 105 metres (345 feet) to the north. Access to the Twin Oaks area from the west would be via the S. Service Rd. to Lauzon Parkway.
2. Loop Ramp W-N would be removed since that movement could be made by left turns at the intersection of the S. Service Rd. from Ramp W-SSR.
3. The S. Service Rd. would be re-aligned so that the intersection with Jefferson Boulevard would be at the base of the fill for the Expressway overpasses.

CONSTRUCTION REQUIREMENTS

Item	Comment	Assessment
Grading	Excluded from further consideration because Alternative H would be very costly even to provide a substandard downgrade on the proposed ramp.	
Drainage		
Structures		
Pavement Area		
Property Acquisition		

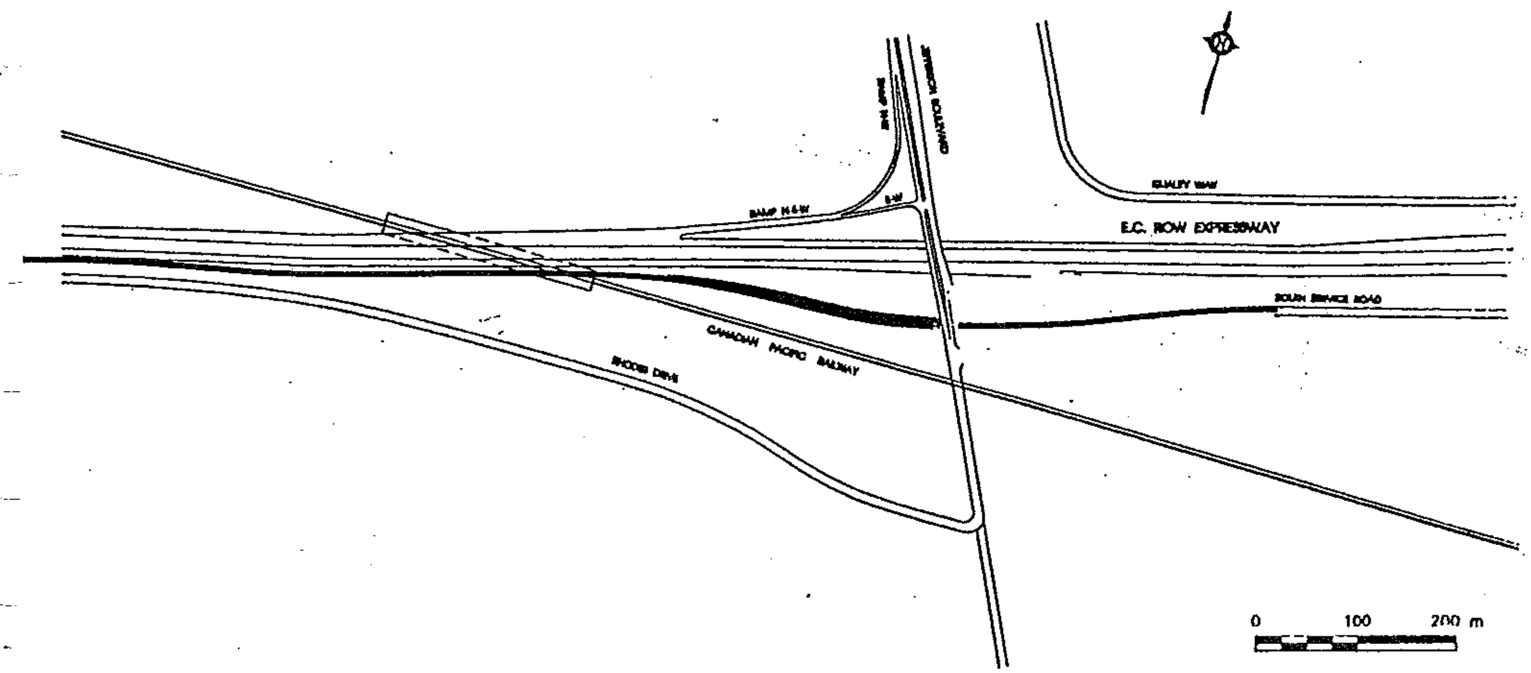
CRITICAL TRAFFIC OPERATION CONSIDERATIONS

1. Sight distances for motorists at the intersection of Ramp W-SSR and Jefferson Boulevard would be restricted by the proximity of the E.C. Row Expressway overpass.
2. The suggested relocation of the S. Service Rd. allows some vehicle storage space between the ramp intersection and the at-grade railway crossing. As well, it would be more visible than if closer to the Express way overpass structure.
3. The bull-nose for the new Ramp W-SSR would need to be located on the approach grade to the west of the E.C. Row Expressway bridge over the CPR tracks so that the bull-nose in the bifurcation area could be fully visible to eastbound drivers on the Expressway. This extends the length of the exit ramp.
4. The downgrade on the ramp would have to be about seven percent (7%) to match the grade of Jefferson Boulevard.

OTHER COMMENTS

A major bridge over the CPR would have to be extended by about 130 feet adding over $1M in cost extra to that for any other alternative.

The greater than normal downgrade is especially bad for winter conditions because of the required stop at Jefferson Boulevard.



H. ALTERNATIVE H

Figure 3.9 LAUZON PARKWAY: ACCESS FROM THE WEST TO TWIN OAKS

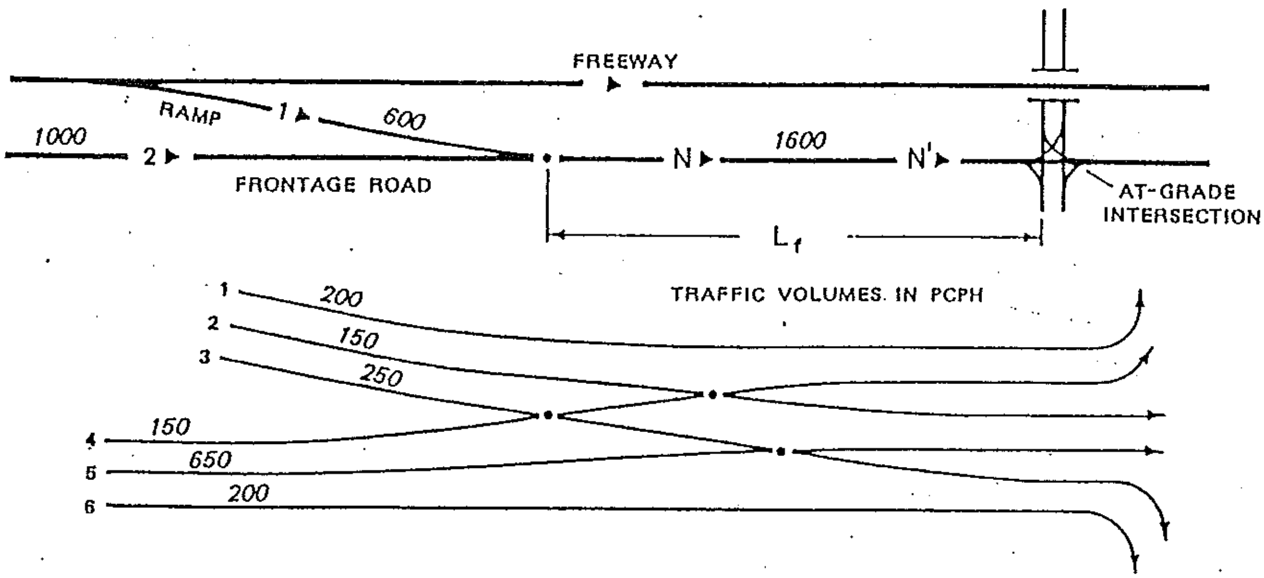
APPENDIX F

SAMPLE WEAVING CALCULATIONS: ARTERIAL ROADS

SOURCE: PROCEDURE FOR ANALYSIS AND DESIGN OF WEAVING SECTIONS
VOLUME 2. Users guide FINAL REPORT
Federal Highway Administration Contract DTFH61 - 82 - C - 00050
JACK E. LEISCH & ASSOCIATES, Evanston, Illinois, February, 1984,
Problem 19, Pages 60 to 62 and 66.

NOTE : For analyzing weaving conditions on the E.C. Row Expressway, the procedures used were those in guidelines published by the Ministry of Transportation, Ontario

Problem 19. An urban freeway with continuous one-way frontage roads is being designed with diamond interchanges utilizing slip ramps between freeway and frontage road, for the condition shown in the accompanying figure. Determine the length L_f and width N (and N' if wider than N) required to accommodate the indicated traffic.



WEAVING MOVEMENT: RAMP + FRONTAGE ROAD

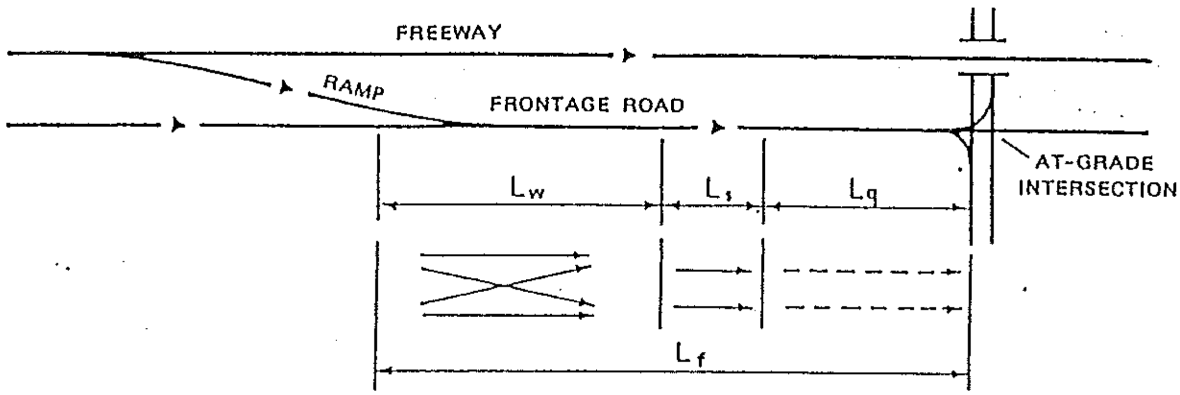
V_w = (2 + 3) + (4 + 5)

= 400 + 800 = 1200 pcph

Solution:

Since no specific research or data are available for this prevalent condition associated with freeways, a rational method to solve the problem is utilized, deduced from general observation and operational experience. The technique employs the sum of three dimensions during a representative peak hour, where $L_f = L_w + L_s + L_q$ as structured in the following diagram. The first element, L_w, involves the distance required for the traffic weaving between the ramp and frontage road (in this problem, as shown above, V_w = 1200 pcph from which--according to appropriate weaving speed and SV--both L and N can be determined. The second length, L_s, is that required for the complete weave to come to a stop, considering its speed, before reaching the end of the queue of stopped vehicles in advance of the intersection. The third length, L_q, is the average distance per signal cycle occupied by queued vehicles produced by operation of the intersection.

Problem 19: (Continued)



The weaving maneuver, unlike that along a freeway or C-D road, takes place on the frontage road at a variable speed, after which the traffic alternately must come to a stop at the end of an appropriate queue of the intersection. The three length elements are logically quantified in the following manner, considering that the configuration for the condition described does not lend itself to a specific level of service but to an acceptable and appropriate operational situation.

The speeds of ramp and frontage road upon merging and beginning of weaving are considered well represented by 40 mph in urban areas. Since the weaving maneuver is faced by a queue of standing vehicles, the variable speed of weaving is assumed to be accomplished by the time the speed is reduced to about 15 mph followed by a deceleration to a stop at the queue end. Accordingly, the average speed of weaving over distance L_w may be approximated at 25 mph, which is used in Nomograph 1 to determine distance L_w. In this case for V_w of 1200 pcph it is found to be 300 feet.

Length L_s, according to AASHTO design policy, is equivalent to a stopping distance of 80 feet from a speed of 15 mph. The average length of queue is dependent upon the design and operation of the at-grade intersection. Although the analaysis of the intersection is not shown here, for the resulting N' of 4 lanes on the approach, an L_q of 320 feet was determined. Thus, the distance between ramp junction and intersection is $L_f = 300 + 80 + 320 = 700$ feet.*

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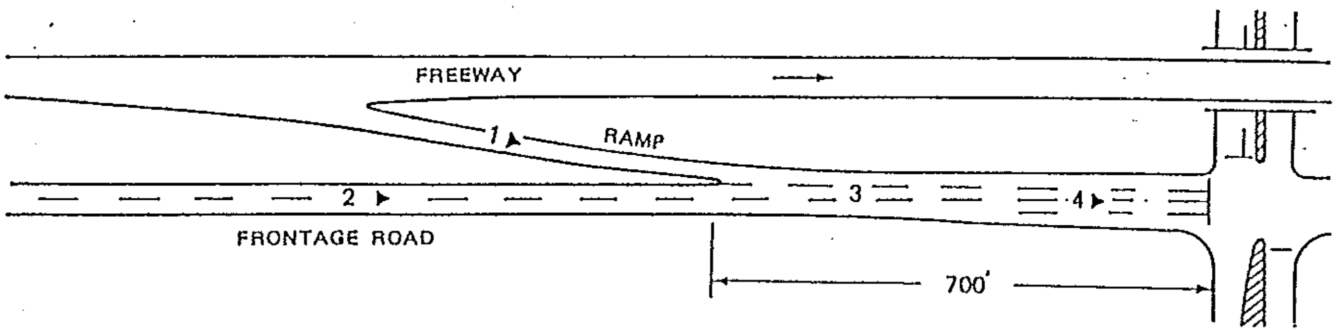
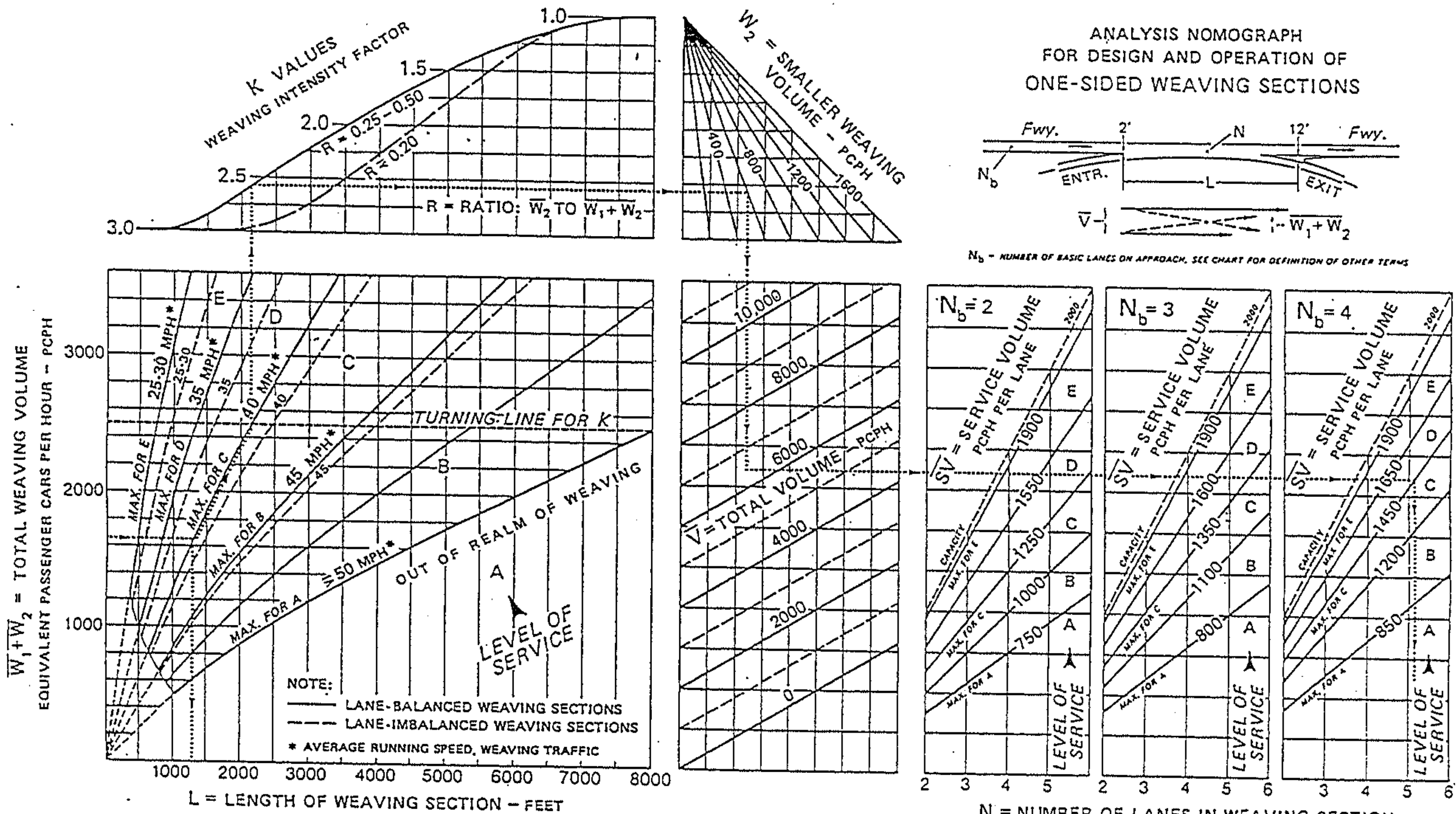
* Dimension of L_f is frequently smaller than demonstrated (as a minimum), due to less stringent traffic requirements.

Problem 19: (Continued)

Using Nomograph 1 with values of V_W = 1200, S_W = 25 mph, resulting k = 3, W_2 = 400, V = 1600, and an assumed value of SV = 800, N closely approximates 3 lanes. (An SV of 800 pcph per lane is taken to be representative of uninterrupted flow operation on portions of non-access controlled facilities.)

The following plan is the result of this analysis.



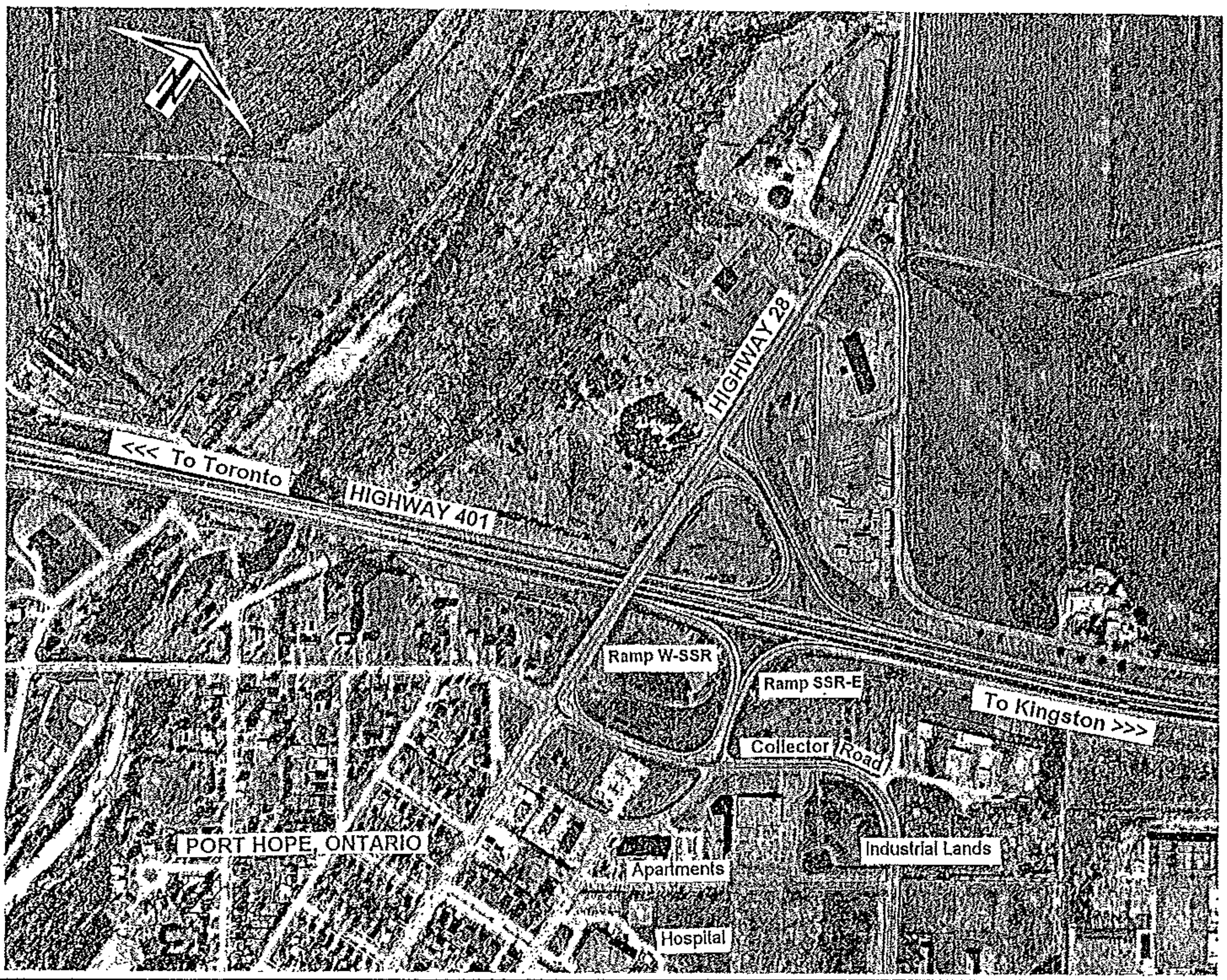


NOMOGRAPH FOR DESIGN AND ANALYSIS OF WEAVING SECTIONS — ONE-SIDED CONFIGURATIONS

NOMOGRAPH 1

APPENDIX G

BUTTONHOOK RAMPS IN ONTARIO



PRIME FEATURES

1. Location: Highway 401 Interchange with Highway 28 at Port Credit, Ontario.
2. Ramp W-SSR constructed to meet a collector road at a full intersection.
3. Intersection with collector road is not signalized but controls favour ramp traffic.
4. Surrounding development includes industrial, institutional and high density residential units (high-rise and low-rise apartments) served by the collector roads to which the ramp connects.
5. Traffic includes a high proportion of trucks destined for the truck stop in the north-east quadrant.

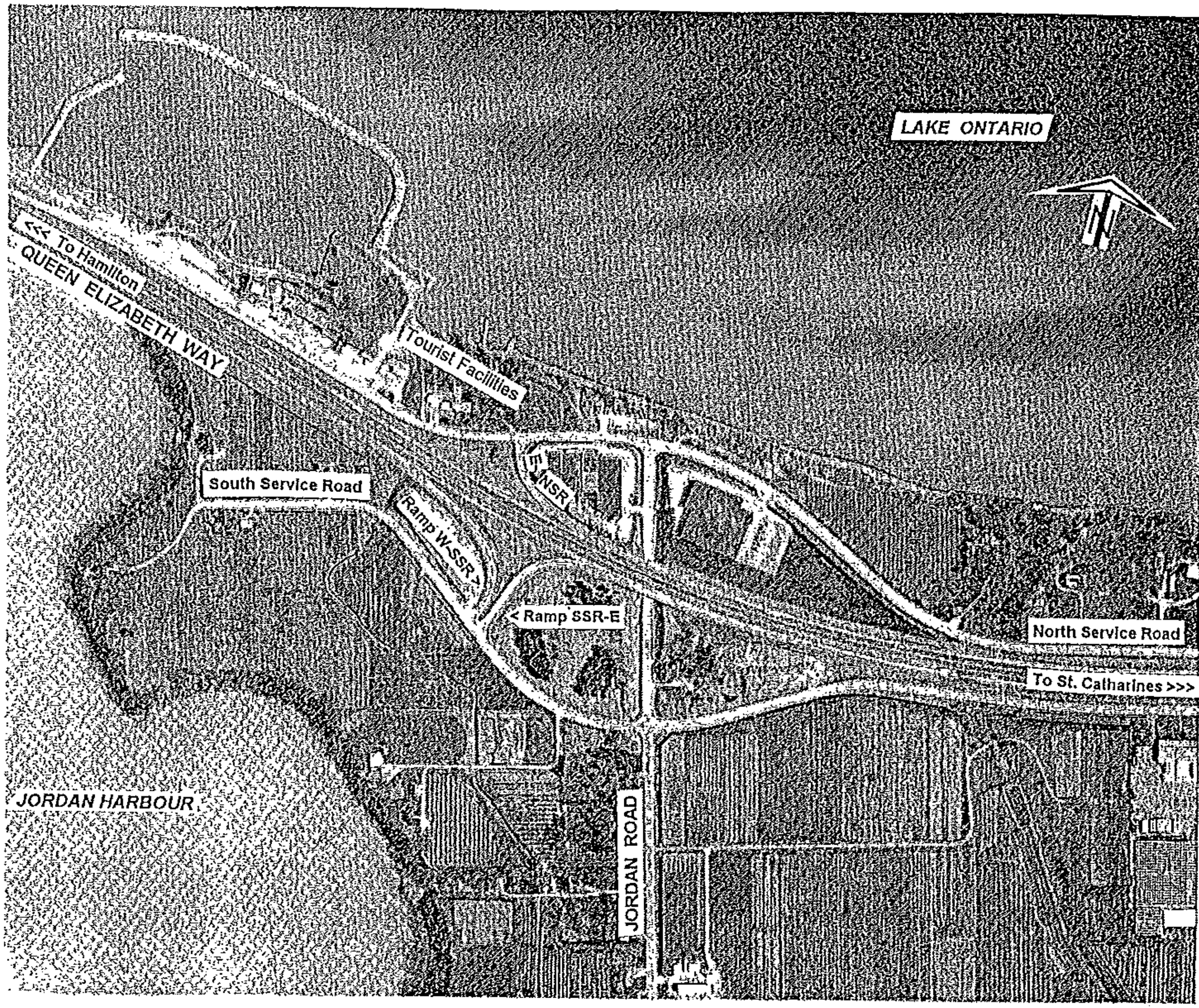
CRITICAL TRAFFIC OPERATION CONSIDERATIONS

1. Controlling curve appears to have a radius approximately that for a standard loop ramp when used for a freeway exit - 85 metres (280 feet)
2. Guardrail lines the outside edge of pavement for the entire length of the controlling curve.
3. Lane arrangement for the exit ramp provides one lane for through and left-turn movements plus a free-flow right turn.
4. Vehicle storage from the end of curve to the collector road intersection is 70 metres (230 feet) accommodating approximately 10 cars for left turns and through traffic.

DESIGN CRITERIA

1. THE RADIUS OF A CONTROLLING CURVE SHOULD BE AS LARGE AS POSSIBLE.
2. THE NEED FOR GUARDRAIL DIMINISHES WITH LARGER RADII. GUARDRAIL IS NOT NECESSARY IF THERE IS NO ADJACENT RAMP NS-E. IN THIS CASE, APPROPRIATE GRADING ALONG THE OUTSIDE OF THE CONTROLLING CURVE CAN PROVIDE A SAFE ESCAPE AREA FOR ERRANT VEHICLES IF IT IS FELT NECESSARY.
3. A SEPARATE LANE FOR EACH FLOW WOULD IMPROVE VEHICLE STORAGE CAPACITY AND LESSEN THE POTENTIAL FOR REAR-END ACCIDENTS.
4. A GOOD DESIGN WOULD INCLUDE AS GREAT A DISTANCE AS POSSIBLE FROM THE END OF THE CONTROLLING CURVE TO THE FIRST INTERSECTION.

Figure G.1 'BUTTONHOOK' EXIT RAMP: HIGHWAY 401



PRIME FEATURES

1. Location: QEW interchange with Service Roads - Jordan Harbour, Ontario.
2. Ramps W-SSR and E-NSR constructed to meet service roads at 'T' intersections. Service roads connect to Jordan Road.
3. Intersections with service roads are not signalized but have stop-sign control.
4. Surrounding development includes agricultural lands, tourist facilities and rural homes with access to the QEW via the service roads.

CRITICAL TRAFFIC OPERATION CONSIDERATIONS

1. Ramps W-SSR and E-NSR carry low traffic volumes.
2. Controlling curves for the exit ramps appear to have a radii approximately that of a standard loop ramp when used for an exit from an arterial road. That is, 45 metres (150 feet).
3. There are no guardrails along the outside edge of the controlling curve for any of the freeway exit ramps
4. Lane arrangement for the exit ramps provide one lane for through, left-turn, and right turn movements.
5. Vehicle storage is minimal requiring motorists to stop on the controlling curve for the ramps.

Figure G.2 'BUTTONHOOK' EXIT RAMPS: QUEEN ELIZABETH WAY

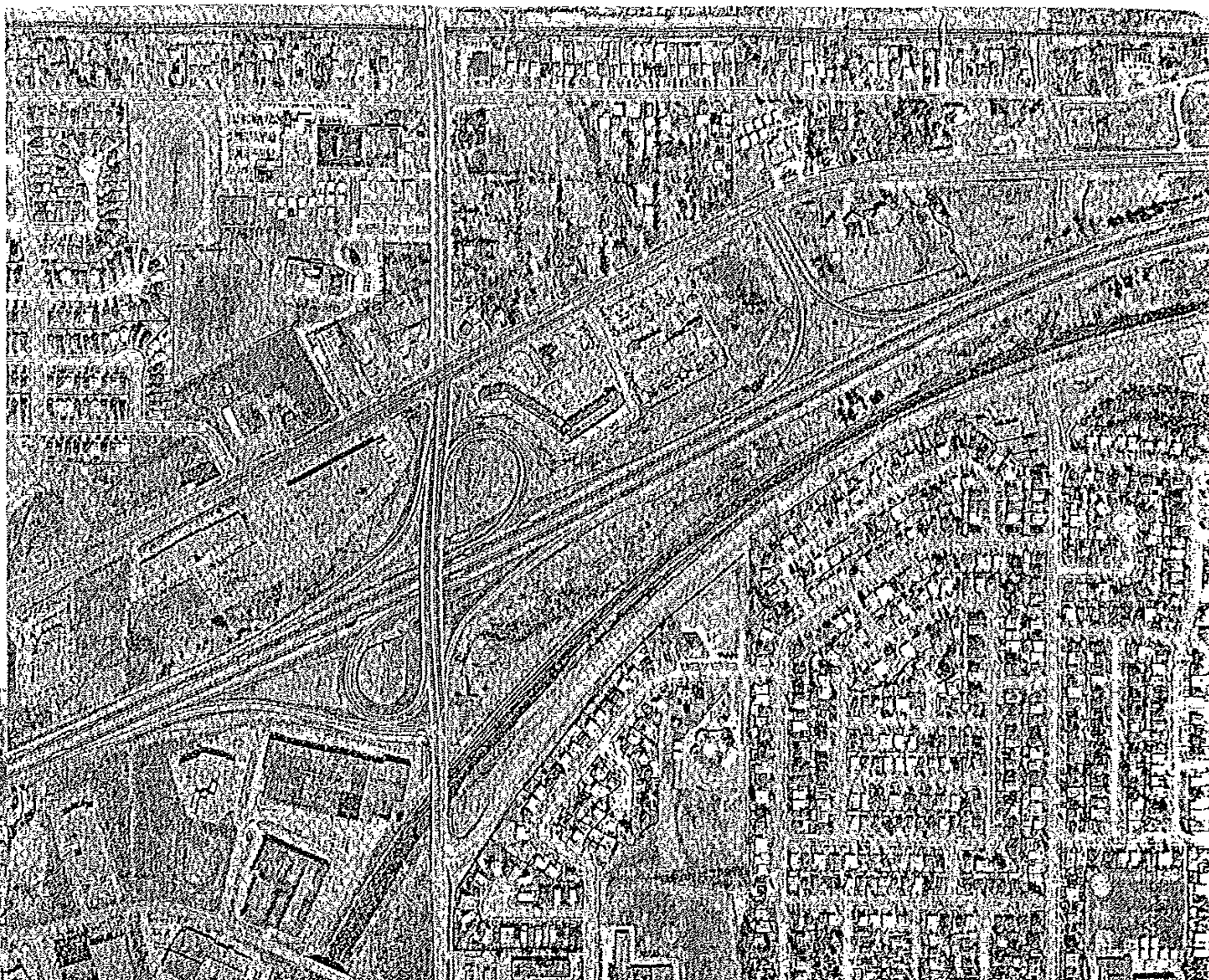


Figure G.3 'BUTTONHOOK' EXIT RAMP: HIGHWAY 401 - PICKERING, ONTARIO

Figure G.4 'BUTTONHOOK' EXIT RAMP: HIGHWAY 401 - WHITBY, ONTARIO

ZONING/PLANNING ISSUES

- Zoning By-Law
- Minutes of Meeting - July 18, 1996

BILL

NO. 162

1990

BY-LAW NUMBER 10221

A BY-LAW TO FURTHER AMEND BY-LAW NUMBER 3072 CITED AS THE "ZONING BY-LAW "A"".

Passed the 10th day of April ,1990.

WHEREAS it is deemed expedient to further amend By-law Number 3072 of the Council of The Corporation of the City of Windsor, cited as the "Zoning By-law "A"", passed the 9th day of January, 1967, as heretofore amended:

THEREFORE the Council of The Corporation of the City of Windsor enacts as follows:

1. That Section 13 of By-law Number 3072 is hereby amended by adding after subsection (14), the following subsection:

"(15) MANUFACTURING DISTRICT 2.15 (M2.15)

(a) PERMITTED USES

(i) Any industrial use as defined in this by-law, save and except the following:

Food Agriculture	(a)	Slaughtering, the processing of poultry or fish; fat rendering or vegetable oil mill, feeding pen, stockyard, feed manufacture, flour mill, bone distillation
Leather	(b)	Leather tannery
Wood/Paper	(c)	Sawmills, veneer and plywood mills, pulp and paper mill, wood distillation
Metals	(d)	Iron and steel mill, blast furnace, smelting and refining of metals and ores, boiler and plate works, manufacture of railroad rolling stock
Minerals/ Extractive	(e)	Mineral extraction, pits and quarries, the manufacture of cement, lime, gypsum products, concrete or concrete products, clay and clay products, plaster of Paris, brick refractory, mineral wool manufacturing, concrete or asphalt batching plant, asbestos products manufacturing, abrasives manufacturers
Petroleum/ Chemical/Coal	(f)	The manufacturing of explosives and ammunition, acid, alkalies, asphalt, fertilizer, plastics, resins, soap and cleaning compounds, petroleum refinaries, coke oven, coal and tar distillation
Outdoor/ Storage/Scrap	(g)	The outdoor storage or processing of the following materials: rags, scrap paper, bottles, scrap metal, bones, rubber or salvage, sand, gravel and aggregate materials, ores and non-metallic minerals
		A bulk fuel depot
		An automobile or general salvage operation
		Waste processing, disposal and storage
Repair	(h)	An automobile repair garage, a collision shop

(ii) A railway, truck transportation facilities

(iii) Food catering service, including the packaging and preparation of food or foodstuffs for distribution and sale elsewhere

(iv) Commercial printing, engraving, stereotyping, publishing, photographic processing, blueprinting, book binding

(v) A wholesale store

(vi) A business, financial or medical office

(vii) For the lands delineated by a broken black line and shown as Blocks A, B, D, and K on Zoning District Map Part 20.1, the following additional uses shall be permitted:

- a hotel, a motel;

- a day nursery;

- a club, health studio;

- an exhibition hall.

(viii) An arena, swimming pool, hockey rink, baseball field and other similar recreational use;

(ix) Any use accessory to the foregoing uses, which may also include the following uses in combination with any industrial use permitted in sub-clauses (i) to (v), both inclusive of this clause:

- a day nursery

- a retail store, provided that the net floor area of the retail store does not exceed 25% of the gross floor area of the main building or 15% of the lot area

- caretaker's residence.

(b) <u>REGULATIONS</u>

(i)	Minimum lot width	- 30 metres
(ii)	Minimum lot area	- 3,000 square metres (0.74 acres)
(iii)	Minimum front yard depth	- 6 metres or 10% of the lot depth, whichever is greater, provided however the minimum required front yard depth need not exceed 25 metres
(iv)	Minimum side yard width	- 6 metres where such yard abuts a public street
(v)	Minimum rear yard depth	- 6 metres where such yard abuts a public street
(vi)	Maximum building height	- 22 metres

(vii) Exposed flat concrete or flat concrete block, whether painted or unpainted is prohibited on any wall which faces, directly or indirectly, a public street

(viii) An outdoor storage yard is prohibited in any front, rear or side yard abutting a public street

(ix) Repairing, servicing, processing, manufacturing or packaging activities undertaken for any permitted use shall occur entirely within a fully enclosed building

(x) No land shall be used and no buildings or structures shall be erected unless a municipal storm and sanitary sewer are available to serve the land, building or structures."

2. That the said By-law Number 3072 as heretofore amended be and the same is hereby further amended by changing the Zoning District Maps or parts thereof referred to in Section Three of the said By-law Number 3072, and made part thereof, so that the zoning symbol of the said lands therein and hereinafter described shall be changed from that shown in Column 5 hereof to that shown in Column 6 hereof:

1.	2.	3.	4.	5.	6.
Item Number	Zoning District Map Parts	Lands Affected	Official Plan Amendment Number	Present Zoning Symbols	Amending Zoning Symbol
1	19 20	Part of Farm Lots 125, 126, 127, 134 and 135, Concession 3 as more particularly shown delineated by a dotted black line on Schedule "A", attached hereto (southeast of Lauzon Parkway/E. C. Row Expressway interchange)	--	M2.1 OS.2	M2.15

3. That the Zoning District Map as referred to in Section 3 of By-law 3072 as heretofore amended is hereby further amended by adding Zoning District Map Part 20.1 as attached as Schedule "A" to this amending by-law.

4. That Schedule "A" attached hereto is declared to form part of this amending by-law.

MAYOR

CITY CLERK

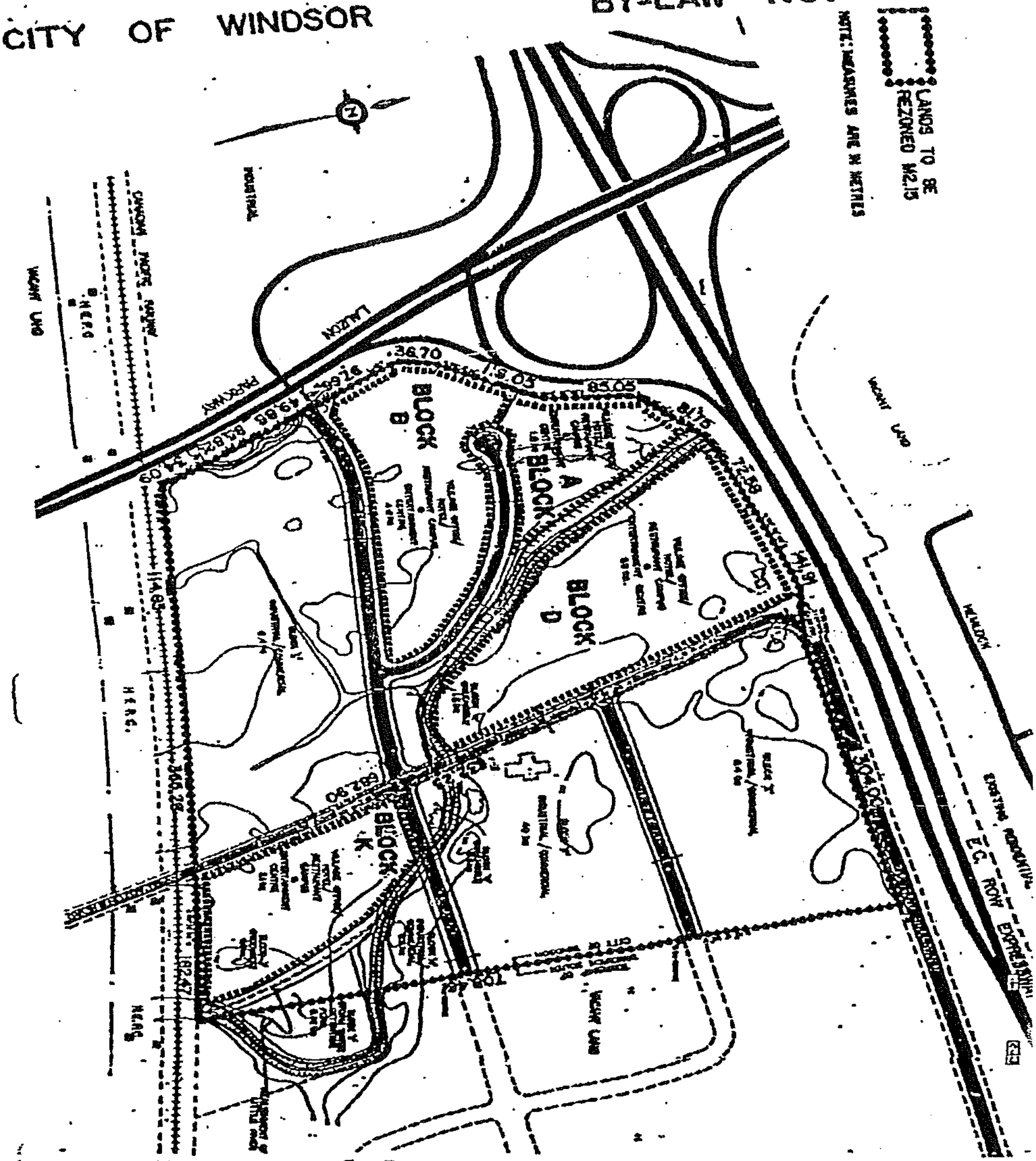
First Reading - April 9, 1990

Second Reading - April 9, 1990

Third Reading - April 10, 1990

"APPROVED BY CLERK'S CERTIFICATE ON MAY 4, 1990, PURSUANT TO SECTION 34(20) OF THE PLANNING ACT."

CITY OF WINDSOR BY-LAW NO.

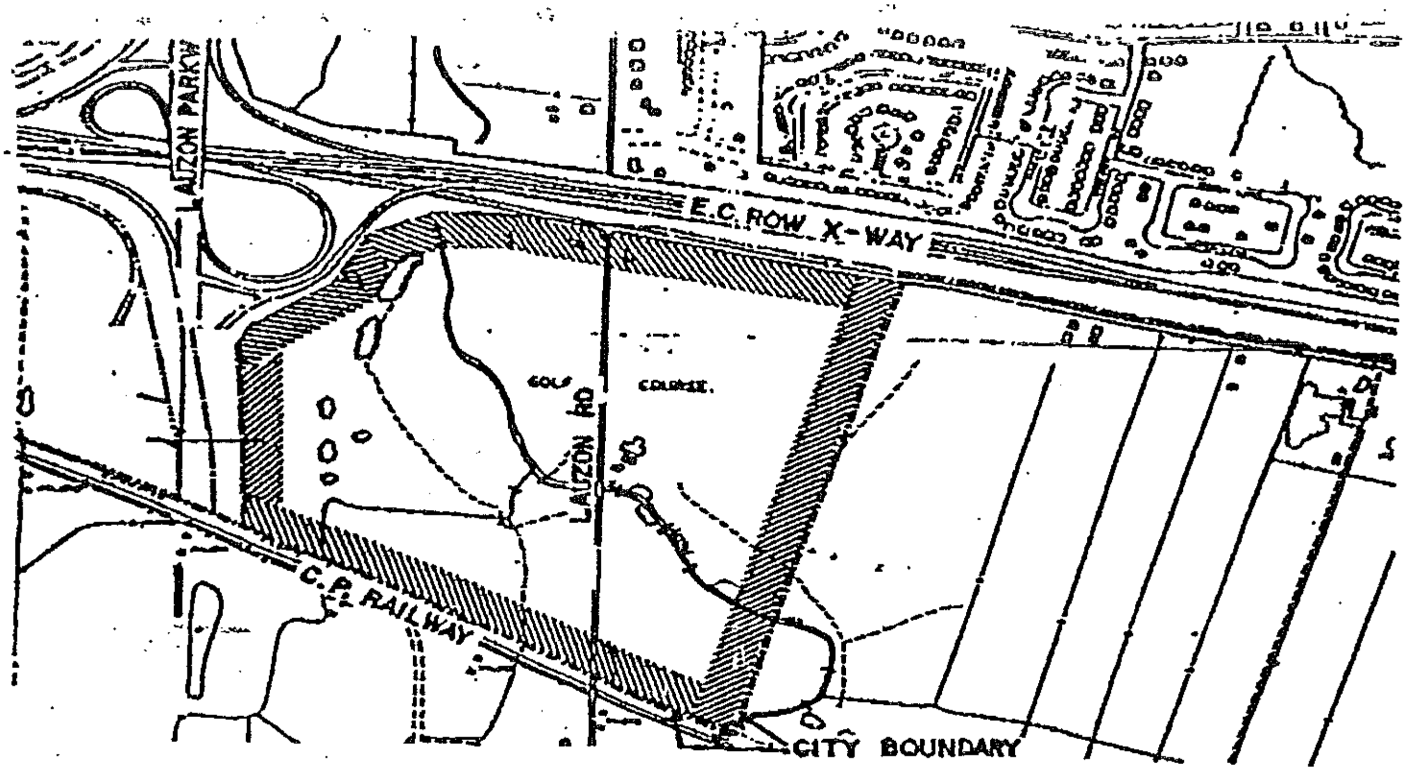


THIS IS SCHEDULE "A" TO BY-LAW NUMBER 10221 PASSED THE 10th DAY OF April, 1990.

MAYOR

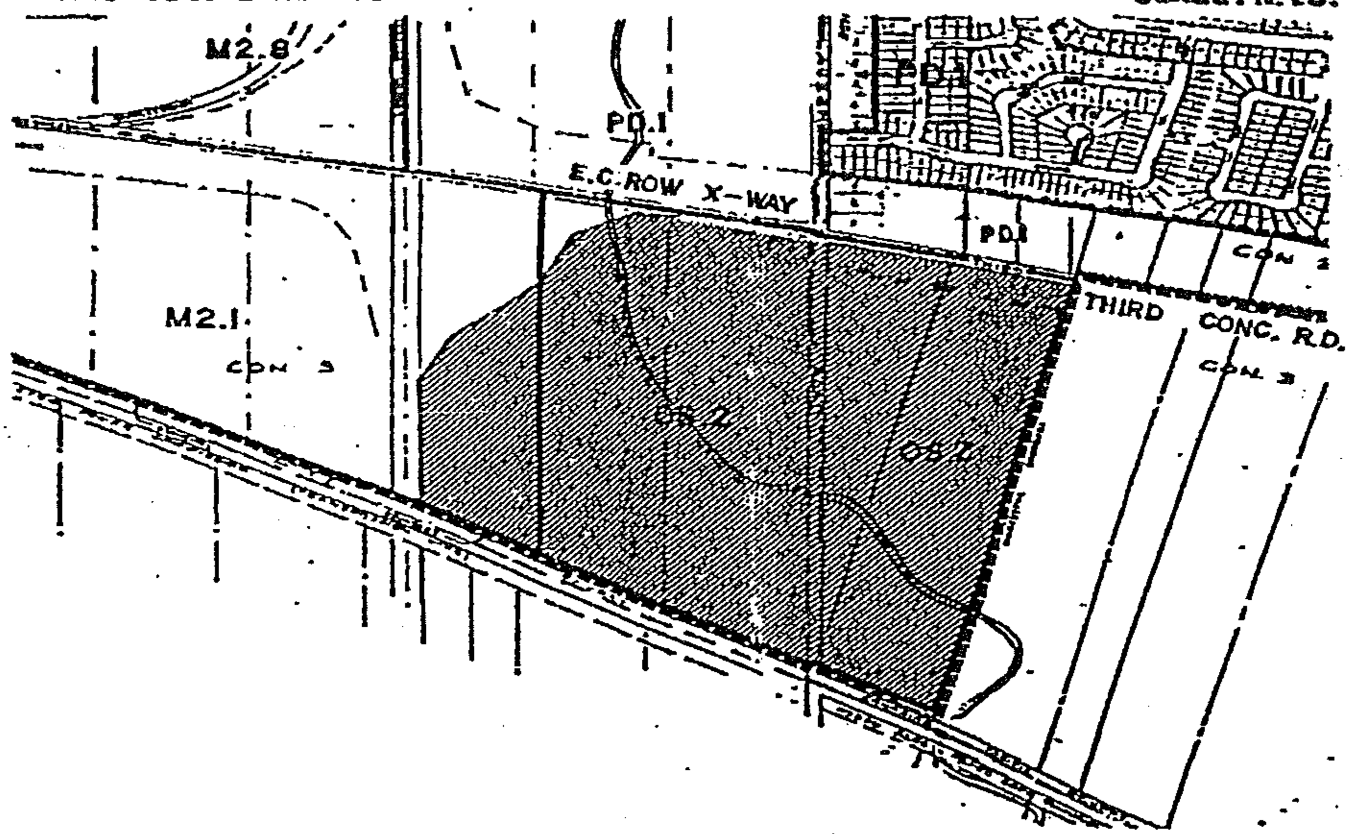
CLERK

SECTION 3 . ZONING DISTRICT MAP . PART 20.



ADJACENT LAND USE

SCALE: N.T.S.



PART OF ZONING DISTRICT MAP(S): 19, 20

SCALE: N.T.S.

SCHEDULE '2'

2. KEY MAP SHOWING LOCATION OF LANDS TO WHICH BY-LAW 10221 APPLIES

LANDS AFFECTED

NORTH

NOTE: THE INFORMATION RESPECTING EXISTING ZONING DESCRIBED ON SCHEDULE '2' IS PROVIDED AS A GUIDE AND SHOULD NOT BE CONSIDERED AS OFFICIAL.

DATE: FEB. 1990

AGENDA

JULY 18, 1996

TWIN OAKS INDUSTRIAL PARK

E.A. PROCESS

PLANNING ISSUES SESSION

ROOM 301, CITY HALL, 1:30 PM

1. PURPOSE

   An Environmental Assessment Process is required prior to the construction of services in the Twin Oaks Industrial Park. As part of that process, it is appropriate to review the current zoning of the property to discuss what implications it would have and if it should be changed and what input should be sought. This session is intended to be a brainstorming session to bring all the issues to light.

2. CURRENT M 2.15 - ATTACHED

   - Appropriateness
   - Affects Beyond Twin Oaks - Pros and Cons

3. WHAT USES WOULD BE APPROPRIATE?

4. WHAT RESTRICTIONS SHOULD BE AMENDED/REMOVED

5. MARKET TO BE TARGETTED

6. OTHER

CITY OF WINDSOR

TWIN OAKS INDUSTRIAL PARK

MINUTES OF MEETING

HELD ON THURSDAY, JULY 18, 1996 AT 1:30 P.M.

AT CITY HALL, ROOM 301

The meeting was held to review the current zoning of the site and to determine if the zoning revisions will be required to meet the goals of the development.

In attendance were the following:

Mario Sonego	-	City of Windsor
Doug Caruso	-	City of Windsor
Wira Deshield	-	City of Windsor
Jim Yanshula	-	City of Windsor
Paul Bondy	-	Windsor-Essex County Development Commission
Harold Horneck	-	LaFontaine, Cowie, Buratto & Associates Limited
Don Joudrey	-	LaFontaine, Cowie, Buratto & Associates Limited

A number of questions were raised regarding hard servicing requirements, development density and lot sizes.

The current zoning for the site allows a minimum lot size of 3000 m^2 (0.75 acres).

From previous discussions, it was generally agreed that lot sizing should be left as flexible as possible to accommodate market demands and it was noted there may be a market preference for some lots as small as 2000 m^2 (0.5 acres) in size. If this is the case, the zoning would have to be revised to allow ½ acre lots. As well, issues such as setbacks and architectural requirement will need to be addressed. It was noted that a lot depth of up to 1000 feet may be required along the railway right-of-way if lots are to be serviced with rail spur lines.

Land use within the site was discussed with respect to designating certain areas for financial, mechanical and like services to meet the needs of the overall industrial park.

It was agreed rezoning will be initiated only after a preferred road pattern is selected and minimum lot sizes finalized.

Other concerns discussed included traffic (amount, safety) economics, lotting (wasted space) and existing hard servicing.

Permitted uses that may not be appropriate for an industrial park were also discussed. These will be considered further in any rezoning.

Those in attendance were identified as on-going members of the Study Team for this project. Others on the Team will include Parks and Recreation and Essex Region Conservation Authority.

If there are any errors or omissions to these minutes, please notify our office.

LaFONTAINE, COWIE, BURATTO
& ASSOCIATES LIMITED

per: Don Joudrey
Don Joudrey, P. Eng.

DJ/lw