ROSEMARY HEIGHTS CENTRAL

NEIGHBOURHOOD CONCEPT PLAN

CITY OF SURREY

PLANNING & DEVELOPMENT DEPARTMENT

SURREY
CITY OF PARKS

ROSEMARY HEIGHTS CENTRAL

NEIGHBOURHOOD CONCEPT PLAN

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ROSEMARY HEIGHTS CENTRAL NEIGHBOURHOOD CONCEPT PLAN (NCP)

This Neighbourhood Concept Plan (NCP) was prepared by Urban Systems Ltd. for the City of Surrey and the property owners of Rosemary Heights. Please note that the Neighbourhood Concept Plan may be subject to minor amendments from time to time.

AMENDMENTS TO ROSEMARY HEIGHTS CENTRAL NEIGHBOURHOOD CONCEPT PLAN (NCP)

CORPORATE REPORT #	FILE #	COUNCIL APPROVAL DATE	APPROVED AMENDMENT
R1725	2350-007/2	12/14/98	The clause "No vinyl siding will be permitted as exterior cladding material" was added as a separate clause # .4.
Planning Report	7995-0156-00	12/14/98	Portion of 156A Street between 36 Avenue and 40 Avenue is realigned approximately 45 to 75 metres to the east from its previous location.

Item No. C328 Rosemary Heights Central Neighbourhood Concept Plan (NCP) - Stage 2 - Final Report
File: 2350-007/2

It was

Moved by Councillor McKinnon
Seconded by Councillor Huot
That Council:

1. Approve the final and complete Neighbourhood Concept Plan (NCP) for Rosemary Heights (Central Neighbourhood) (Appendix I);

2. Approve the arrangements, terms and conditions specified in the NCP (Appendix I) as a means of managing the development and general provision of services, amenities and facilities for this new neighbourhood;

3. Amend the Local Area Plan (LAP) for the Rosemary Heights (Central Neighbourhood) to reflect the recommendations contained in the NCP;

4. Authorize staff to draft the following by-laws to implement the provisions of the NCP:

   a. a by-law to adopt the Rosemary Heights (Central Neighbourhood) NCP as an Official Community Plan;
   b. an amendment to Zoning By-law, 1993, No. 12000, as amended, to enact the approved bonus density provision for Rosemary Heights (Central Neighbourhood) NCP area; and
   c. an amendment to the City of Surrey Land Use and Development Application Fees Imposition By-law, 1993, No. 11631, as amended to authorize the payment of additional application fees to recover the costs of preparing the Rosemary Heights (Central Neighbourhood) NCP.

RES.96-3273

Carried

Item No. C328.1 Rosemary Heights Neighbourhood Concept Plan - East of 152 Street
File: 2350-007/2

It was

Moved by Councillor McKinnon
Seconded by Councillor Huot
That Council approve the Stage 2 report subject to the following:

1. That financing of the NCP infrastructure will be provided by the developers with no funds being provided by the City other than Development Cost Charges received from the NCP.

2. That developments follow the servicing and road layouts, as proposed in the Stage 2 report or as revised to meet with the City's approval.

3. Council include the proposed new items in the revised 10 Year Servicing Plan to be completed in the first quarter of 1997.

4. Council authorize staff to pursue transit needs of this plan with B.C. Transit.

5. All developments must comply with all City By-laws, Standards, Specifications and Policies.

6. Final approval from the Department of Fisheries & Oceans and the Ministry of Environment.

RES.96-3274 Carried

Surrey Heritage Advisory Committee
Interurban Rail Revitalization Process
File: 0525-001

It was Moved by Councillor McKinnon
Seconded by Councillor Robinson
That the report be received and the request approved as follows:

1. Council undertaking that if the funds are deposited with the City, they will only be used for a rail revitalization feasibility assessment through the Heritage Advisory Committee.

2. Support for the project.

With the Heritage Advisory Committee to:

1. Seek support from other Heritage Commissions in the Fraser Valley.

2. Seek support from regional, provincial and national entities, including rail enthusiasts.

3. Convene a steering group (for which Council may want to have staff representation) including participants from other interested entities.

4. Call for expressions of interest from potential consultants.

5. Issue a limited request for proposals based on the expressions of interest.

CITY OF SURREY

Central Rosemary Heights Neighbourhood Concept Plan

Stage Two Plan

URBAN SYSTEMS

October, 1996
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CONTENTS

APPENDICES

FIGURES

1. Introduction

1.1 Overview

In July 1994, Surrey City Council approved the Rosemary Heights Local Area Plan (LAP), which proposed a number of Official Community Plan (OCP) amendments to allow urban land uses in the Rosemary Heights area. The LAP also established proposed land uses, a transportation and roads concept and broad servicing concepts for the provision of water, sanitary sewer and storm drainage within Rosemary Heights.

Subsequently, property owners within the Rosemary Heights Central Neighbourhood (a sub-unit within the LAP area) requested that a Neighbourhood Concept Plan (NCP) be prepared to refine the LAP as it applies to the Rosemary Heights Central neighbourhood.

The NCP for the Rosemary Heights Central Neighbourhood has been developed in two stages. The first stage of the NCP was directed at establishing consensus on a physical plan for the neighbourhood. The Stage 1 Report which described the physical plan addressed land use and densities, identified land for school, parks and open space, established the proposed road system including the hierarchy of roads and presented broad servicing concepts. The Stage I NCP Report was approved by Council on April 29, 1996.

Following the adoption of the Stage I Report by Council, work commenced on the second stage of the NCP planning process. This stage of the process provided more detailed servicing concepts, the recommended phasing of development in the neighbourhood, design guidelines as well as a financial strategy for the provision of services, amenities and neighbourhood facilities.

The plan conforms to the principles of the LAP and is the product of a lengthy consultation process involving the Steering Committee, representatives of various City departments, Provincial and Federal Government agencies and the residents of the neighbourhood.

This document contains a consolidation of both the Stage 1 and Stage 2 reports and provides a comprehensive NCP for the Rosemary Heights Central neighbourhood.

A Background Report which summarizes much of the background information, data and analysis used in the preparation of the NCP has been submitted to the City under separate cover.

1.2 Relationship of NCP to LAP

In preparing the Rosemary Heights Central Neighbourhood Concept Plan (NCP) various considerations were taken into account including:

- Principles, objectives and policies of the Local Area Plan (LAP) for the Rosemary Heights area as adopted by Council in July 1994;
- Other plans and studies carried out by the City of Surrey subsequent to the adoption of the Local Area Plan including:
  - Major Road Network Plan;
  - Morgan Creek Master Drainage Plan; and
  - Elgin Master Drainage Plan.
- Public input received during the course of the planning process through open houses and public meetings;
- Direction received from the NCP Steering Committee;
- More detailed technical analysis relating to the provision of municipal services, public facilities and transportation facilities.

Each of these considerations are discussed in detail in this plan.

1.2.1 Local Area Plan

The Rosemary Heights Central Neighbourhood Concept Plan (NCP) is based on the Rosemary Heights Local Area Plan (LAP) adopted by Council in July 1994. Council's intention is that the NCP should refine the LAP, and not introduce new concepts or significantly alter land uses and densities established in the LAP.

Important planning principles established by LAP include the following:

1. To provide a variety of housing types ranging from low to high densities to meet the diverse needs and lifestyles of future residents and to achieve a balanced and integrated social structure.

2. To create an identifiable community with neighbourhoods that have well-defined boundaries, structure, form and character.

3. To maximize the amount of green space and retention of existing trees and natural environment.

4. To ensure the road system complements the integrity of the community and discourages intrusions.

5. To provide for community facilities, schools and parks which are appropriate to serve all area residents.

6. To discourage family oriented housing west of 152nd Street to reduce the need for children crossing 152nd Street to go to school.

7. To establish a network of walking and cycling trails which link destination points including the Nicomekl River and the village centre, and decrease the dependence on automobiles within the community.

This NCP is consistent with the principles established in the LAP.

1.2.2 Planning Issues Arising from the LAP

Implementation of the LAP has required various issues to be addressed in preparing the NCP. These issues were identified through additional technical analysis, input of the NCP Steering Committee and comments of property owners within the neighbourhood. These issues are as follows:

- Location of the proposed neighbourhood commercial centre illustrated in the LAP has been questioned for a number of reasons:

  - it is proposed in an area which contains important stands of trees;
  - it is located close to the proposed western elementary school; and
  - while it is located in the geographical centre of the neighbourhood, it is not located in the area of highest residential densities.

- The proposed road system illustrated in the LAP has been questioned in view of the Major Road Network Plan. The ring road provides for circuitous access to and from arterial roads (32nd Avenue, 152nd Street) and concentrates traffic at a number of intersections. There is some support for providing more direct access from the neighbourhood to 32nd Avenue and 152nd Street, while ensuring commuter traffic from outside the neighbourhood does not use roads within the neighbourhood as an alternative to the arterial roads.

- The road system proposed in the LAP results in fragmentation of a number of properties resulting in limited or no development potential for these properties. In some cases, it would have been necessary for developers to purchase entire properties to secure necessary road allowances for limited collector roads.

- School District (SD) #36 has not been successful in acquiring school sites shown in the LAP. For the proposed western elementary school, SD #36 has acquired a property fronting 36th Avenue which was not designated for school use in the LAP. If the site acquired by the SD #36 is used for school purposes, adjustments must be made to the land uses proposed in the LAP. The proposed eastern school site illustrated in the LAP does not have sufficient area to accommodate an elementary school.

- Results of the environmental analysis carried out in preparing this NCP have been incorporated into the plan. Key environmental features found in the plan area include the Nicomekl River riparian forest as well as upland forest areas and forest which is contiguous with the riparian forest. Adjustments to the land use plan set out in the LAP are required to reflect the environmental analysis.

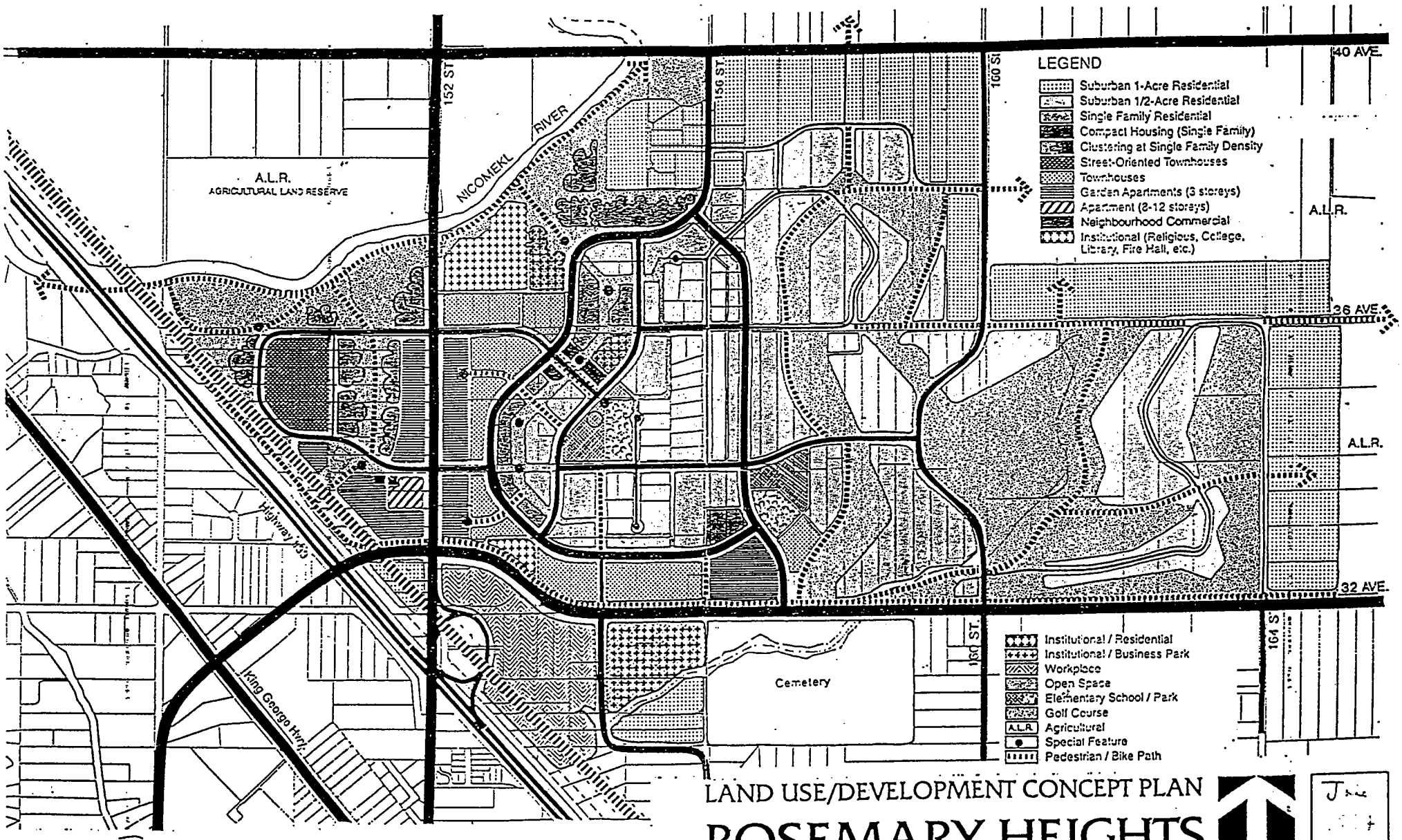
1.2.3 Refinements to LAP

In response to the issues arising from the LAP, various refinements to the road system, land uses and public facilities are proposed in this NCP. The LAP is illustrated in Figure 1.1. The proposed NCP land use plan is illustrated in Figure 1.2. These refinements are summarized in the following sections and described in detail in the following chapters of the plan.

.1 Road System

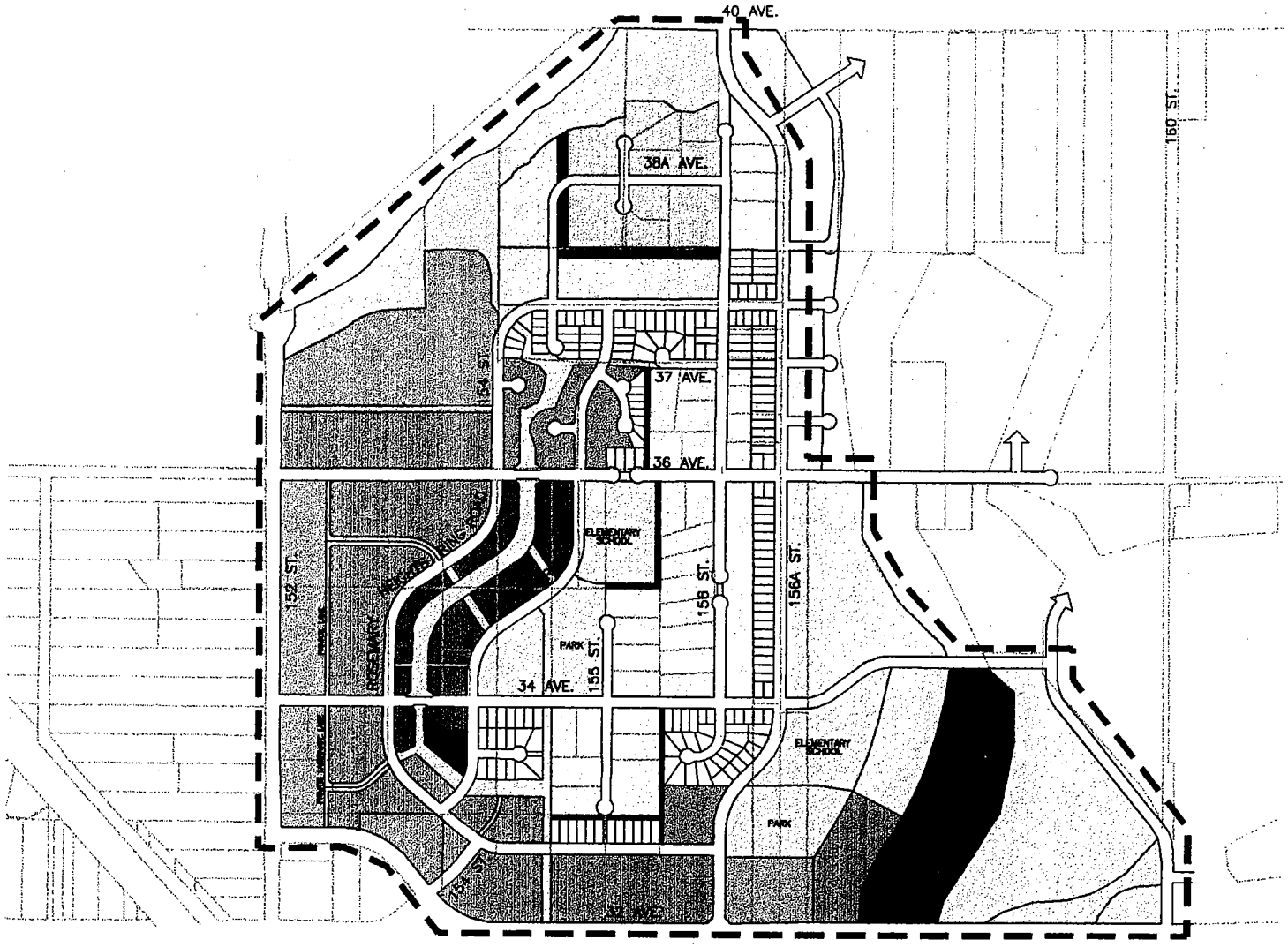
Four overall refinements to the Rosemary Heights Central road system are proposed in the NCP to improve the road system previously described in the LAP. These refinements are further described in Section 4.4 and include the following:

- Realignment of the proposed collector road lying east of 156th Street (named 156A Street for planning purposes), between 36th Avenue and 40th Avenue and south of 34th Avenue;
- Realignment of the Rosemary Ring Road in the northern portion of the neighbourhood;
- Retention of the present alignment of 36th Avenue provided that 36th Avenue is not proposed as a through road to avoid traffic impacts on residential properties;
- Retention of the present alignment of 34th Avenue rather than closing a section between the ring roads as proposed in the LAP; and,
- Implementation of traffic calming techniques to manage traffic within the neighbourhood with specific applications on 34th Avenue.



Rosemary Heights Local Area Plan

Figure 1.1



ROSEMARY HEIGHTS

NEIGHBOURHOOD CONCEPT PLAN

FIGURE 1.2.

- SUBURBAN 1 ACRE RESIDENTIAL
- SUBURBAN 1/2 ACRE RESIDENTIAL
- SINGLE FAMILY RESIDENTIAL
- COMPACT SINGLE FAMILY RESIDENTIAL
- CLUSTERING AT SINGLE FAMILY DENSITY
- COMPACT SINGLE FAMILY/CLUSTER
- TOWNHOUSES
- GARDEN APARTMENTS (3-STOREYS)
- NEIGHBOURHOOD COMMERCIAL
- INSTITUTIONAL (RELIGIOUS, COLLEGE, LIBRARY, FIRE HALL, ETC.)
- INSTITUTIONAL RESIDENTIAL
- BUFFER
- PARK / OPEN SPACE
- ELEMENTARY SCHOOL
- GOLF COURSE

URBAN SYSTEMS

DATE: OCTOBER 1990 JOB No. 610721.1

These road system refined are proposed in order to achieve the following objectives:

- Distribute traffic more evenly across the neighbourhood road network thereby allowing arterials to function more efficiently;
- Reduce traffic volumes on the ring roads;
- Reduce the number of intersections and complicated turning movements; and,
- Reduce the impacts on existing properties and allow a more efficient use of land designated for urban and suburban uses.

.2 Land Uses

The following refinements to the land uses established in the LAP are proposed in this NCP:

Neighbourhood Commercial Centre

In the LAP, a Neighbourhood Commercial Centre is proposed near 36th Avenue between the ring roads, as shown in Figure 1.1.

This NCP proposes relocation of the Neighbourhood Commercial Centre to a location along 34th Avenue between the proposed ring roads, as shown in Figure 1.2, to achieve the following objectives:

- To allow for the protection of portions of the Upland Forest which would otherwise be destroyed if the Neighbourhood Commercial Centre was located near 36th Avenue as proposed in the LAP;
- To provide for greater separation between the Neighbourhood Commercial Centre and the NCP proposed western elementary school (located on property largely owned by School District #36); and
- To locate the Neighbourhood Commercial Centre within the area where the highest residential densities will occur to provide excellent market support and greater pedestrian access to the centre.

Public Facilities

In keeping with the LAP, the NCP proposes two elementary schools within the Rosemary Heights Central neighbourhood, consistent with requirements of School District #36 (SD #36). Since SD #36 has had difficulty in acquiring the LAP proposed western elementary school site, they have purchased property along 36th Avenue as an alternative school location.

In addition, the alternative western elementary school site as well as the LAP proposed eastern elementary school site do not have enough area to accommodate the facility requirements of SD#36.

For these reasons, the following refinements to the LAP school sites are proposed in this NCP:

- Relocate the LAP proposed western elementary school from 34th Avenue to a site purchased by SD #36 along 36th Avenue;
- Acquire a portion of the property west of the LAP proposed western park site, to increase the size of the integrated western school/park site to meet facility requirements of SD #36 and the Parks & Recreation Department; and
- Increase the size of the eastern elementary school/park site by shifting the curve of the proposed realigned 156A Street to the west, to meet facility requirements of SD #36 and the Parks & Recreation Department.

Residential Uses

To accommodate the road system and public facility refinements noted above, the following refinements to the residential land uses proposed in the LAP are proposed in this NCP (as illustrated in Figure 1.2):

- Area designated for Neighbourhood Commercial Centre in the LAP is redesignated for Compact and Cluster Single Family Density, since the Neighbourhood Commercial Centre is relocated to 34th Avenue. Compact and Cluster Single Family Residential better allows for the retention of existing Upland Forest south of 36th Avenue, between the ring roads;

- Institutional Residential site illustrated near 36th Avenue and the Inner Ring Road in the LAP is relocated closer to the 34th Avenue Neighbourhood Commercial Centre;
- Proposed residential uses flanking the southern portion of proposed linear park between 34th Avenue and 36th Avenue are largely designated for Compact and Cluster Single Family Residential to allow units to front onto the ring roads and the linear park;
- Area designated by the LAP for the western elementary school is redesignated for Cluster Housing (at Single Family Density), to provide a transition of housing types between higher density housing and the proposed western park; and
- Minor refinements to the size and shape of various residential areas established in the LAP are incorporated to accommodate the realignment of the proposed 156A Street collector road (east of 156th Street).

1.3 Process Followed in Preparing NCP

In preparing the Rosemary Heights Central Neighbourhood Concept Plan (NCP) an interactive planning process involving the City of Surrey, an NCP Steering Committee, key stakeholders, property owners and the general public was undertaken.

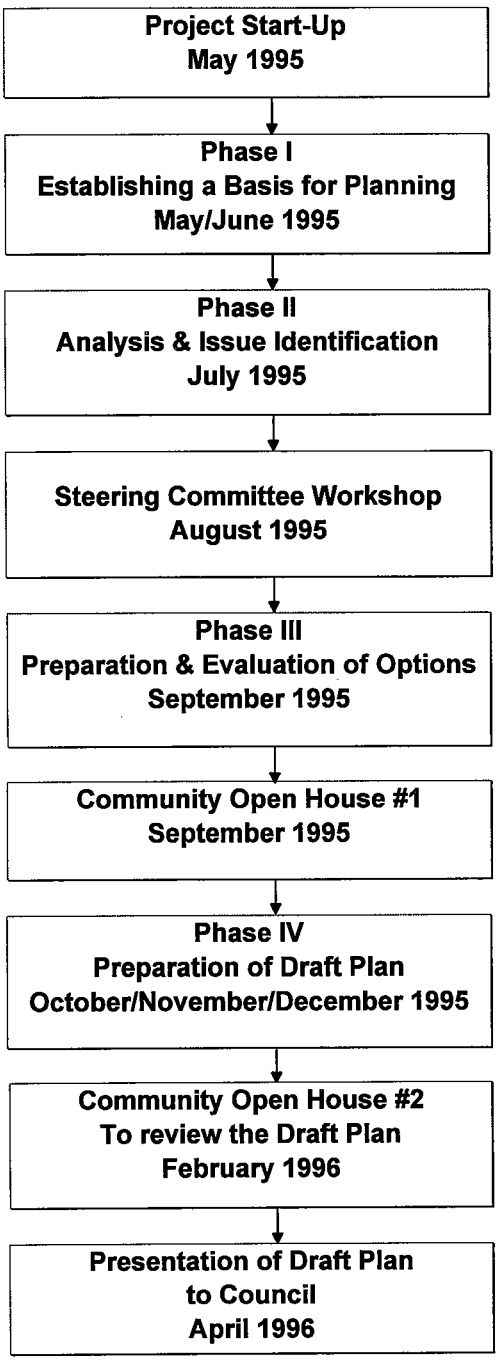
As a result of this process, important issues relating to implementation of the LAP have been identified. These issues were noted in the previous section and form the basis for preparation of the NCP.

The planning process which was followed in preparing this NCP is summarized in Figure 1.3. The process involved two stages. The first stage was directed at the establishment of a land use concept plan, including the density of development, identification of land for public facilities, establishment of the road system and broad servicing concepts.

During the second stage of the planning process more detailed servicing concepts were identified, the staging of development was established, a financial strategy was identified and design guidelines were prepared.

Planning Process

Stage 1



Stage 2
(See following page)

Figure 1.3

Planning Process

Stage 2

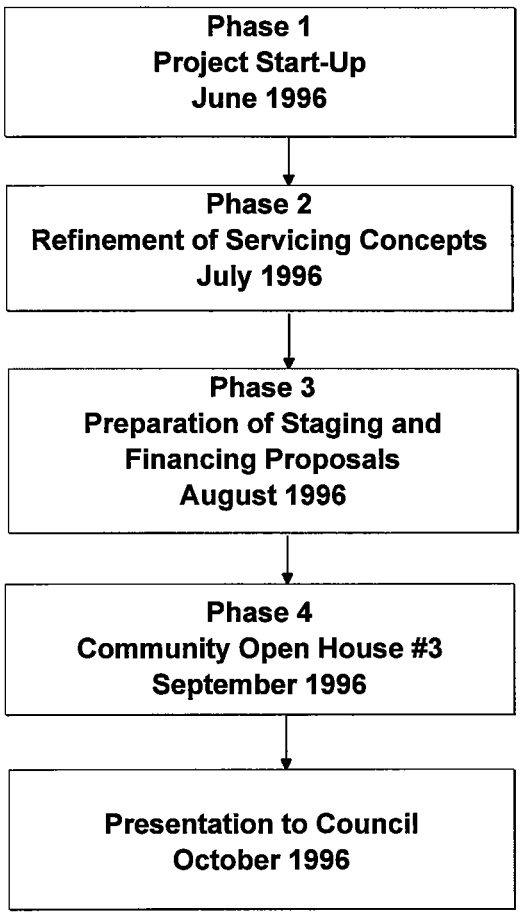


Figure 1.3

1.3.1 City of Surrey

Throughout the course of the NCP study, staff from the City's Planning and Development Services and Engineering Departments have provided ongoing input and review of technical analysis and plan options.

Staff from each of these departments have actively participated in NCP Steering Committee meetings, workshops and a public open houses. They have also facilitated coordination between this study and other NCP processes occurring within the vicinity of the NCP area.

1.3.2 NCP Steering Committee

As part of the NCP planning process, an NCP Steering Committee was established in the spring 1995. This Steering Committee consists of property owners from within the NCP area. It was the responsibility of the Steering Committee to raise issues and concerns on behalf of property owners.

The Steering Committee met on a regular basis (throughout the process) to review background information, identify issues, provide input on options and comment on drafts of various reports.

Throughout the NCP planning process, City of Surrey staff and representatives from the consulting team attended Steering Committee meetings to present background information, planning concepts, options, LAP refinements and various drafts of this NCP.

At the direction of the NCP Steering Committee and City of Surrey staff, the proposed NCP was presented to the public at three open houses during the two stage planning process.

1.3.3 Stakeholders

In addition to ongoing consultation with the NCP Steering Committee and staff from the City's Planning and Development Services and Engineering Departments, the concerns of various stakeholders have also been addressed in preparing this NCP. Stakeholders were contacted on an individual basis by means of meetings and interviews to solicit their input

regarding future development within the Rosemary Heights Central neighbourhood.

The following stakeholders contributed to this planning process:

- Surrey School District #36;
- Surrey Parks & Recreation Department;
- Surrey RCMP;
- Surrey Fire Department;
- Surrey Dyking District;
- Surrey Logging Ditch Improvement District;
- BC Transit;
- BC Ministry of Transportation and Highways;
- BC Ministry of Environment (Lands and Parks);
- Federal Department of Fisheries and Oceans;
- BC Hydro and Power Authority;
- BC Telephone Company;
- BC Gas;
- Consulting team preparing Rosemary Heights West NCP;
- Consulting team preparing Morgan Creek Master Drainage Plan; and
- Consulting team preparing the Elgin Master Drainage Plan.

Comments and issues raised by these stakeholders are documented in the Background Report which was submitted to the City under separate cover.

1.3.4 Property Owners

Interviews were held with residents and property owners over a two week period in May, 1995 to:

- record the development plans of individual property owners;
- identify issues relating to the LAP; and
- identify the specific objectives of property owners and residents for the future of their neighbourhood.

In total some 35 interviews were held. The results of these interviews are documented in the Background Report.

1.3.5 General Public

Three public open houses were held in the course of the planning process. On September 13, 1995, a public open house was held to present background information and the NCP options to the general public. Representatives from the NCP Steering Committee, the City of Surrey and the planning consulting team were on hand to assist the public with their inquiries. A second public open house was held on February 8, 1996 to present the draft Stage 1 Report to the public. A third public open house was held to present the draft Stage 2 Report on September 17, 1996.

.1 Open House Questionnaire – September 13, 1995

At the Open House held on September 13, 1995, an exit survey was carried out to solicit the public's views on the proposed refinements to the LAP and on NCP options. A copy of the survey questionnaire is shown in Figure 1.4.

Out of a total of 82 people who attended the open house, 52 submitted questionnaires.

Questionnaire results are summarized in Figure 1.5. A review of these questionnaire results yields the following information regarding proposed refinements to the LAP:

Road System Refinements

- Majority of the respondents supported the realignment of both the northern and southern portions of the proposed 156A Street;
- Approximately half of the respondents supported the opening of 34th Avenue for automobile traffic, between the ring roads;
- Approximately half of the respondents supported the opening of 36th Avenue for automobile traffic, between the ring roads;
- Approximately half of the respondents supported the idea of closing 34th Avenue to automobile traffic, between the ring roads and using this space for pedestrians only; and,
- The majority of the respondents supported the realignment of the intersection of the ring road and the proposed 156A Street, to reduce impacts on properties.

Figure 1.4

Rosemary Heights Central NCP

Public Open House - September 13, 1995
Community Questionnaire

The purpose of this Open House is to present background information collected throughout the Neighbourhood Concept Plan (NCP) process, identify key issues which will guide NCP options and display NCP options which address the issues and refine the Local Area Plan (LAP) for the Rosemary Heights Central neighbourhood.

In order to solicit public input, this community questionnaire has been prepared to provide you with the opportunity to express your opinions regarding the issues and conceptual NCP options. Your comments and feedback are important to the NCP Steering Committee in which case we encourage you to complete the questionnaire and submit it in the box near the exit of the auditorium.

1. Do you believe the background information presented provides a sound basis for generating NCP options ? (Please circle appropriate answer).

   a) Yes b) No

2. Are there any gaps in the information or issues which you feel should be further investigated ?

   _____
   _____
   _____

3. A number of conceptual options have been presented at this Open House. These options strive to implement the Local Area Plan for the Rosemary Heights Central neighbourhood. Please indicate which of the options you support and why, by circling the appropriate option(s).

   a) Option 1A
   b) Option 1B
   c) Option 2A
   d) Option 2B
   e) Option 2C

   Reasons why: _____
   _____
   _____
   _____
   _____

4. Options 2A, 2B and 2C propose a number of refinements to the Local Area Plan which address issues raised throughout the NCP process. Please indicate which of these refinements you support with a tick.

	Road System Refinements	Support	Do Not Support
a)	Realignment of the northern portion of the proposed 156A Street, as shown in Options 2A, 2B and 2C.	( )	( )
b)	Realignment of the southern portion of the proposed 156A Street, as shown in Options 2A, 2B and 2C.	( )	( )
c)	Opening 36th Avenue between the ring roads for automobile traffic, as shown in Options 2A and 2C.	( )	( )

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	Road System Refinements (Continued)	Support	Do Not Support
d)	Opening 34th Avenue between the ring roads for automobile traffic, as shown in Options 2A and 2C.	( )	( )
e)	Closing the portion of the 34th Avenue right-of-way between the ring roads from automobile traffic and using this space for pedestrians only, as shown in Option 2B.	( )	( )
f)	Re-aligning the intersection of the ring road and the proposed 156A Street to reduce impacts on properties, as shown in Options 2A, 2B and 2C.	( )	( )
	Neighbourhood Commercial Centre Location		
f)	Locating a neighbourhood commercial centre on each side of 34th Avenue between the ring roads, as shown in Options 2A and 2C.	( )	( )
g)	Locating a neighbourhood commercial centre on each side of a pedestrian oriented 34th Avenue between the ring roads, as shown in Option 2B.	( )	( )
	Western Elementary School Location		
h)	Locating an elementary school near the intersection of the inner ring road and 36th Avenue, as shown in Options 2A and 2C.	( )	( )
i)	Locating an elementary school near the intersection of the inner ring road and 34th Avenue, as shown in Option 2B.	( )	( )

5. Please provide any additional comments you may have regarding the options, or any additional concepts you feel should be considered.

*** Please submit your completed questionnaire in the box near the exit before you leave. Thank you !

Figure 1.5

Rosemary Heights Central - Neighbourhood Concept Plan

Community Open House
Summary of Questionnaire Results

September 13, 1995
(52 Questionaires completed)

Question	Support		Do Not Support		No Answer	
	#	% of Total	#	% of Total	#	% of Total
Do you believe the background information presented provides a sound basis for generating NCP options ?	46	88%	4	8%	2	4%
Road System Refinements						
Realignment of the northern portion of the proposed 156A Street, as shown in Options 2A, 2B and 2C.	40	77%	9	17%	3	6%
Realignment of the southern portion of the proposed 156A Street, as shown in Options 2A, 2B and 2C.	41	79%	7	13%	4	8%
Opening 36th Avenue between the ring roads for automobile traffic, as shown in Options 2A and 2C.	26	50%	21	40%	5	10%
Opening 34th Avenue between the ring roads for automobile traffic, as shown in Options 2A and 2C.	27	52%	23	44%	2	4%
Closing the portion of 34th Avenue right-of-way between the ring roads from automobile traffic and using this space for pedestrians only, as shown in Option 2B.	26	50%	24	46%	1	2%
Re-aligning the intersection of the ring road and the proposed 156A Street to reduce impacts on properties, as shown in Options 2A, 2B and 2C.	43	83%	7	13%	2	4%
Neighbourhood Commercial Centre Location						
Locating a neighbourhood commercial centre on each side of 34th Avenue between the ring roads, as shown in Options 2A and 2C.	32	62%	16	31%	4	8%
Locating a neighbourhood commercial centre on each side of a pedestrian oriented 34th Avenue between the ring roads, as shown in Option 2B.	23	44%	23	44%	6	12%
Western Elementary School Location						
Locating an elementary school near the intersection of the inner ring road and 36th Avenue, as shown in Options 2A and 2C.	38	73%	9	17%	5	10%
Locating an elementary school near the intersection of the inner ring road and 34th Avenue, as shown in Option 2B.	11	21%	34	65%	7	13%

The Options

Option	1A	1B	2A	2B	2C	No Resp.
Indicate which of the option.s you support (can provide more than one response if necessary).	10%	15%	35%	15%	33%	12%

The owner of property located on the southeast corner of 156th Street and 40th Avenue expressed concerns regarding the proposed 156A Street, and believes this street should not provide an easy through route between 32nd and 40th Avenues.

Neighbourhood Commercial Centre

- Almost two-thirds of the respondents supported locating a neighbourhood commercial centre on each side of an automobile accessible 34th Avenue between the ring roads; and,
- Approximately 44% of the respondents supported locating a neighbourhood commercial centre on each side of a pedestrian oriented 34th Avenue between the ring roads.

Western Elementary School Location

- The majority of the respondents supported locating the elementary school near the intersection of the Inner Ring Road and 36th Avenue; and,
- Approximately 20% of the respondents supported locating an elementary school near the intersection of the Inner Ring Road and 34th Avenue.

NCP Options Presented at the Open House

At the open house, five NCP options were presented. Two of these options (Options 1A and 1B) were close representations of the LAP with minor revisions to illustrate how local roads could be implemented. The difference between the two options was the location of the western elementary school. As illustrated in Figure 1.4, approximately 10% of the questionnaire respondents supported Option 1A and 15% supported Option 1B.

Three NCP options (Options 2A, 2B and 2C), based on the revised road system refinements noted in earlier sections of this plan, were also presented at the open house. The difference between these options related to the location of the western elementary school and whether a portion of 34th Avenue between the ring roads would remain open or closed to automobile traffic.

Approximately 68% of the respondents supported Options 2A and 2C, which locate the western elementary school along 36th Avenue. Only 15% supported Option 2B which locates the western elementary school on 34th Avenue. More respondents preferred Option 2A (which proposes 34th Avenue remain open to automobile traffic between the ring roads) over Option 2C (which closes this portion of 34th Avenue from automobile traffic).

On the basis of these results, the NCP Steering Committee, City of Surrey staff and the planning consulting team selected a preferred option, which forms the basis for preparing this NCP.

.2 Open House Questionnaire – February 8, 1996

A second open house was held on February 8, 1996 to provide the public an opportunity to review the draft NCP. A total of 89 property owners or residents signed the attendance sheet and 565 questionnaires were completed and returned.

Approximately 80% of the public submitting a questionnaire supported the plan, with approximately one quarter of the respondents wishing to see minor modifications to the draft plan. Approximately 20% did not support the plan because of traffic or road issues, the use of buffers or that densities were either too high or too low.

.3 Open House – September 17, 1996

A third open house was held on September 17, 1996 to allow property owners in the plan area to review the draft Stage 2 Report. Some 76 property owners signed in and 45 completed exit surveys were received. There was general support for the Stage 2 Report:

- 74% of respondents to the exit survey supported the servicing concepts. The support would have been significantly higher as many respondents who did not support the servicing concepts objected to 36th Avenue being a through street. Council has, since the open house, decided to close 36th Avenue to through traffic in the future.

- 75% of respondents agreed with the staging of development proposed in the Stage 2 Report.
- 84% of respondents agreed with the financing strategy set out in the report.

2. Description of the Plan

This section provides a detailed description of the various land uses proposed by this NCP and summarizes the implications associated with these land uses. Objectives and policies are presented for each land use.

Objectives and policies are also presented for the protection of environmentally sensitive areas in the context of urban development.

As well, objectives for the provision of the following municipal services are presented in order to service the land uses (and development) proposed in this NCP:

- Transportation and Mobility System
  - Road System
  - Traffic Management
  - Public Transit
  - Pedestrian/Bicycle Facilities; and,

- Infrastructure Services
  - Storm Drainage
  - Sanitary Sewer
  - Water Supply & Distribution
  - Utilities.

A more detailed discussion of servicing and transportation strategies is contained in Section 4 of this plan.

2.1 Environmental Protection

The Rosemary Heights Central neighbourhood contains several areas that demonstrate environmental sensitivity to development.

- High sensitivity areas include the riparian forest of the Nicomekl River and a portion of the mixed upland forest (coniferous and deciduous trees) which is contiguous with the riparian forest;

- Medium sensitivity areas include ephemeral creeks and their associated riparian habitats, mixed upland and early seral deciduous forest within the central and southern portions of the study area. These areas are known to accommodate raptor and active primary cavity nest sites or are used by blacktail deer.

Figure 2.1 shows the extent of high and medium sensitivity areas within the neighbourhood and establishes the location of the top-of-bank for the Nicomekl River. A comprehensive biophysical assessment of the plan area is contained within the Background Report.

Objectives

The broad environmental objectives are as follows:

- To protect environmentally sensitive areas within the neighbourhood;

- To maintain the functional capacity of environmentally sensitive areas for fish and wildlife; and

- To preserve and protect the riparian forest along the Nicomekl River.

Policies and Guidelines

The following policies and guidelines are established to protect the environmental resources sustained within the neighbourhood.

- The riparian forest located between the natural boundary of the Nicomekl River and the landward extent of the environmental setback (ie. the setback beyond the top-of-bank) is to be preserved as natural

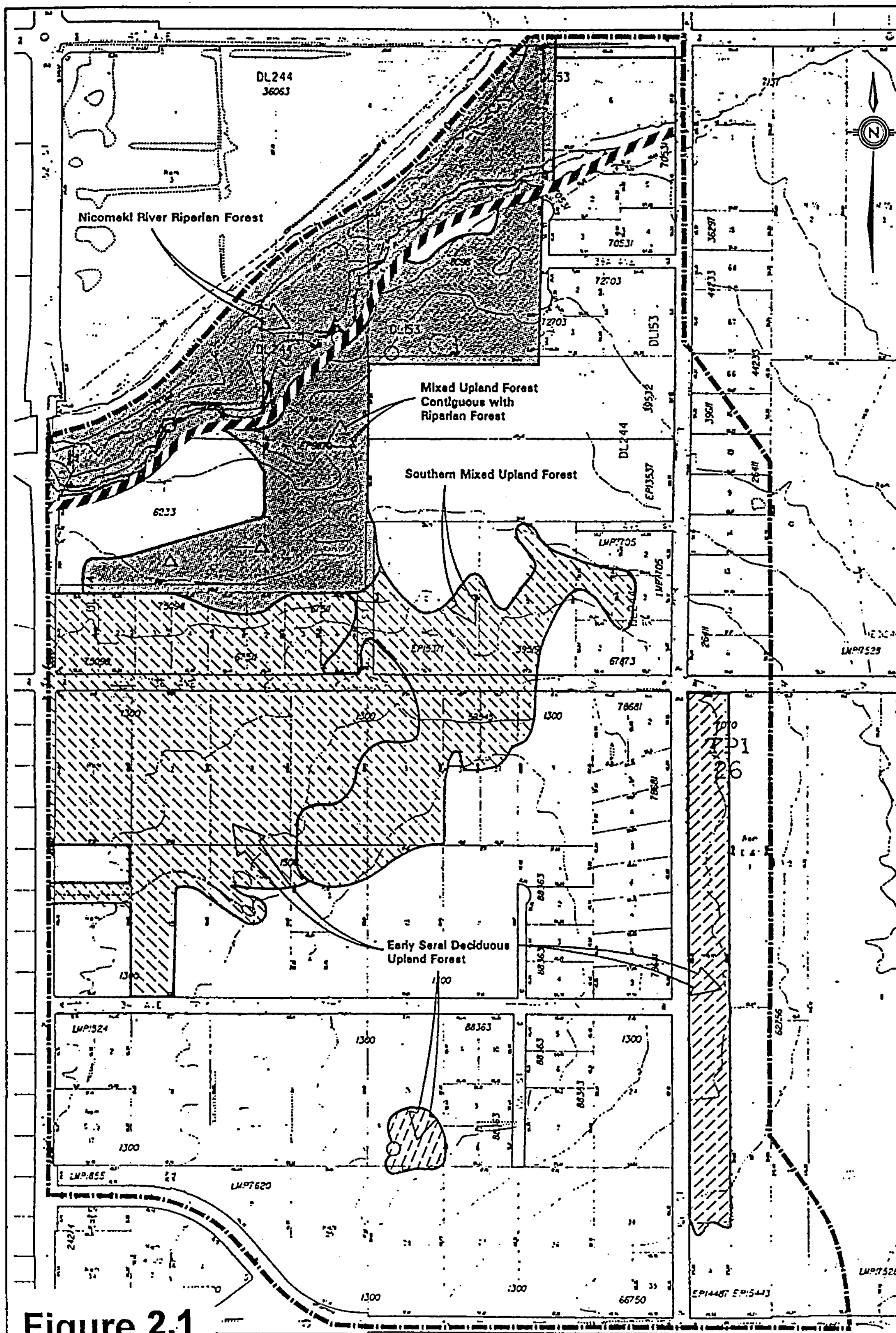


Figure 2.1

Legend

- High Sensitivity
- Medium Sensitivity
- Low Sensitivity
- △ Raptor Nest
- ○ Primary Cavity Nest

* riparian forest designation shown incorporates 15 metre setback from top of bank

▰▰ = Top-of-Bank

Nicomekl River Riparian Forest

The riparian forest found within the study area is a remnant of a forest community that once dominated [illegible] floodplains and adjacent uplands within the lower Fraser River valley. Only a small portion of the riparian forest that once existed along the Nicomekl River now remains; much of the original forest has been converted to agricultural fields. The riparian forest within Rosemary Heights represents approximately 53 percent of the riparian forest that now remains along the lower Nicomekl River. Approximately 94 percent of native riparian vegetation along the lower Nicomekl River below 192nd Avenue has been lost due to agricultural or urban development. At 840 metres in length, the riparian forest encompassed by the study area is the longest stretch of undisturbed and unditched riparian forest of the lower Nicomekl River. It represents an important ecological feature within both the study area and the Serpentine-Nicomekl lowlands.

Mixed Upland Forest Contiguous with Riparian Forest

Large stands of mature mixed forest within large urban centres such as Surrey are a rare landscape feature. Approximately 24 percent of the Rosemary Heights Central Neighbourhood is forested. Riparian forest comprises 5.75 percent of the study area, whereas 18.18 percent is composed of upland mixed forest. Forest stands that are large and have a high level of variation in habitat composition have the greatest habitat value. The number of overstory, shrub and herbaceous plant species; the amount of complex vertical structure; the existence of an uneven aged overstory; and numerous snags or wildlife trees (dead standing trees) provide the optimum conditions for wildlife and ecological diversity. The large stand of mixed upland forest adjacent to the riparian woodland provides many of the aforementioned habitat features. The ecological value of this forest will increase with time as the deciduous trees will soon reach their life expectancy. Once this occurs, snags and logs will become abundant, thereby increasing the value of the forest as wildlife habitat. Currently, the forest is used extensively by deer. It sustains nesting sites for three species of woodpecker as well as raptors. Intermixed deciduous and coniferous stands create a heterogeneous forest environment, which in turn increases both plant and wildlife species richness.

This forest and the riparian forest compliment each other in terms of the number of functional values that can be supported for wildlife. Fragmented, these two forests would not sustain the diversity of functional values now supported by the two forests as a contiguous unit. For example, nesting woodpeckers require a minimum area of forested habitat. The nesting sites observed within the study area are dependent on this minimum area; a significant reduction in area of the upland mixed forest would likely eliminate nesting woodpeckers from the study area.

Southern Mixed Upland Forest

Although this forest is linked to the upland forest considered contiguous with the riparian forest, the linkage is through a narrow wooded corridor that limits its interface with the Nicomekl River system. This limited interface in turn restricts the functional values for fish and wildlife that this forest can sustain. It does, however, provide habitat for a myriad of bird species as well as black tailed deer, and sustains structural habitat features similar to those sustained by other forests within the study area.

Early Seral Deciduous Upland Forest

The primary value of early seral deciduous forest within the study area is the habitat complexity it affords wildlife, especially when adjacent to agricultural lands. It provides nesting and refuge for passerine birds, and refuge for small mammals.

Ephemeral Creeks and Associated Riparian Areas

Although ephemeral creeks within the study area do not support instream fish populations, development that impacts the creek channel and/or associated riparian areas has the potential to impact downstream habitats that do support instream fish populations. The riparian areas buffer the creek channel to surrounding land uses. The creek channels, when conveying flows, export nutrients and insects (via drift) to downstream habitats. They are also utilized as a migration corridor by small mammals and herptiles.

ROSEMARY HEIGHTS CENTRAL NEIGHBOURHOOD	envirowest ENVIRONMENTAL CONSULTANTS	ENVIRONMENTAL SENSITIVE AREAS
URBAN SYSTEMS LTD.	ECL ENVIROWEST CONSULTANTS LIMITED Suite 204 - 800 McBride Boulevard, New Westminster, B.C. Canada V3L 2B8 phone: (604) 521-8500 fax: (604) 521-2206	SCALE: 1:2500 — DATE: JULY 12/95 DESIGN: MAA — DRWG. No. 484-080-01 DRAWN: RWS

open space. There is to be no development from the natural boundary of the Nicomekl River to the top-of-bank. Walking trails, limited community amenities (other than buildings) and some public utilities may be permitted within this area provided they do not significantly impact environmental resources. Development would be subject to approval by the BC Ministry of Environment, Lands and Parks;

- The mixed upland forest contiguous to the riparian forest may accommodate limited development. Development within this area must sustain the functional capacity of the landscape for fish and wildlife, with special regard for raptors. Where impacts to vegetation occur, these impacts are to be offset by the planting of replacement vegetation to increase the habitat value for fish and/or wildlife;

- Mixed upland forest not contiguous with the riparian forest and early seral deciduous upland forest may be developed, provided development incorporates features that mitigate impacts on environmental resources within the development area. For example, landscape guidelines that maintain or require the planting of shrubs and trees of known habitat value to small mammals and birds are to be implemented; and,

- The stormwater drainage system implemented within the NCP area is to incorporate design features that mitigate impacts to surface water hydrology and quality. This mitigation requirement also applies to interim stormwater management systems, such as control of sediment during the construction phase of development.

Environmental setbacks associated with watercourses shall be as follows (as established in the BC Ministry of Environment, Land and Parks "Land Development Guidelines for the Protection of Aquatic Habitat"):

- 15 metres from the top-of-bank of the Nicomekl River for single family residential development;

- 30 metres from the top-of-bank of the Nicomekl River for multiple family residential, commercial and institutional development; and,

- 9 metres from the top-of-bank of ephemeral watercourses for any development.

The top-of-bank is defined as the first significant break in topography. Development, except where noted in the above policies and guidelines, is not to occur within environmental setback areas. The top-of-bank of the Nicomekl River is illustrated in Figure 2.1.

Environmental setback areas are to be protected by a restrictive covenant specifically, but not limited to, Section 215 of the Land Title Act.

2.2 Future Land Use

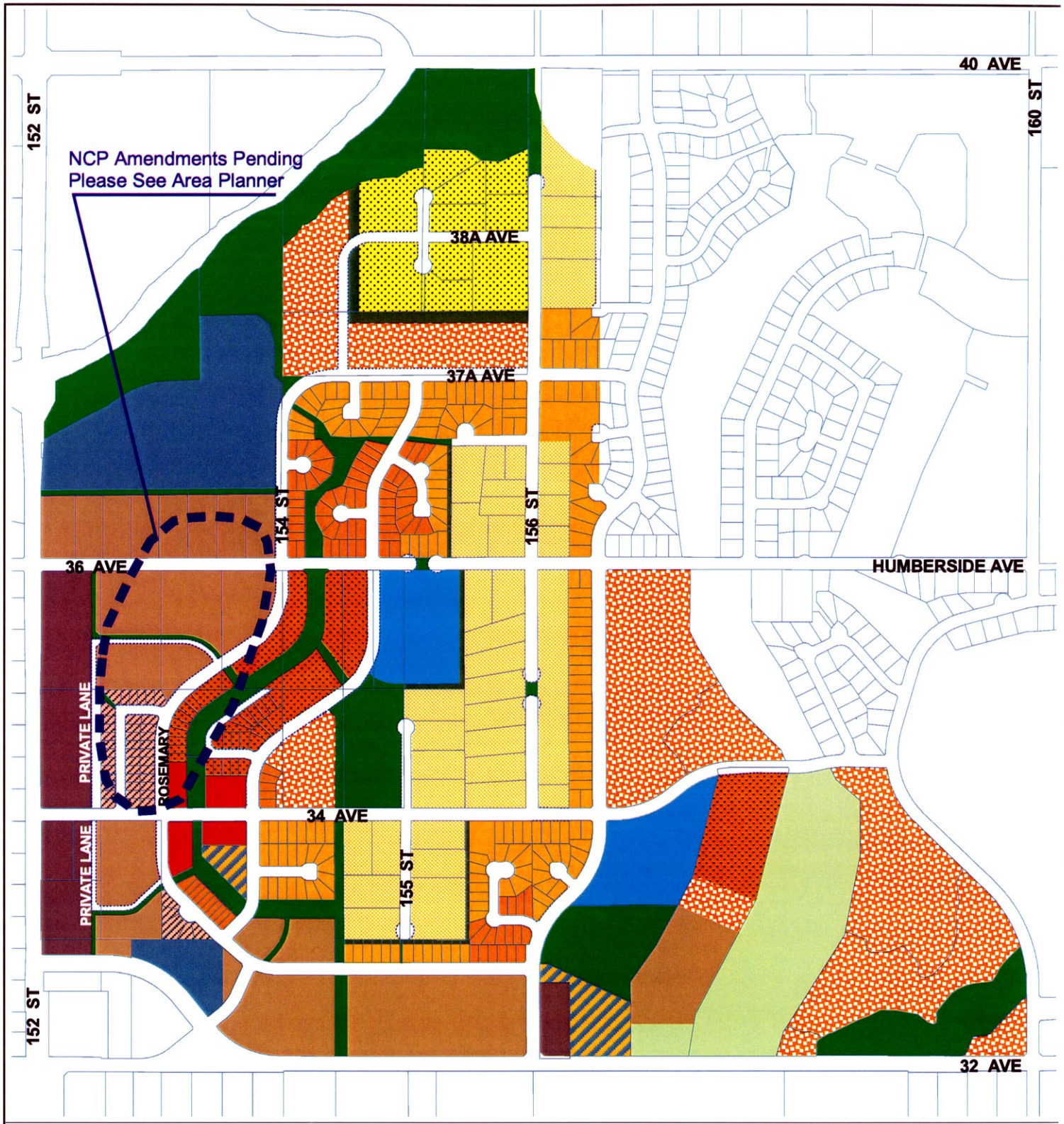
2.2.1 Overview

Overall land uses proposed in this NCP are illustrated in Figure 2.2, and are described as follows:

- The focal point of the community is a neighbourhood commercial centre located at the intersection of 34th Avenue and the proposed Rosemary Heights Ring Road;

- A wide variety of residential uses would be provided for in the neighbourhood including:

  - retention of existing suburban residential uses is provided for along 156th and 155th and on 39th Streets;
  - development of garden apartments along the east side of 152nd Street and along 32nd Avenue east of the realigned 156th Street;
  - development of townhouses along 32nd Avenue, west of the proposed Rosemary Heights Ring Road (between 34th and 36th Avenues) and along 36th Avenue (west of the Rosemary Heights Ring Road);
  - development of cluster housing at single family densities (in single detached, duplex, triplex and fourplex form) east of the proposed 156A Street); and
  - provision of various forms of urban single family residential uses including:
    - conventional fee simple subdivisions which provide transition between higher density housing and suburban residential uses;
    - compact single family residential uses which are predominantly located between the ring roads, and,
    - cluster housing at single family densities in proximity of areas demonstrating environmental sensitivity.



- Suburban 1 Acre Residential
- Suburban 1/2 Acre Residential
- Single Family Residential
- Compact Single Family Residential
- Clustering at Single Family Density
- Compact Single Family/Cluster
- Single Family Small Lot
- Townhouses
- Garden Apartments (3-Storeys)
- Neighbourhood Commercial
- Institutional (Religious, College, Library, Fire Hall, etc.)
- Institutional Residential
- Buffer
- Park / Open Space
- Elementary School
- Golf Course

Approved by Council: May 6, 1999 Amended April 8,2002

NOTE: This plan is conceptual in nature and is only intended to reflect a general pattern of land uses.
These maps are general reference only and all information should be varified by the Surrey Planning and Development Department.

ROSEMARY HEIGHTS CENTRAL LAND USE PLAN

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- Institutional housing, including seniors and special needs housing in conjunction with the neighbourhood commercial centre would be provided for;

- Provision of two elementary schools within the plan area;

- Retention and enhancement of existing fire hall located on 32nd Avenue;

- Provision of a parks and open space system consisting of:

  - two neighbourhood parks located adjacent to the elementary schools;
  - natural open space to preserve the riparian forest of the Nicomekl River;
  - a linear park throughout the western portion of the neighbourhood.

2.2.2 Residential Uses

Approximately 101 hectares (248 acres) of the neighbourhood's land area is proposed for future residential use. Consistent with the LAP, a wide variety of housing forms is proposed. Objectives, policies and guidelines for the development of future residential uses are presented in this section.

Objectives

The following broad objectives have been established to provide direction for future residential development within the neighbourhood:

- To provide for a variety of housing forms and densities within the neighbourhood;

- To provide for the housing needs of specific groups such as seniors, etc.;

- To preserve existing suburban residential development within the neighbourhood and provide for the continuation of this form of housing in the neighbourhood;

- To encourage high quality design in future residential developments; and,

- To provide affordable housing opportunities within the neighbourhood.

Policies and Guidelines

Policies and guidelines noted in this section apply to the development of the following residential land uses which are proposed within the plan area.

- Suburban 1 Acre Residential
- Suburban ½ Acre Residential
- Single Family Residential
- Compact Single Family Residential
- Cluster Housing (at Single Family Density)
- Compact/Cluster (at Single Family Density)
- Townhouses
- Garden Apartments
- Institutional Residential

All residential uses must ensure that the functional capacity of the landscape is sustained for developed areas that occur within the Mixed Upland Forest that is contiguous with the Riparian Forest.

Institutional, institutional residential and other residential uses are not to be developed within the Nicomekl Riparian Forest area which is designated as open space on Figure 2.2.

Suburban - 1 Acre Residential

To be consistent with the LAP, Suburban 1 Acre Residential uses are shown for properties along 156th Street north of 38A Avenue as shown in Figure 2.2.

The purpose of this designation is to protect existing established residential uses rather than providing for future development at this density.

The following policies and guidelines apply to Suburban 1 Acre Residential uses:

- Suburban 1 Acre Residential (single family) uses shall be developed on parcels created by fee simple subdivision;

- The following zone(s) of the City of Surrey Zoning Bylaw No. 12000, as amended, shall apply to areas designated for Suburban 1 Acre Residential uses:

  - RA;

  - Where a site can provide 15% or more of the lands for open space, the One Acre Gross Density zone, RA-G, may apply; and

- The minimum parcel size for single family residential uses could range from 2,230m^2 (24,000 sq.ft.) under the RA-G zone to 4,047m^2 (1 acre) under the RA zone.

Suburban - ½ Acre Residential

The following principal areas (illustrated in Figure 2.2) are proposed for Suburban ½ Acre Residential uses:

- Along 156th Street between 34th and 37th Avenue;
- Along 155th Street near 34th Avenue;
- Along the east side of 156A Street, north of 36th Avenue; and,
- Along the east side 156th Street north of 36th Avenue.

The purpose of this designation is to recognize existing suburban residential development rather than provide for future residential development at this density.

The following policies and guidelines apply to Suburban ½ Acre Residential uses:

- Suburban ½ Acre Residential (single family) uses shall be developed on parcels created by fee simple subdivision;

- The minimum parcel size for single family residential uses shall be 1,858m² (20,000 sq.ft.);

- The following zone(s) of the City of Surrey Zoning Bylaw No. 12000, as amended, shall apply to areas designated for Suburban ½ Acre Residential uses:

  - R-H

  - Where a site can provide 15% or more of the lands for open space, the One Half Acre Gross Density Zone, RH-G, may apply.

Single Family Residential

Conventional Single Family Residential uses are designated in a variety of locations as shown in Figure 2.2. Single Family Residential uses provide for a transition between suburban residential uses and higher density forms of housing.

The following policies and guidelines apply to Single Family Residential uses:

- Single Family Residential uses shall be developed on parcels created by fee simple subdivision;
- The minimum parcel size for Single Family Residential uses shall be 560m² (6,000 sq.ft.);
- The maximum density shall be 14.8 units per hectare (6 units per acre);
- Single Family Residential units shall be oriented to front onto the municipal roads;
- Where applicable, open space/park dedication equal to 5% of the gross site area or an equivalent payment of cash-in-lieu for open space/park dedication will be secured during the development approval process; and,
- The following zone(s) of the City of Surrey Zoning Bylaw No. 12000, as amended, shall apply to areas designated for Single Family Residential uses:

  - R-F

Compact Single Family Residential

Compact Single Family Residential uses are proposed in a number of locations within the neighbourhood, as shown in Figure 2.2.

The purpose of this designation is to provide for higher density single family residential uses.

The following policies and guidelines apply to Compact Single Family Residential uses:

- Compact Single Family Residential development shall occur on parcels created by fee simple subdivision or subdivision under the bare land strata regulations (with private internal roads).

- The minimum parcel size for Compact Single Family Residential uses shall be 325m^2 (3,500 sq.ft.) to 370m^2 (4,000 sq.ft) as per the RF-G Zone in the City of Surrey Zoning Bylaw No. 12000, as amended;

- The maximum density shall be 18.5 units per hectare (7.5 units/acre);

- All Compact Single Family Residential developments shall comply with the development guidelines and servicing standards set out in this NCP;

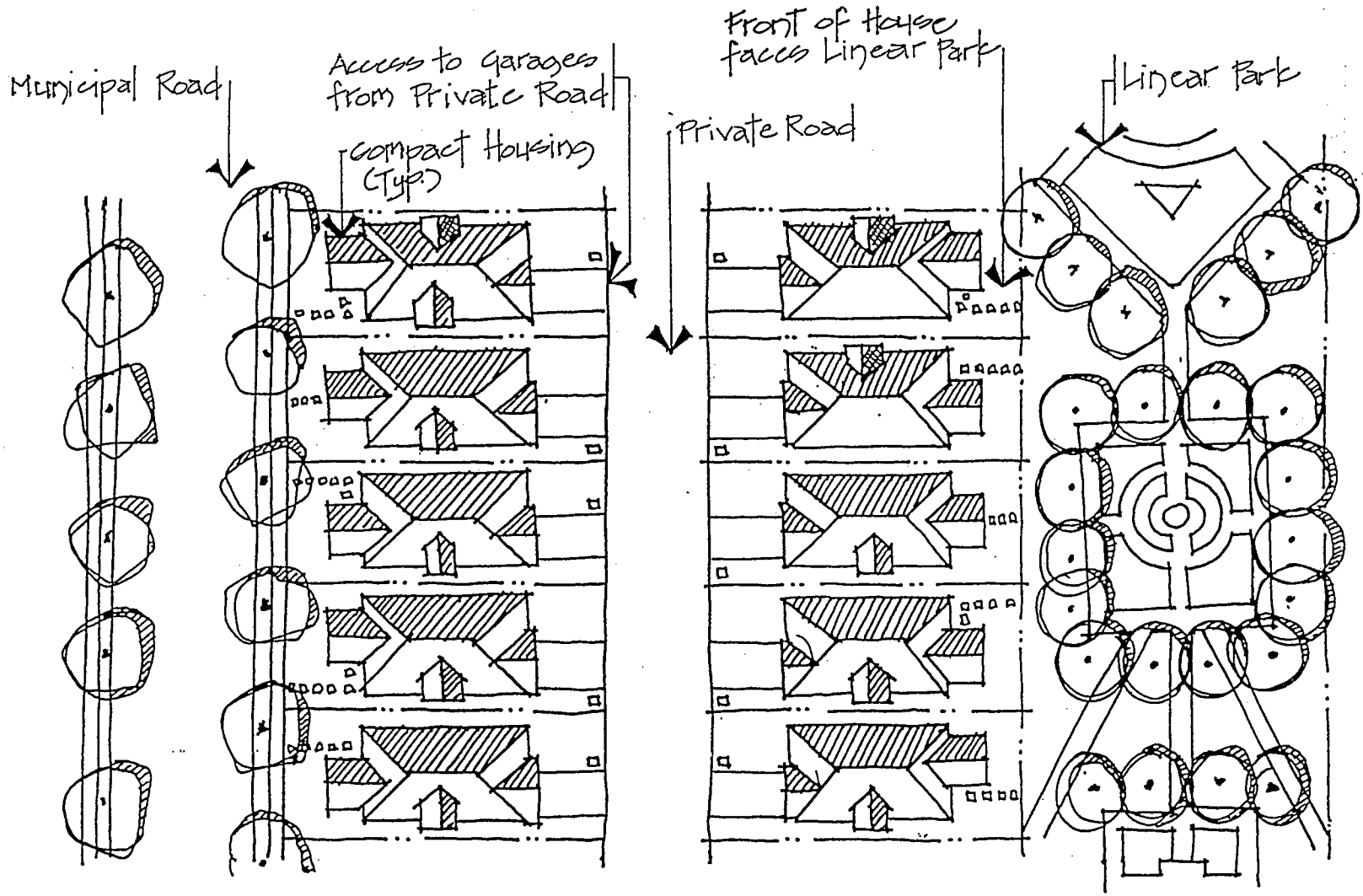
- All areas designated for Compact Single Family Residential development will be subject to a registered building scheme to regulate landscaping, building form and character,

- Where Compact Single Family Residential lots are located adjacent to the linear park, buildings shall, whenever possible, be oriented to front onto the linear park by incorporating front yard landscaping and front entrance treatments in the yard abutting the linear park (as shown in Figure 2.3);

- A minimum open space/park dedication equal to 15% of the gross site area or an equivalent payment of cash-in-lieu for any portion of the 15% dedication which is not secured for open space/park shall be required during the development approval process; and,

- The following zone(s) of the City of Surrey Zoning Bylaw No. 12000, as amended, shall apply to areas designated for Compact Single Family Residential uses:

  - RF-G
  - CD



Compact SFD with Private Road

Figure 2.3

Conceptual Plan

Clustering of Dwelling Units (at Single Family Density)

Clustering of Dwelling Units (at Single Family Density) is proposed, as shown in Figure 2.2. Examples of Clustering of Dwelling Units (at Single Family Density) are illustrated in Figures 2.4 and 2.5.

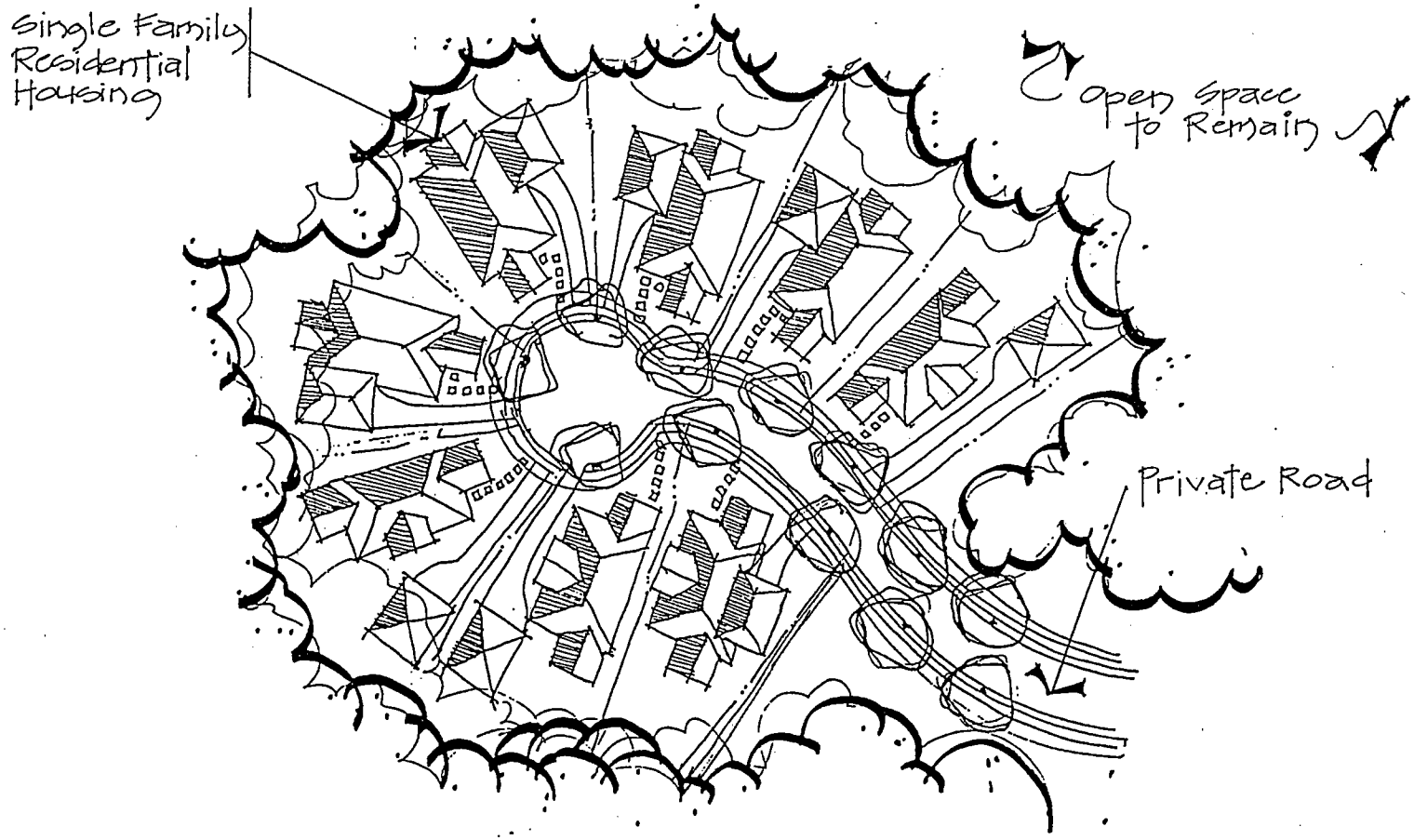
The purpose of this designation is to provide for flexibility in siting of residential units to avoid hazards, protect environmental features and/or provide an appropriate interface with adjacent development.

The following policies and guidelines apply to Clustering of Dwelling Units (at Single Family Density) uses:

- Clustering of Dwelling Units (at Single Family Density) shall be permitted in areas shown in Figure 2.2;
- Clustering of Dwelling Units (at Single Family Density) shall occur on parcels created by fee simple subdivision or strata title.
- The maximum gross density shall be 14.8 units per hectare (6 units/acre);
- The predominant form of housing permitted shall be single family detached units provided that duplexes, triplexes and fourplexes may be permitted subject to the approval of a site plan by the City of Surrey and provided that the overall gross density of 14.8 units per hectare (6 units per acre) is not exceeded;
- Development providing for Clustering of Dwelling Units (at Single Family Density) shall comply with the development guidelines and servicing standards set out in this NCP;
- All areas designated for Clustering of Dwelling Units (at Single Family Density) may be designated as a development permit area in order to regulate landscaping, siting of buildings and building form and character; and,

- The following zone(s) of the City of Surrey Zoning Bylaw No. 12000, as amended, shall apply to areas designated for Clustering of Dwelling Units (at Single Family Density):

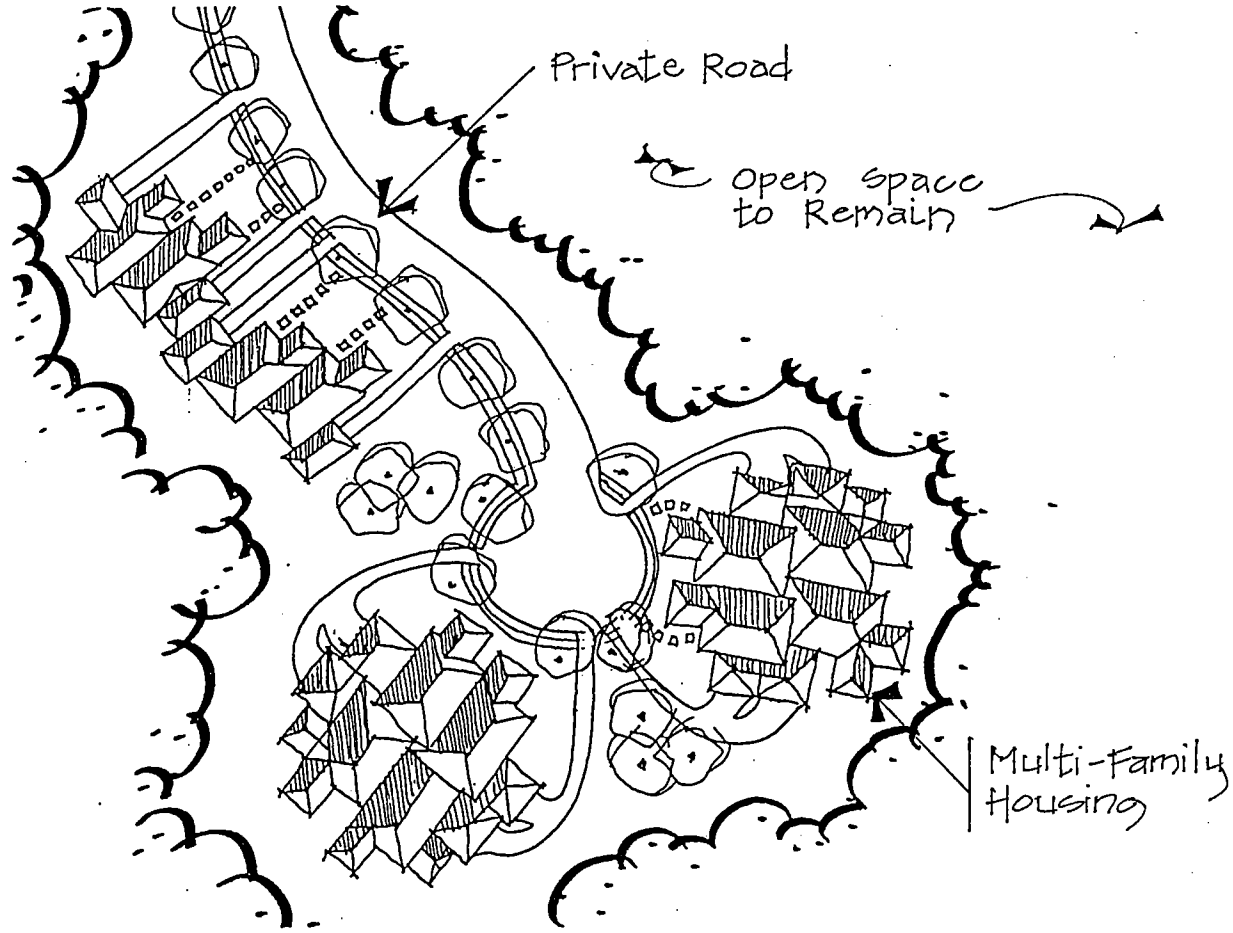
  - CD



Clustering of Dwelling Units

Figure 2.4

Conceptual Plan



Townhouse Housing **Figure 2.5**

Conceptual Plan

Compact/Clustering of Dwelling Units (at Single Family Density)

An area located between the ring roads south of 36th Avenue is suitable for either Compact Single Family Residential development or Clustering of Dwelling Units (at Single Family Density). In this area, the City of Surrey will entertain either use. The policies and guidelines set out for Compact Single Family Residential Development or Clustering of Dwelling Units (at Single Family Density) as set out in this plan shall apply depending on the chosen use.

Townhouse

Approximately 19 hectares (47 acres) of the plan area are proposed for Townhouse Residential development. Various locations within the plan area are proposed for Townhouse development including areas along major arterial roads, as shown in Figure 2.2.

The purpose of this designation is to allow for low density multi-family forms of housing close to the village centre and along major roads, and to create a transition between Garden Apartments and Single Family Residential uses.

The following policies and guidelines apply to Townhouse Residential uses:

- Townhouses shall be permitted in areas as designated in Figure 2.2;
- The maximum density for townhouses shall be 37.1 units per hectare (15 units/acre);
- All Townhouse developments shall comply with the development guidelines and servicing standards set out in this NCP;
- All areas depicted for Townhouse development have been declared as development permit areas in order to regulate landscaping, siting of buildings and building form and character;
- Where Townhouse lots abut a public road, Townhouse units and buildings shall be street-oriented by measure of articulation of the building elevation, front yard landscape treatments and discouraging use of fences;
- A continuous landscape buffer strip shall be incorporated into yards of Townhouse lots abutting 32nd Avenue;
- The following zone(s) of the City of Surrey Zoning Bylaw No. 12000, as amended, shall apply to areas designated for Townhouse Residential uses:

  - RM-15

Garden Apartments

Approximately 6.8 hectares (17 acres) of the plan area are designated for Garden Apartment use. Garden Apartments are proposed within the plan area along arterial roads and other locations, as shown in Figure 2.2.

The purpose of this designation is to allow for medium density forms of multi-family forms of housing along major arterial roads.

The following policies and guidelines apply to Garden Apartments:

- Garden Apartments shall be permitted only in the areas designated in Figure 2.2;
- The maximum density for Garden Apartments shall be 74.1 units per hectare (30 units/acre);
- Garden Apartments shall not exceed three storeys in height;
- Direct access for automobiles onto 152nd Street and 32nd Avenue is not allowed;
- Where Garden Apartments adjoin arterial roads (152nd Street and 32nd Avenue), buildings shall be oriented to front onto these roads through articulation of the building elevation (facade) and landscape treatment;
- A continuous landscape buffer strip shall be incorporated into yards of Garden Apartment lots abutting 152nd Street and 32nd Avenue;
- Garden Apartment development shall comply with the development guidelines and servicing standards set out in this NCP;
- All areas designated for Garden Apartment use have been declared as a development permit area in order to regulate landscaping, building siting and building form and character; and

- The following zone(s) of the City of Surrey Zoning Bylaw No. 12000, as amended, shall apply to areas designated for Garden Apartment uses:

  - RM-30

Institutional Residential

One site is designated as Institutional Residential in this NCP, as shown in Figure 2.2. The purpose of this land use designation is to allow the development of a residential use in conjunction with an institutional use. This site is located within the Village Centre. Institutional Residential development anticipated for this site would include seniors housing, or congregate care housing, associated with a specific institution such as a church or private hospital.

The following policies and guidelines apply to Institutional Residential uses:

- Residential uses developed on sites designated Institutional Residential (as shown in Figure 2.2) shall be associated with an institutional use (for example, a church or private hospital);

- Institutional uses on sites designated Institutional Residential shall have a residential component and shall comply with the relevant Institutional zone (either PA-1, RMS-1 or a CD based on these zones) specified in the City of Surrey Zoning Bylaw No. 12000, as amended;

- Development density shall be calculated based on the permitted floor area ratio of the appropriate zone (as noted above);

- Institutional Residential uses shall not be developed within the riparian forest of the Nicomekl River; and

- All areas designated for Institutional Residential use have been declared as development permit areas in order to regulate landscaping, building siting and building form and character.

2.2.3 Neighbourhood Commercial Centre

The Neighbourhood Commercial Centre provides a focus for the neighbourhood and is intended to provide neighbourhood residents and residents of adjoining neighbourhoods with a limited range of retail stores and personal service establishments which cater to the day to day needs of area residents.

The Neighbourhood Commercial Centre is located close to a key entry point to the neighbourhood along 34th Avenue, and sets the tone for the neighbourhood in terms of quality of design and pedestrian orientation. The Neighbourhood Commercial Village Centre concept is illustrated in Figure 2.6.

Objectives

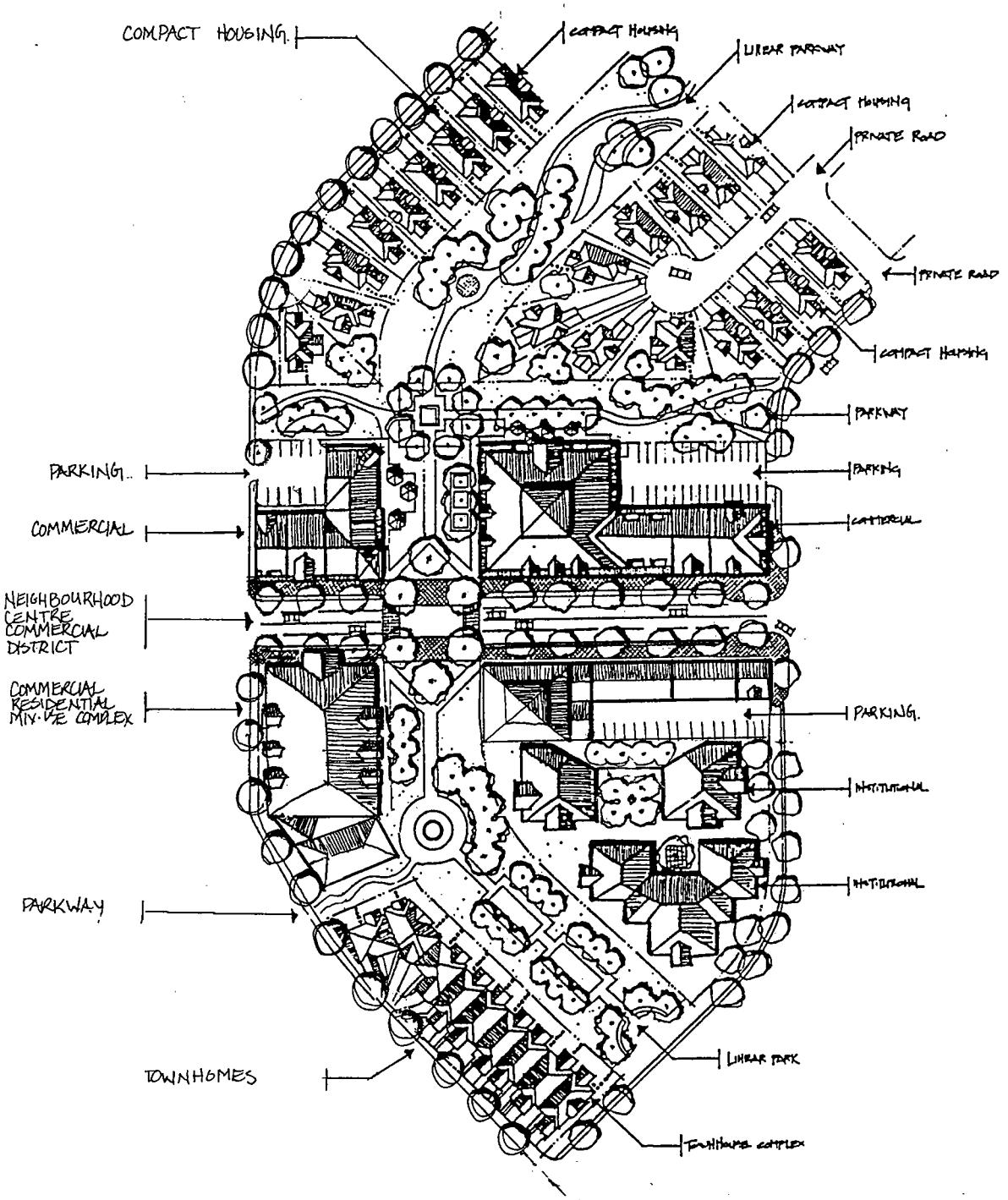
The following broad objectives have been established to provide direction to the development of the Neighbourhood Commercial Centre:

- To provide for the day to day commercial needs of the Rosemary Heights local area;
- To provide a focal point in the neighbourhood from a social perspective; and
- To ensure a pedestrian orientation in the design of the neighbourhood centre.

Policies and Guidelines

The following policies and guidelines apply to the Neighbourhood Commercial Centre:

- Neighbourhood Commercial Centre uses are proposed only in areas designated in Figure 2.2;



(C) Village Centre Area

Figure 2.6

- Land uses within the Neighbourhood Commercial Centre are limited to the uses identified in the C-5 zone of the City's Zoning Bylaw No. 12000, as amended, and may include the following:

  - grocery store;
  - bank/financial institution;
  - pharmacy;
  - video rental;
  - dry cleaning;
  - medical/dental office/clinic;
  - post office;
  - restaurant;
  - travel agency;
  - delicatessen;
  - bakery; and
  - office use;

- gross floor area of individual commercial units shall not exceed 370m² (4,000 sq.ft.); and

- maximum density shall not exceed a floor area ratio of 0.50.

The following development guidelines apply to development of buildings within the Neighbourhood Commercial Centre:

- Buildings fronting onto 34th Avenue and the ring roads will be set back not more than 2m from an exterior lot line, as illustrated in Figure 2.6;

- Buildings shall not exceed the lesser of two storeys or 9 metres (30 feet) in height;

- Off-street parking and loading facilities shall be provided as required in the City's Zoning Bylaw No. 12000, as amended;

- On-site parking and loading facilities shall be provided at the rear of buildings for buildings located north of 34th Avenue and either underground or at the rear of buildings located south of 34th Avenue.

All vehicular access for buildings south of 34th Avenue will be from the proposed ring roads;

- Commercial development shall comply with the development guidelines and servicing standards set out in this NCP;

- All areas designated as Neighbourhood Commercial Centre have been declared development permit areas in order to regulate landscaping, siting of buildings and form and character of buildings; and

- The following zone(s) of the City of Surrey Zoning Bylaw No. 12000, as amended, shall apply to areas designated for Neighbourhood Commercial Centre use:

  - C-5

2.2.4 Institutional Use

A Retreat Centre owned by the Archdiocese of Vancouver currently occupies a property fronting 152nd Street, located in the northern portion of the plan area directly south of the Nicomekl River. The environmental assessment illustrated in Figure 2.1 indicates significant areas on this property contain environmental sensitivity areas comprised of Mixed Upland Forest contiguous with the Nicomekl River riparian forest.

Those parts of the property which are not within the environmentally sensitive areas are generally already developed. The only additional development opportunity is the proposed high school located east of the existing retreat centre. The extent of the developable area is constrained by the environmentally sensitive area including the setback from the top of bank.

Objectives

The following objectives apply to the Institutional use:

- To maintain the existing Retreat Centre Institutional and allow for the development of a high school on lands which have not been identified as having environmental high sensitivity; and

- To use the Retreat Centre as an existing buffer between the Nicomekl River riparian zone and higher density residential uses proposed to the south.

Policies & Guidelines

The following policies and guidelines apply to the areas designated for Institutional use:

- The existing Retreat Centre site proposed for a high school shall be designated for Institutional use;

- Any future expansion or renovation of the Retreat Centre site shall not impact the areas identified as having environmental high sensitivity as identified in the environmental assessment of this plan; and

- All areas designated for Institutional use have been declared development permit areas in order to regulate landscaping, siting of buildings, the form and character of buildings and protection of the environment.

2.2.5 Public Facilities

The NCP proposes the following public facilities for the Rosemary Heights Central neighbourhood:

- Two elementary schools; and
- Additions to the existing Fire Hall #17 located on 32nd Avenue near 152nd Street.

Objectives

The following objectives apply to proposed public facilities:

- To provide elementary school facilities to accommodate the population generated by development;
- To provide additional resources to Fire Hall #17 to allow sufficient fire protection and emergency response within the neighbourhood; and,
- To identify potential site location opportunities for affordable housing.

Policies and guidelines for each of the proposed public facilities are presented in the following sections.

Elementary Schools

Surrey School District #36 (SD #36) has identified that two new elementary schools are required within the Rosemary Heights Central neighbourhood, to accommodate the projected number of students from the Rosemary Heights local area (which includes Rosemary Heights West and Morgan Creek). At the current time, SD #36 has not identified the need for a new secondary school within the neighbourhood. Locations of these proposed schools are illustrated in Figure 2.2.

Each elementary school is proposed to accommodate a maximum of 500 students. SD #36 proposes that these schools may include District wide special programs (such as French Immersion) in addition to serving students from Rosemary Heights.

The proposed 156A Street is proposed by SD #36 as the boundary between elementary school student catchment areas, to respect SD #36's policy of reducing the need for students to cross major roads.

The western elementary school is located near 36th Avenue and the proposed Inner Ring Road, and encompasses approximately 2.4 hectares (6 acres) of land. This school is integrated with an active park of approximately 2.2 hectares (5.44 acres) in size, located directly to the south of the school.

The eastern elementary school is located near 34th Avenue and the proposed 156A Street, and also encompasses approximately 2.9 hectares (7.15 acres) of land. This school is integrated with an active park of approximately 2.4 hectares (5.85 acres) in size, located directly south of the school.

Policies and Guidelines

The following policies and guidelines apply to the proposed elementary schools:

- Two elementary schools shall be provided, as illustrated in Figure 2.2;
- Elementary schools shall be designed and located to allow safe access for students and discourage crossing of major roads;
- Elementary schools shall be integrated with the proposed neighbourhood pedestrian circulation system;
- Elementary schools shall be designed to reduce impacts on adjacent residential development;
- The western elementary school shall incorporate a buffer area of approximately 7.62 metres (25 feet) wide along its boundaries which abut existing one acre residential parcels. This buffer shall be located on public property but shall not be used as a pedestrian pathway or for public use. This buffer shall be designed in a manner that reduces safety risks for students and adjacent residences; and,

- Elementary schools are encouraged to incorporate facilities to accommodate public uses such as meeting space and other community amenities.

Fire Protection

Fire Hall #17, located at 32nd Avenue near 152nd Street, was recently constructed. The location of this fire hall is shown in Figure 2.2.

In order to provide effective and reliable fire protection for the potential population generated by development proposed in the Rosemary Heights LAP, Surrey Fire Department has indicated the need for additional staff and equipment as well as expansion of the hall.

Since these facilities would be used for the provision of fire protection and rescue services for the entire Rosemary Heights local area, the costs attributed to these improvements should be shared across the entire local area.

Policies and Guidelines

The following policies and guidelines apply to fire protection for the neighbourhood:

- To improve the services provided by the existing Fire Hall #17 to accommodate the increase in population generated by development proposed in the Rosemary Heights Local Area Plan.

Policing

Surrey RCMP have indicated that since a Community Police Station already exists in South Surrey, one would not be developed in Rosemary Heights in the short term. However, the proposed South Surrey Interchange (located in the vicinity of 152nd Street, 32nd Avenue and Highway 99) would be vital for access to Rosemary Heights from the South Surrey Community Police Station.

Policies and Guidelines

The following policies and guidelines apply to policing of the neighbourhood:

- Multiple-family residential development, community open space, schools, parks, commercial areas and subdivision layouts shall incorporate basic principles of defensible space (incorporating Crime Prevention Through Environmental Design) in their design including:

  - clear definition between public and private spaces;
  - opportunities for natural and casual surveillance;
  - adequate lighting of public areas and pathways; and,
  - elimination of hidden areas and corners.

- Traffic calming measures shall be implemented to reduce traffic violations and speeding vehicles; and,

- Linear Park system pathways and other pedestrian linkages shall be designed for the safety of children and other pedestrians.

Affordable Housing

Affordable housing opportunities could be included in a number of the proposed residential land use designations including:

- Townhouses;
- Garden Apartments; and,
- Institutional Residential.

The City's Planning and Development Department suggests a standard need for one 40 unit affordable housing project (on approximately 3.5 acres) for each school catchment area, and has identified the following criteria for identifying potential site locations:

- Within walking distance to an elementary school; and
- Within walking distance to the Neighbourhood Commercial Centre.

An analysis of proposed townhouse sites undertaken by the Planning and Development Department is attached as Appendix B and identifies townhouse sites which meet these location and size criteria. These sites are located either near the intersection of 154th Street and the Rosemary Heights Ring Road, or alternatively near 36th Avenue and the Rosemary Heights Ring Road.

In addition, the NCP identifies a site for Institutional Residential land uses (as shown in Figure 2.2) which is proposed to accommodate housing for seniors, or congregate care.

2.3 Parks and Open Space

The LAP defines a multi-purpose parks and open space system which incorporates the following facilities:

- A linear park system, with a pedestrian orientation throughout the centre of the neighbourhood, in a north/south orientation;
- Two neighbourhood parks located adjacent to the proposed elementary schools;
- Natural open space areas to preserve the riparian zone of the Nicomekl River and portions of forested areas south of 36th Avenue between the proposed ring roads;
- Pedestrian linkages through higher density residential areas to provide safe and effective pedestrian access to public transit facilities and the circulation system;
- Continuous landscaped buffer strip (within private property), including berms, along 152nd Street and 32nd Avenue, to minimize visual and noise impact on adjacent residential uses and improve the streetscape along these arterial roads; and,
- Buffer areas between existing one acre single family residential properties and proposed higher density areas.

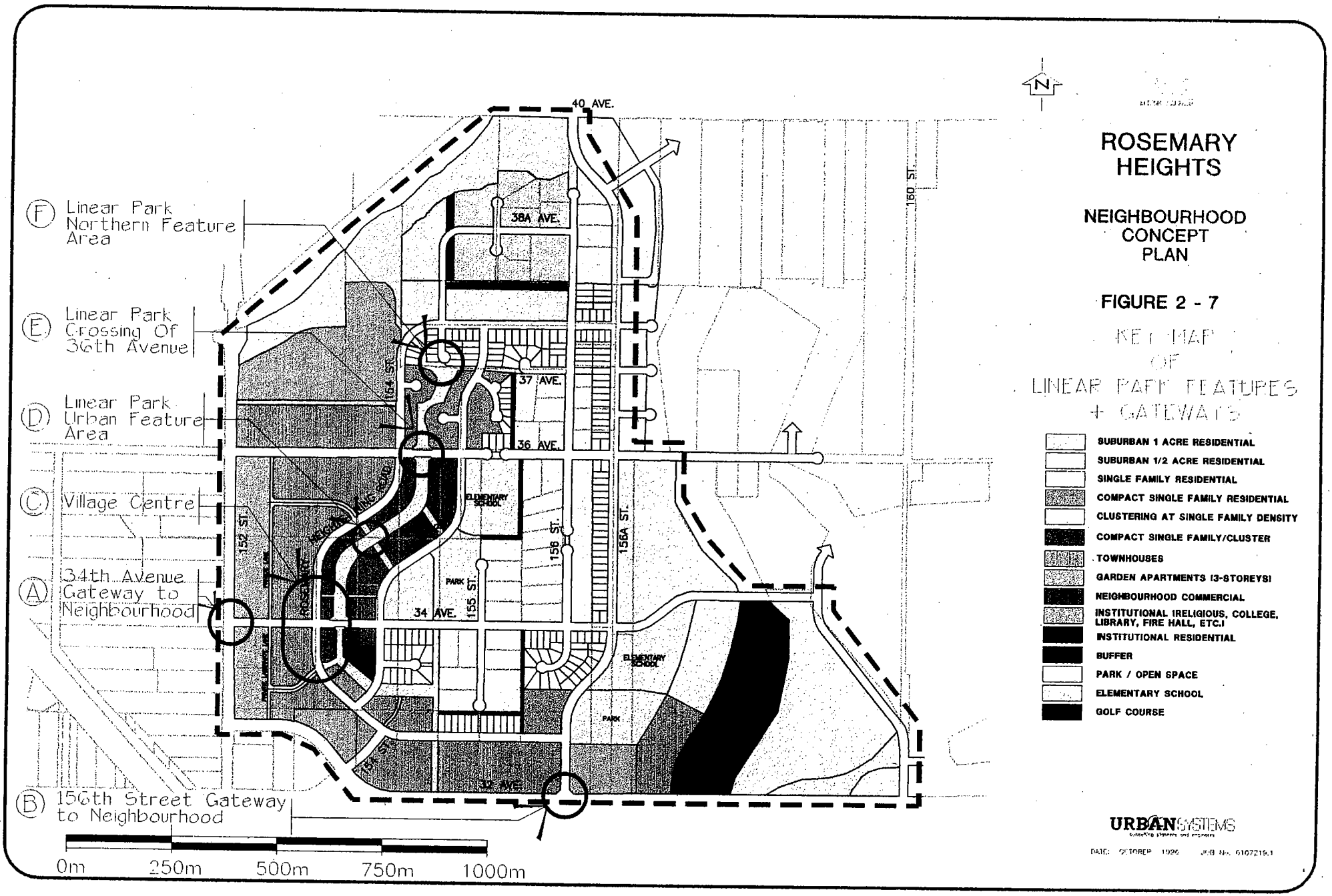
These various components are illustrated in the draft plan shown in Figure 2.7.

In response to neighbourhood concerns, this plan also proposes that the key entrance points to the neighbourhood located at 152nd Street/34th Avenue and 156A Street/32nd Avenue be clearly defined and developed as gateways to the neighbourhood.

Objectives

Broad objectives for the parks and open space system are as follows:

- To provide neighbourhood park facilities to accommodate the needs of the Rosemary Heights local area;
- To provide active park facilities in the vicinity of the proposed elementary schools;



ROSEMARY HEIGHTS

NEIGHBOURHOOD CONCEPT PLAN

FIGURE 2 - 7

KEY MAP OF LINEAR PARK FEATURES + GATEWAYS

- SUBURBAN 1 ACRE RESIDENTIAL
- SUBURBAN 1/2 ACRE RESIDENTIAL
- SINGLE FAMILY RESIDENTIAL
- COMPACT SINGLE FAMILY RESIDENTIAL
- CLUSTERING AT SINGLE FAMILY DENSITY
- COMPACT SINGLE FAMILY/CLUSTER
- TOWNHOUSES
- GARDEN APARTMENTS (3-8TOREYS)
- NEIGHBOURHOOD COMMERCIAL
- INSTITUTIONAL (RELIGIOUS, COLLEGE, LIBRARY, FIRE HALL, ETC.)
- INSTITUTIONAL RESIDENTIAL
- BUFFER
- PARK / OPEN SPACE
- ELEMENTARY SCHOOL
- GOLF COURSE

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- To establish the basis for a safe and effective pedestrian circulation system;
- To preserve natural areas by implementing cluster forms of residential development;
- To protect significant riparian forest areas associated with the Nicomekl River;
- To establish effective means for buffering between lower and higher density residential development;
- To clearly identify key gateway points to the neighbourhood; and
- To provide for bicycle facilities, including bike trails and paths.

Objectives, policies and guidelines associated with each of the components of the proposed parks and open space system are described in the following sections.

2.3.1 Linear Park System

A key element of the open space system within the neighbourhood is a linear park which provides a pedestrian oriented spine through the centre of the neighbourhood, between the proposed ring roads. This linear park system is illustrated in Figure 2.7. On average, the linear park would have a width of 30 metres (100 feet) and encompasses approximately 5.8 hectares (14 acres) of land.

Several points of interest should be located within the linear park including the retention of existing stands of trees in the vicinity of 36th Avenue.

The linear park provides pedestrian linkages between the Nicomekl River and northern portions of the neighbourhood with the proposed Village Centre and higher density housing in the vicinity of 34th Avenue. It also links the pedestrian system proposed in the Rosemary West Neighbourhood to the system established in the Morgan Creek development.

Figures 2.8 through 2.11 illustrate how the linear park should be developed and feature areas within the system. (These feature areas are keyed to the circles shown in Figure 2.7). The linear park would be located on property acquired by the City of Surrey by means of dedication and additional property purchases where necessary.

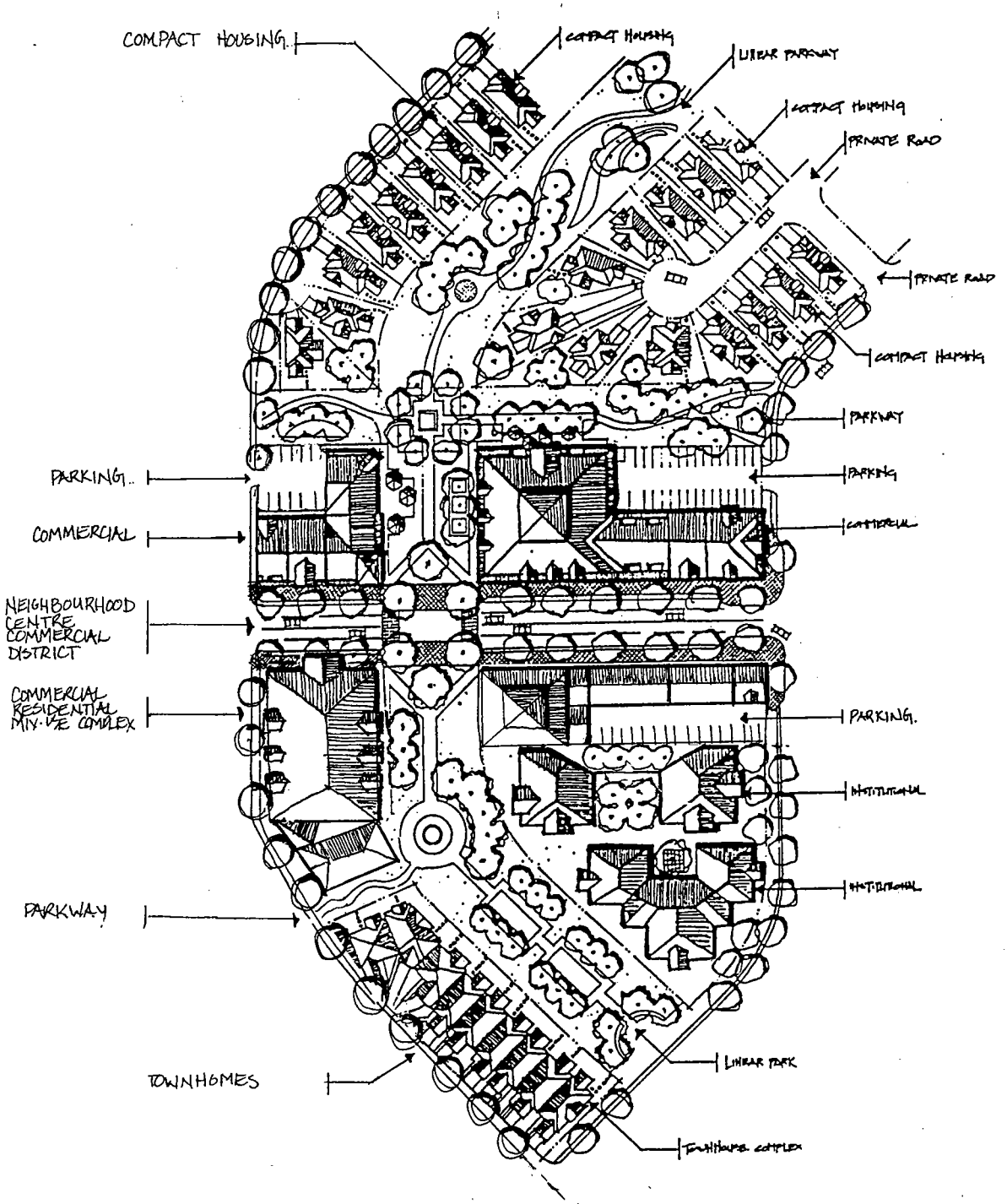


Figure 2.8

C Village Centre Area

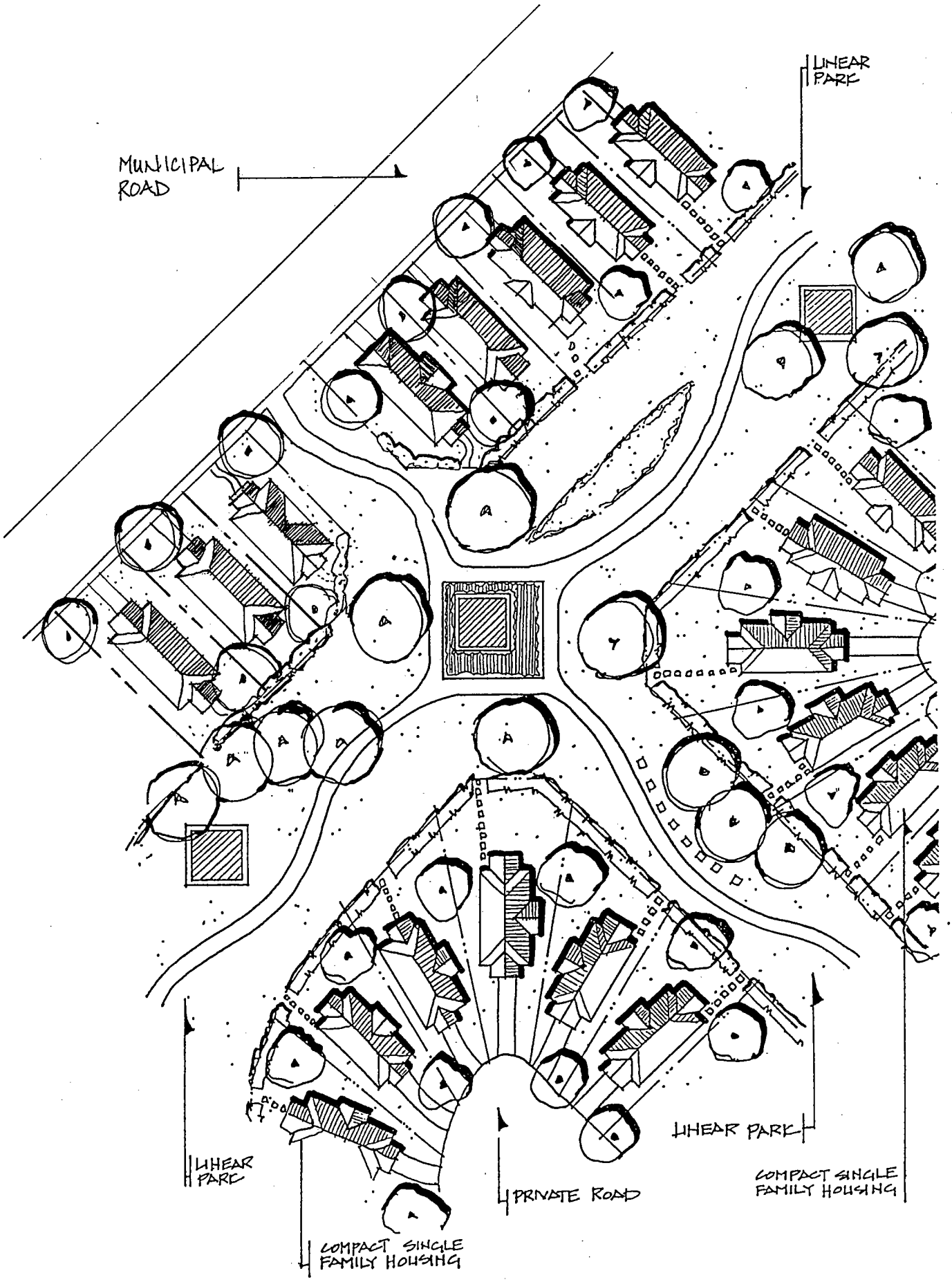
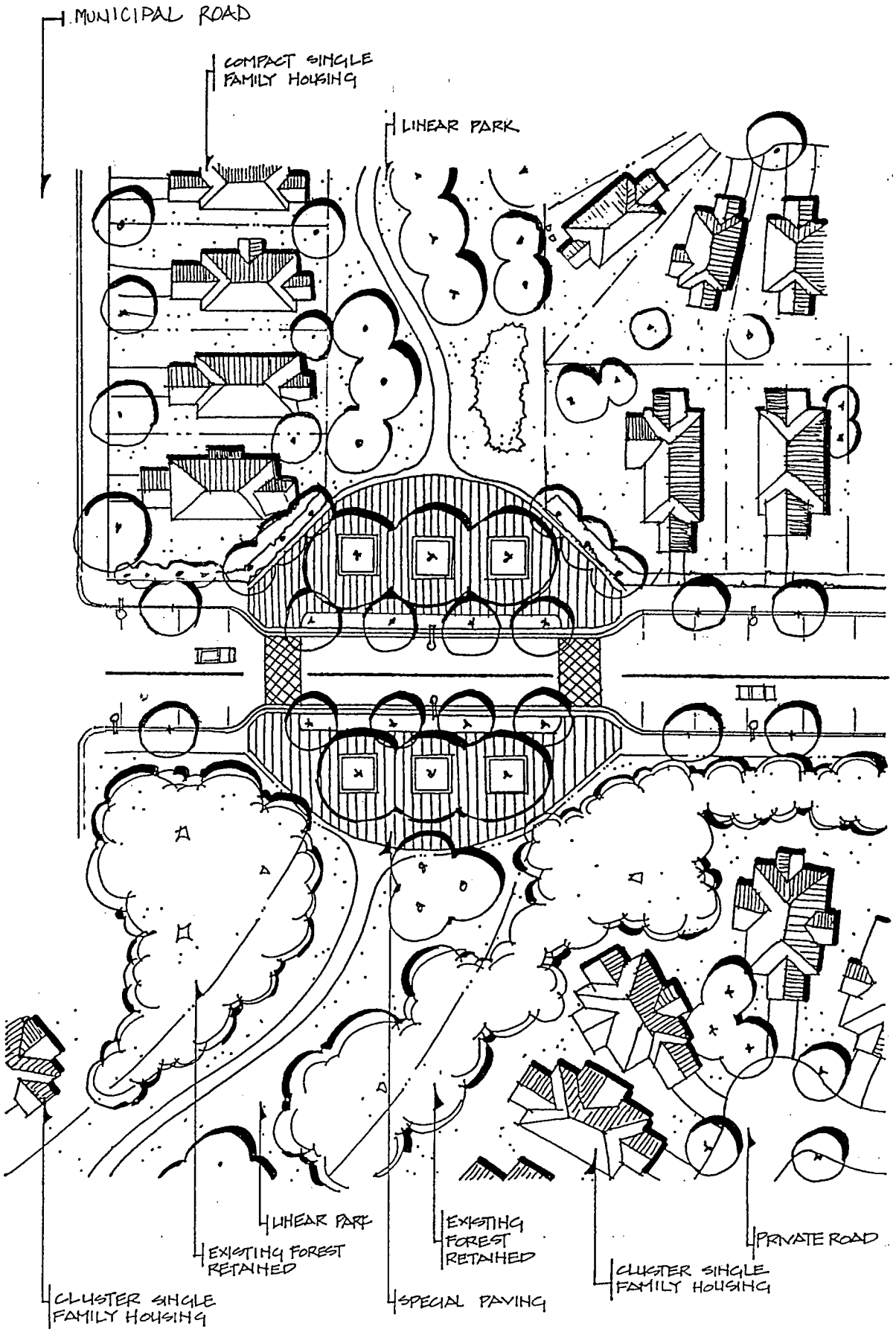


Figure 2.9

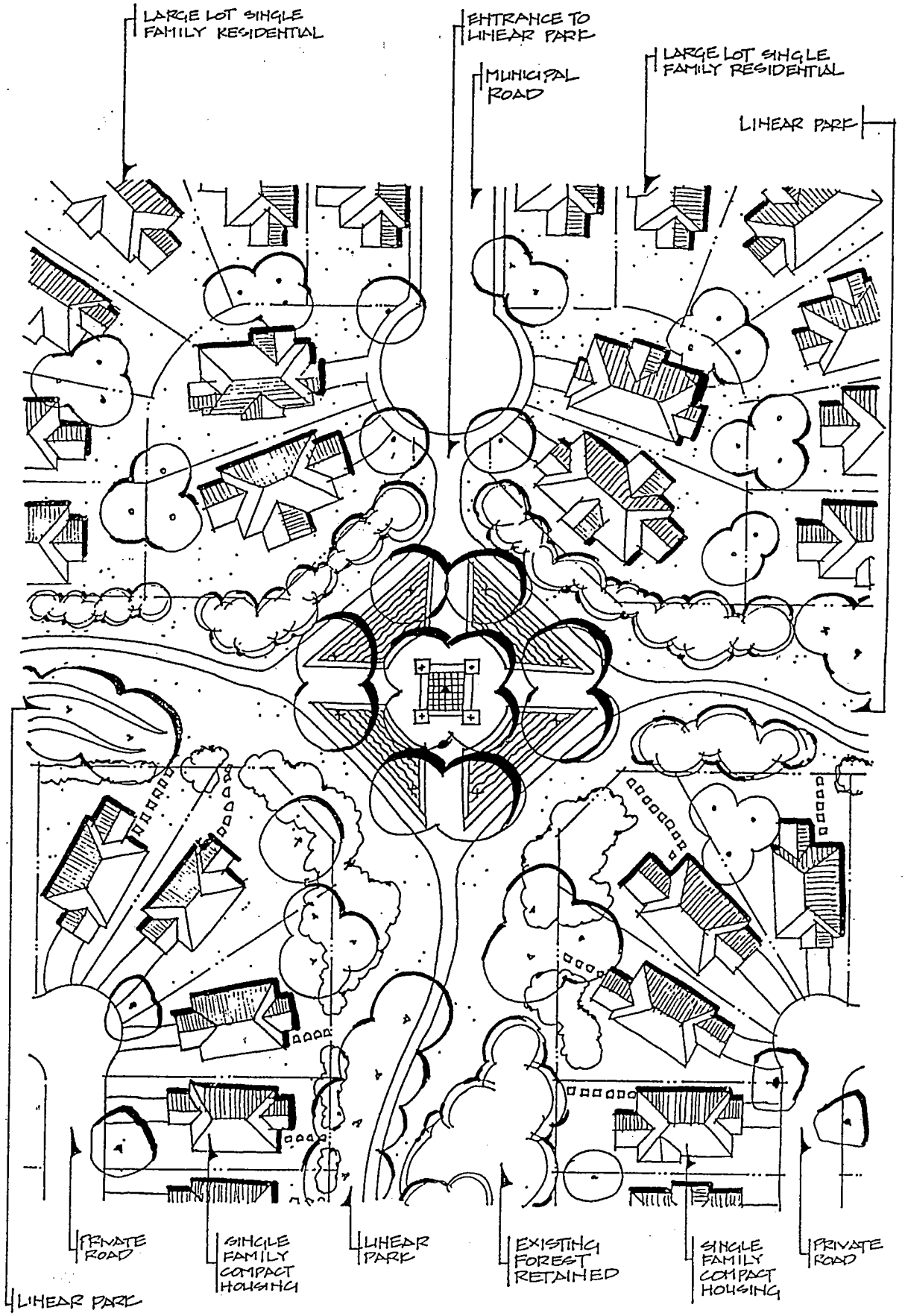
(D) Linear Park Urban Feature Area

Conceptual Plan



(E) Linear Park Crossing of 36th Avenue **Figure 2.10**

Conceptual Plan



(F) Linear Park Northern Feature Area

Conceptual Plan

Figure 2.11

Objectives

Objectives for the linear park are as follows:

- To provide pedestrian linkages between the northern, central and southern portions of the neighbourhood;
- To provide a strong central spine for the neighbourhood; and,
- To establish points of interest including pedestrian crossroads areas and the retention of existing trees.

Policies and Guidelines

The following policies and guidelines apply to the linear park:

- Linear park shall have an average width of approximately 30 metres (100 feet);
- Where existing stands of trees are located within the linear park, they shall be retained as special features;
- Near the proposed Village Neighbourhood Commercial Centre, the linear park shall include pedestrian paths and landscaping to function as an urban pedestrian street;
- An open space plaza with a pedestrian orientation shall be provided within the linear park in the vicinity of the Village Neighbourhood Commercial Centre;
- Linear park shall be designed to safely accommodate pedestrians and bicyclists;
- Special setback policies shall be applied to development which front the linear park, to encourage siting of buildings close to the linear park;

- Use of fences along property boundaries abutting the linear park shall be limited, in order to create a sense that adjacent residential units have their "eyes on the park" therefore providing for a safer space;

- Fronting of door access and walkways onto the linear park is encouraged for units abutting the linear park;

- Linear park shall be designed to provide safe and barrier free pedestrian movement for children, seniors, physically challenged persons and other pedestrians;

- Design, surface materials and landscape treatment of the linear park shall create a smooth transition between the private (residential) and public (park) realms; and,

- The linear park shall connect to all major activity centres within the neighbourhood including the proposed Village Neighbourhood Commercial Centre, schools, parks, trails and major roads, to provide residents with the opportunity to use the linear park as a pedestrian street and a main access to some residential units.

2.3.2 Neighbourhood Parks

Consistent with the LAP, the NCP proposes two neighbourhood parks within the Rosemary Heights Central neighbourhood. These parks are located adjacent to the two proposed elementary schools, as shown in Figure 2.7.

The western park has an area of approximately 2.2 hectares (5.43 acres), and is configured to accommodate one playing field and one ball diamond.

The eastern park has an area of approximately 2.4 hectares (5.85 acres), and is also configured to accommodate one playing field and one ball diamond.

Objectives

Objectives for the neighbourhood parks are as follows:

- To provide active park facilities for residents of Rosemary Heights;
- To provide park facilities adjacent to the proposed elementary schools; and,
- To provide linkages between the neighbourhood parks and the pedestrian circulation system.

Policies and Guidelines

The following policies and guidelines apply to the neighbourhood parks:

- Neighbourhood parks shall be developed with active park facilities including playing fields and ball diamonds;
- Frontage of neighbourhood parks onto roads shall be minimized;
- Neighbourhood parks shall integrate with adjacent elementary school facilities and the pedestrian circulation system; and,
- Neighbourhood park facilities shall be designed to minimize impacts to adjacent residential units.

2.3.3 Nicomekl River Riparian Zone and Natural Areas

An environmental assessment was undertaken and identified a significant riparian forest adjacent to the southern banks of the Nicomekl River. This riparian forest is identified in Figures 2.1 and 2.7 and encompasses approximately 11.5 hectares (28.41 acres) of land.

The environmental assessment classified this zone as having high environmental sensitivity. Criteria outlined in the BC Ministry of Environment Lands and Park's "Land Development Guidelines for Protection of Aquatic Habitats" recommend that no development other than walking trails, limited community amenities and some public utilities shall be permitted within high sensitivity riparian zones.

In addition to the riparian forest area, the environmental assessment identified stands of mixed upland forest contiguous with the riparian forest as having either high or medium environmental sensitivity. Property owners have identified some of these forest areas, primarily in the vicinity of 36th Avenue between the proposed ring roads, as features which should be preserved and incorporated into the open space system.

Objectives

The following objectives apply to the Nicomekl River riparian forest area and other natural areas:

- To incorporate significant natural areas into the open space system; and,

- To protect areas that possess high environmental sensitivity and other significant natural features by designating these areas for open space purposes.

Policies and Guidelines

The following policies and guidelines apply to the Nicomekl River riparian forest area and other natural areas:

- Nicomekl River riparian forest area shall not be developed with uses other than walking trails, limited community amenities and some public utilities, subject to approval by the BC Ministry of Environment. Development is not to occur within that portion of the riparian forest between the natural boundary of the Nicomekl River and the top-of-bank;.

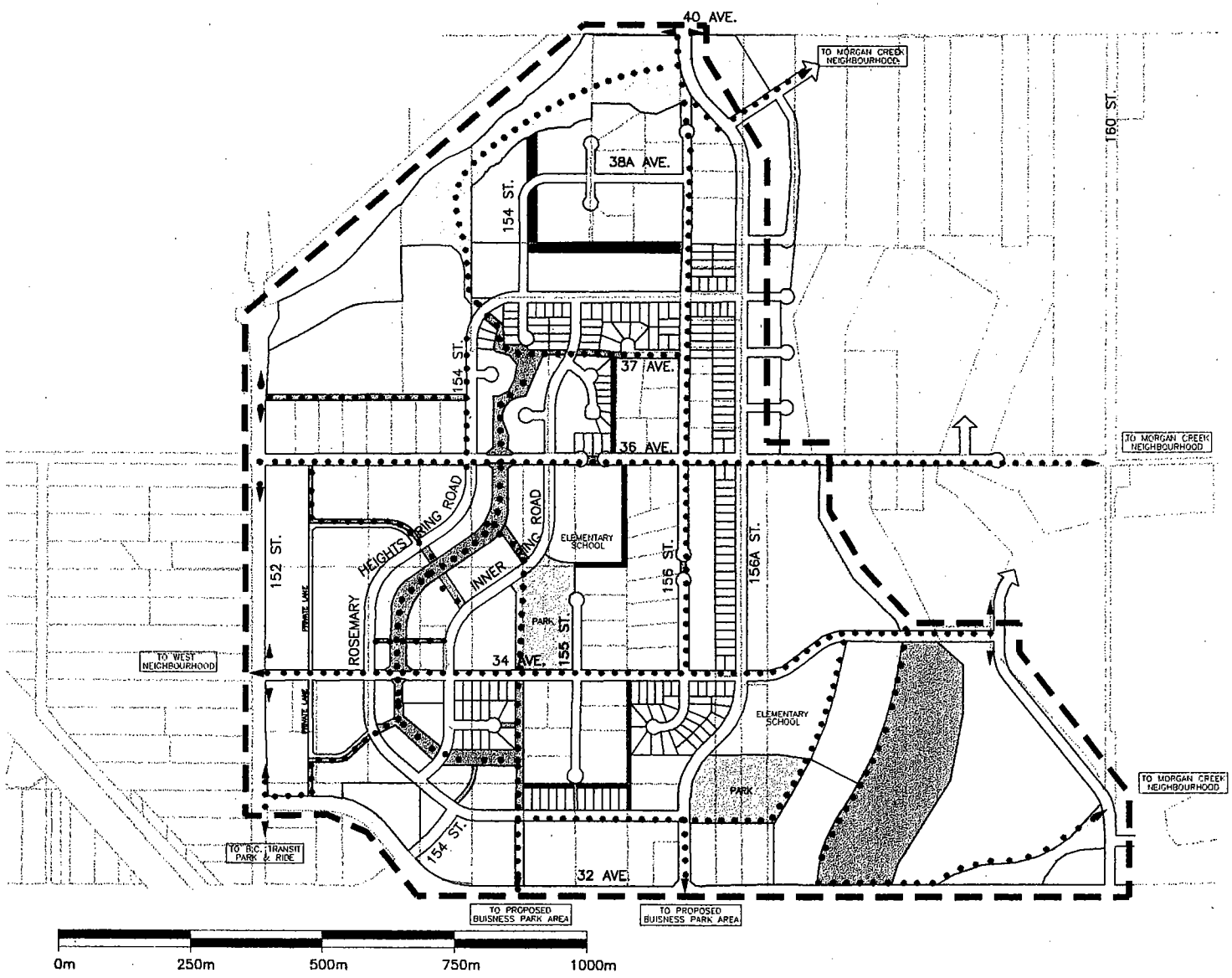
- Where public open space features are developed in the Nicomekl River riparian forest, an assessment of their impacts shall be undertaken by an accredited professional biologist. Impacts are to be mitigated to the fullest extent possible, with unmitigable impacts offset by compensation works that sustain the functional capacity of the forest for fish and wildlife; and,

- Where existing vegetation of the mixed upland forest contiguous with the riparian forest is located within the proposed linear park, it shall be retained as a special feature. Residential development adjacent to these features are encouraged to be clustered in order to retain additional trees in these areas.

2.3.4 Pedestrian Linkages

Consistent with the LAP, the NCP proposes a number of pedestrian linkages between major roads, public transit facilities, the proposed linear park and higher density residential development. These linkages are shown on the Pedestrian Circulation Plan (Figure 2.12).

In some cases these linkages are not directly associated with the road system while in others, they are parallel to the road system such as along 34th and 36th Avenues. An example of walkways which integrate with the street is shown in Figure 2.13. In both cases, pedestrian linkages play an important role in providing various connections in the pedestrian circulation system.



ROSEMARY HEIGHTS

PROPOSED NEIGHBOURHOOD CONCEPT PLAN

PARKS & OPEN SPACE AND PEDESTRIAN CIRCULATION PATH

FIGURE 2.12

- ACTIVE PARKS
- LINEAR PARKS
- RIPARIAN OPEN SPACE
- GOLF COURSE
- BUFFERS
- PEDESTRIAN ROUTES

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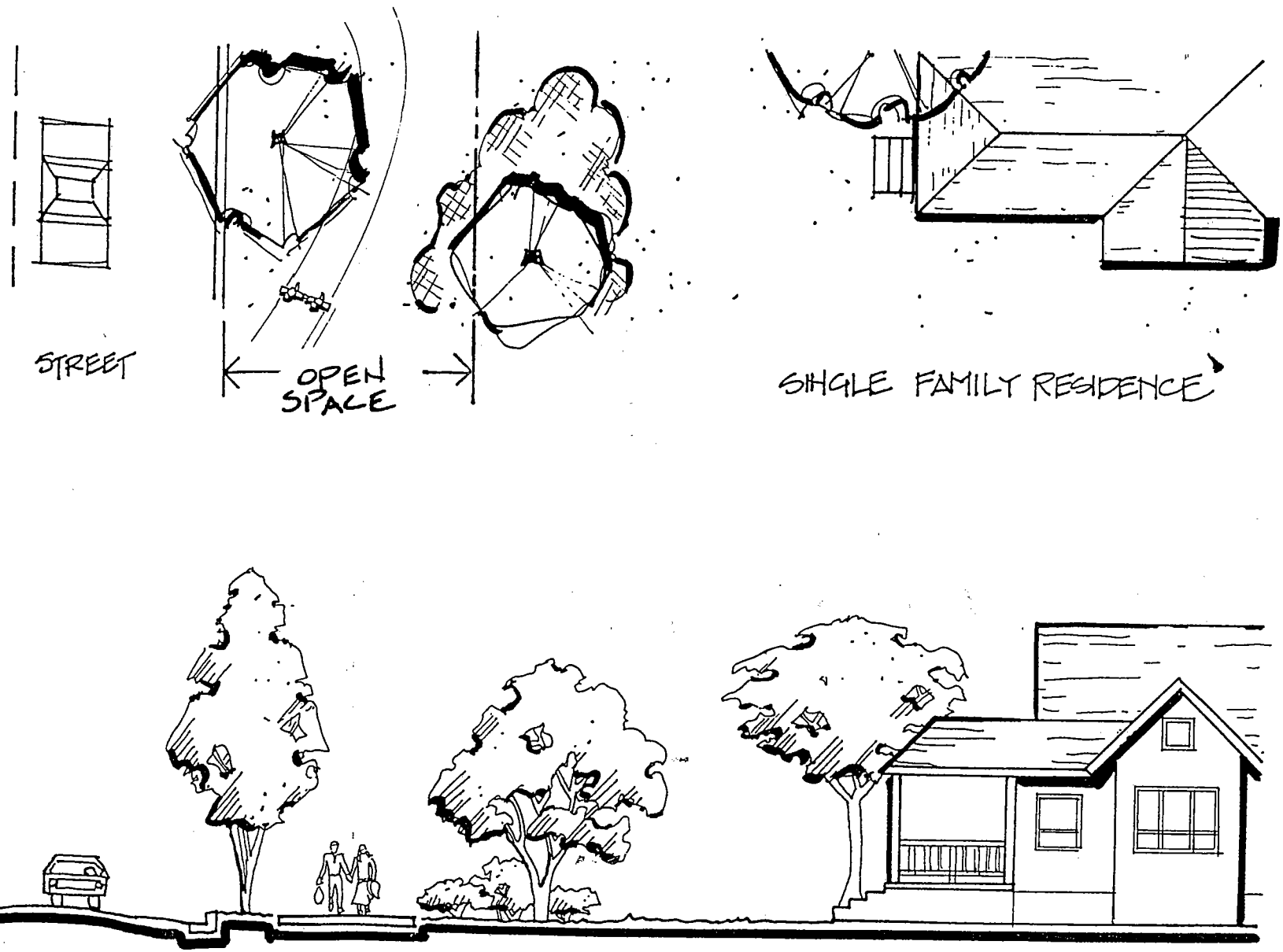


Integration of Pedestrian Open Space with Street **Figure 2.13**

Conceptual Plan

Objectives

The following objectives apply to the pedestrian linkages:

- To provide pedestrian linkages between major roads, public transit facilities, the proposed linear park, neighbourhood parks and higher density residential development; and,

- To enhance the pedestrian circulation system.

Policies and Guidelines

The following policies and guidelines apply to the pedestrian linkages:

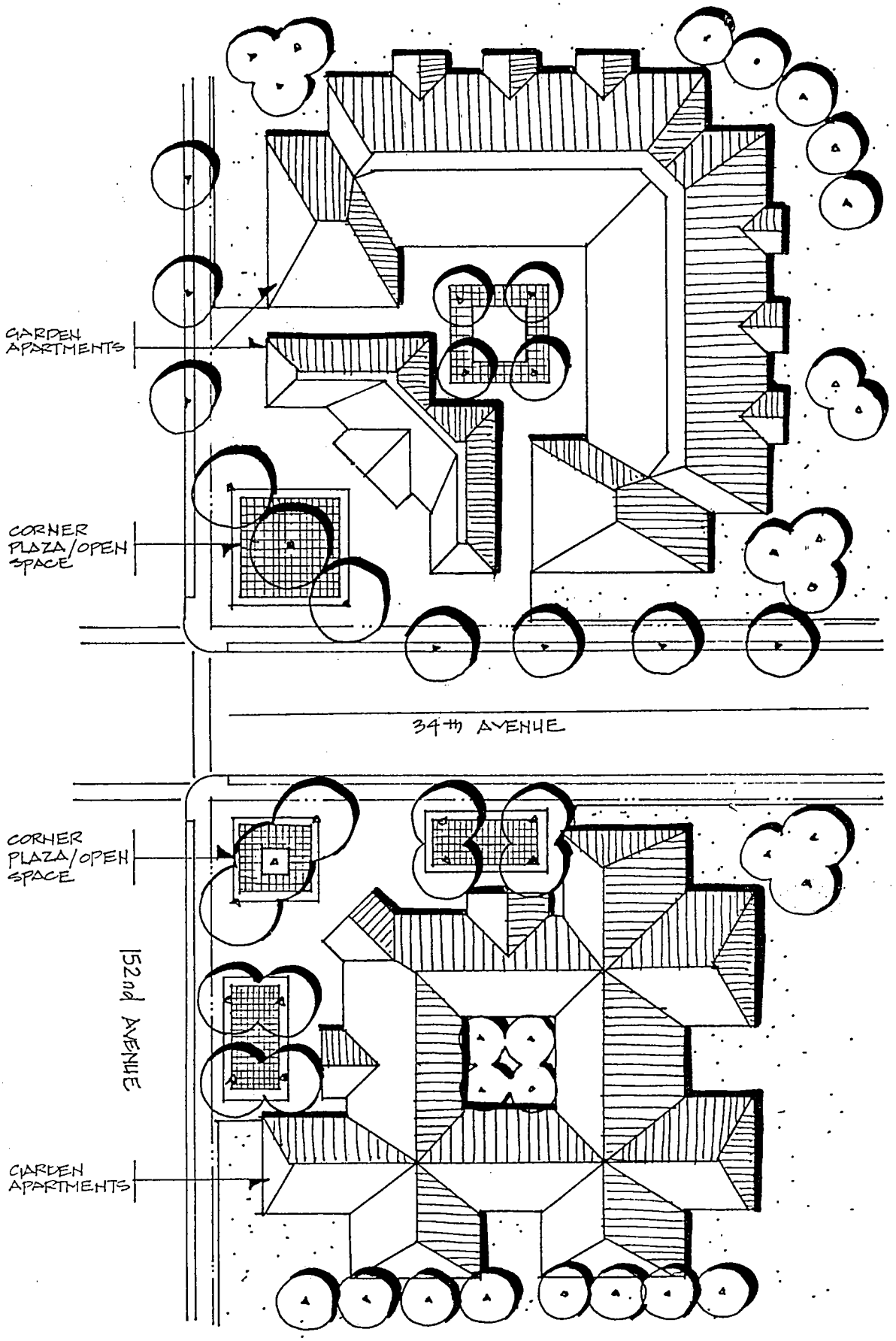
- Pedestrian linkages shall be designed to minimize impacts to adjacent residential units;

- Pedestrian linkages shall be designed to provide safe and barrier free pedestrian movement for children, seniors, physically challenged persons and other pedestrians.

2.3.5 Continuous Landscape Strip and Gateways Along 152nd Street and 32nd Avenue

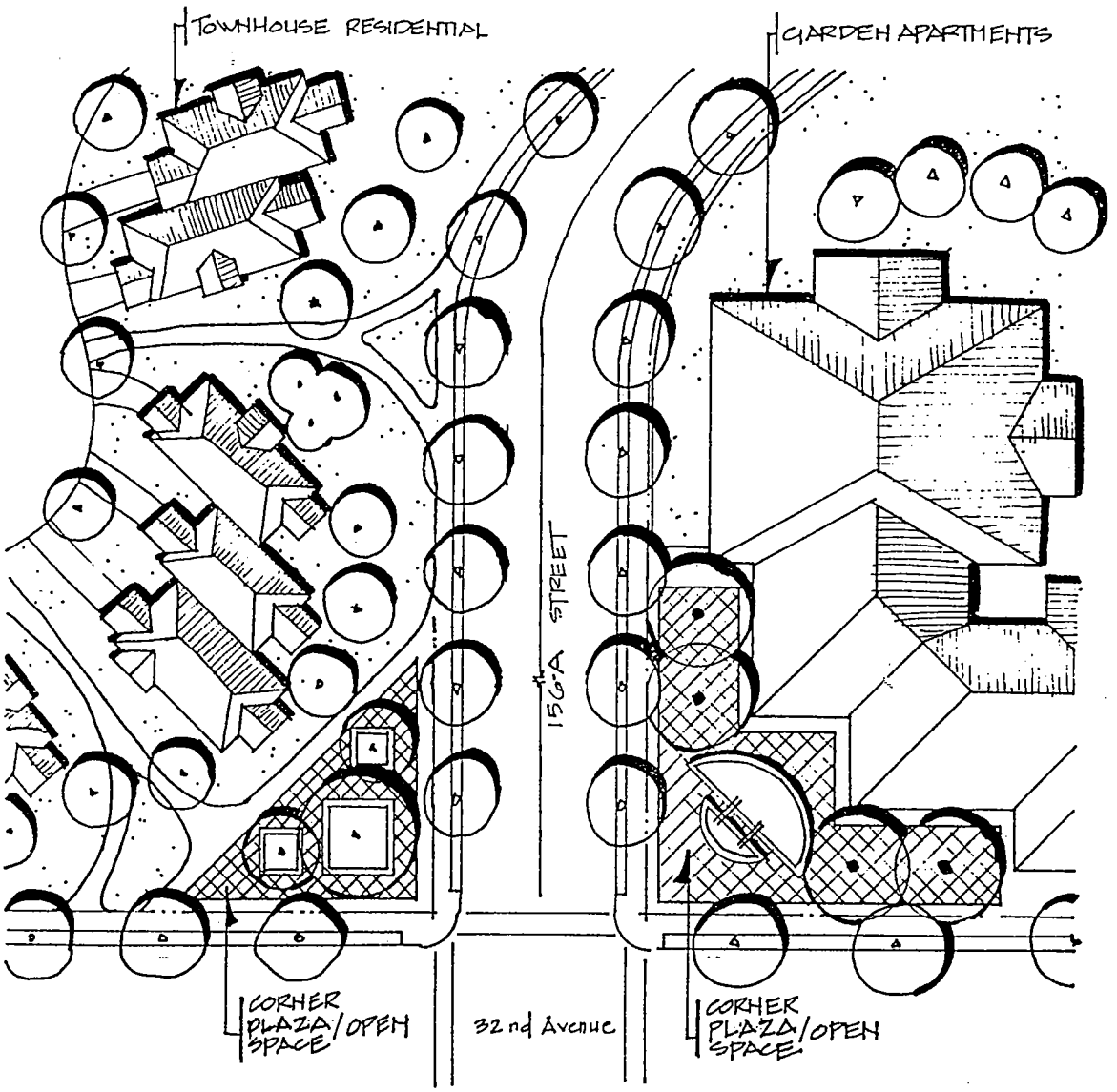
Consistent with the LAP, the NCP proposes that a continuous landscaped buffer strip, including berms, be implemented along 152nd Street and 32nd Avenue to minimize visual and noise impact on adjacent residential uses and improve the streetscape along these arterial roads. This buffer strip would be located on private property within the required building setback area, and would be maintained by the private development.

The NCP proposes that the two primary entrances to the neighbourhood be designed to function as gateways. These two primary entrances include 34th Avenue at 152nd Street and the proposed 156A Street at 32nd Avenue. Examples of proposed gateway treatments for these entrance points are illustrated in Figures 2.14 and 2.15.



A 34th Avenue Gateway to Neighbourhood **Figure 2.14**

Conceptual Plan



(B) 156A Street Gateway to Neighbourhood **Figure 2.15**

Conceptual Plan

Objectives

The following objectives apply to the continuous buffer strip and gateways along arterial roads:

- To provide a buffer between arterial roads and adjacent residential development; and,
- To establish entrance gateway points to the neighbourhood at 34th Avenue/152nd Street and the propose 156A Street/32nd Avenue intersection.

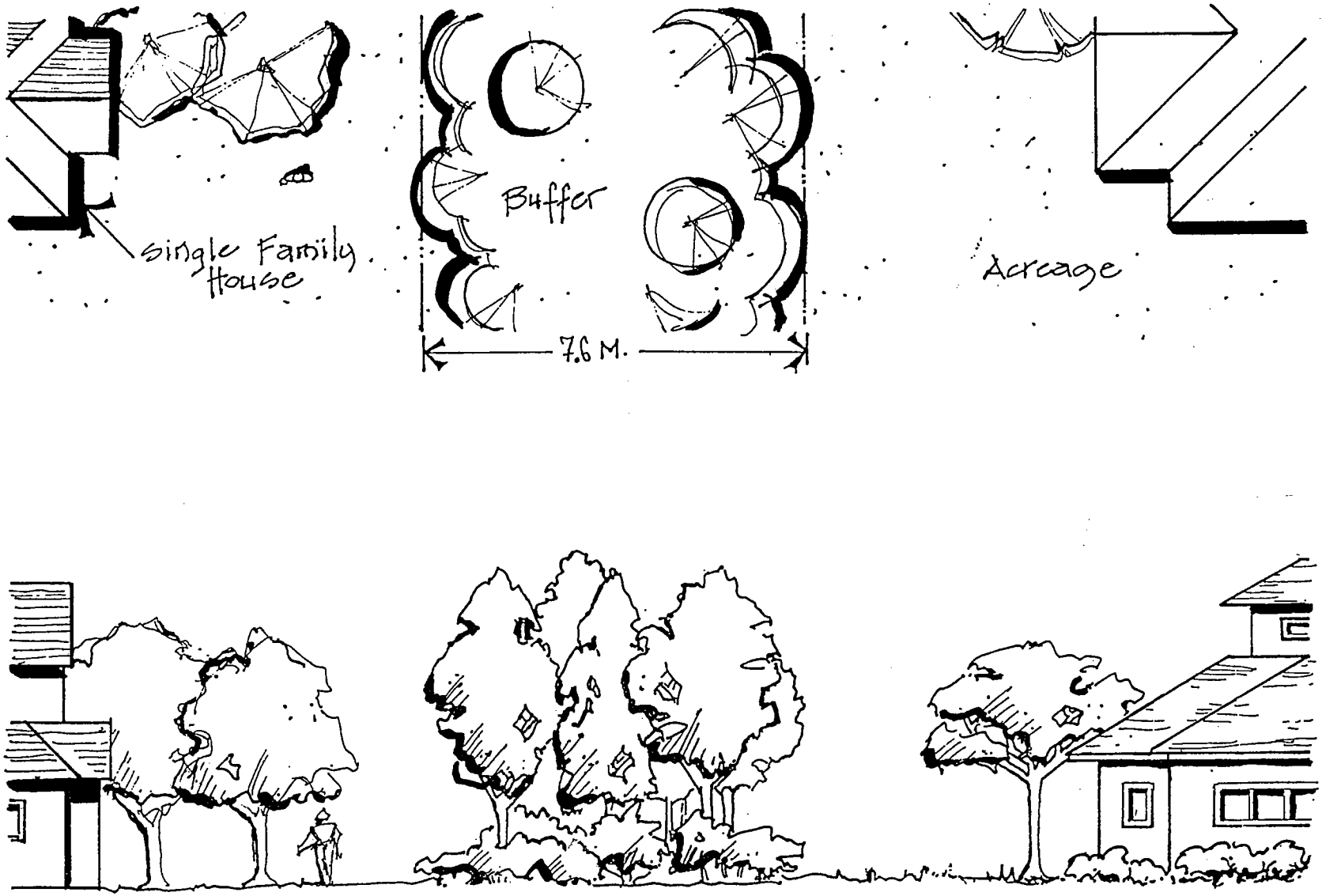
Policies and Guidelines

The following policies and guidelines apply to the continuous buffer strip and gateways along arterial roads:

- Continuous landscaped buffer strip shall be planted within the building setback area (on private property) of developments along 152nd Street and 32nd Avenue;
- Landscape buffer strip shall be owned and maintained by the development on the private property on which it is located; and,
- Residential development on the corners of 152nd Street/34th Avenue and the proposed 156A Street/32nd Avenue shall be designed to provide inviting gateways to the neighbourhood by incorporating open space pedestrian plazas and other techniques.

2.3.6 Buffer Areas

The LAP and this NCP identify buffer areas between existing one acre single family residential properties and proposed urban uses. These buffer areas are identified in Figure 2.7, and encompass approximately 1.3 hectares (3.2 acres) of land. An example of the buffer proposed west of existing one acre parcels along 156th Street, between 36th and 37th Avenues is illustrated in Figure 2.16.



Example of Buffer Area **Figure 2.16**

Conceptual Plan

Objectives

The following objective applies to buffer areas:

- To provide a buffer and transition between low density suburban residential uses and higher density uses.

Policies and Guidelines

The following policies and guidelines apply to buffer areas:

- Buffer areas shall not include pedestrian pathways and shall not be available for public use and access;

- Buffer areas located west of existing one acre residential parcels along 156th Street, between 34th and 36th Avenues (as shown in Figure 2.7), would have a width of 7.6 metres (25 feet) and would be located on publicly owned property as part of the elementary school site. Buffers in this location would be maintained by the School District;

- Buffer areas located east and south of existing suburban residential parcels along 155th Street, south of 34th Avenue (as shown in Figure 2.7), would have a width of at least 7.6 metres (25 feet) and would be located on the private property of undeveloped parcels adjacent to the existing suburban residential parcels. Buffers in this location would be privately maintained;

- Buffer areas located west of existing one acre residential parcels along 156th Street, between 36th and 37th Avenues (as shown in Figure 2.7), would have a width of 7.6 metres (25 feet) and would be located on the private property of undeveloped parcels adjacent to the existing suburban residential parcels. Buffers in this location would be privately maintained;

- Buffer areas located south of existing suburban residential parcels along 38A Avenue and west of proposed Suburban One Acre Residential uses located east of 154th Street (as shown in Figure 2.7), would have a width of 19.8 metres (65 feet) and would be located on

the private property of undeveloped parcels adjacent to the existing suburban residential parcels. Buffers in this location would be privately maintained.

2.4 Transportation and Mobility System

2.4.1 Introduction

The road network is the core of the transportation system. Unlike many other communities, however, the road network in Rosemary Heights is considered a *multi-use* facility, which will accommodate not only automobiles, but also buses, cyclists, pedestrians, carpools and vanpools, and commercial vehicles delivering goods and services. This distinction is important — by designing the road network to accommodate all modes of travel, the overall efficiency of the transportation system is optimized, and the total cost of transportation facilities is minimized.

2.4.2 Objectives

The key objectives in developing the road network within the Rosemary Heights Central Neighbourhood include:

- **Establish redundancy in the road system, which means that for any given trip (a short walking trip or a longer-distance trip by automobile), there are several possible routes.** In a "typical" suburban development, on the other hand, there are often few routes into and out of a neighbourhood, with the result that traffic is concentrated at access points, which increases the size of intersections and results in congestion and delays. In a redundant road network, traffic is dispersed across the road network, minimizing the potential for large, congested intersections and avoiding delays.

- **Direct access to the neighbourhood centre, for both internal and external trips.** For internal trips (which begin and end within the neighbourhood), the network of collector roads, local streets and greenways provides direct access to the neighbourhood commercial centre. For external trips (which begin or end outside the neighbourhood), collector roads provide direct access to the neighbourhood centre from the arterial road network.

- **Protection of the neighbourhood from through traffic.** The most effective means of preventing significant volumes of short-cutting traffic from travelling through the neighbourhood is to ensure that traffic operates efficiently on the arterial road network on the perimeter of the neighbourhood. The *Rosemary Heights Major Road Network Study* has identified improvements to the arterial road network to ensure that traffic generated by Rosemary Heights development and regional traffic on the arterial roads can be accommodated without significant delays or congestion. As a result, there will be no incentive for non-Rosemary Heights residents to short-cut through the Rosemary Heights Central Neighbourhood.

  As a further means of protecting the neighbourhood from the negative impacts of traffic, measures have been incorporated to "calm" traffic in the neighbourhood commercial area, and elsewhere on 34th Avenue, where pedestrian and cycling activity will be relatively high.

- **Facilities for cyclists and pedestrians.** All roads within the Rosemary Heights Central Neighbourhood will be designed to safely accommodate cyclists and pedestrians. On arterial and collector roads, cyclists will be accommodated by wide curb lanes or marked bicycle lanes, which permit an automobile and a bicycle to comfortably share the lane without the automobile having to cross the line into the next lane. On local roads, bicycles can comfortably share the roadway with automobiles due to low traffic volumes. On all roads, sidewalks will be provided for pedestrians. A network of greenways/pathways will complement these on-street facilities.

- **Efficient transit operation.** The road network in Rosemary Heights will enable transit services to operate within 400m walking distances of almost all dwelling units and the neighbourhood centre.

2.4.3 Relationship to the LAP

Using the Rosemary Heights LAP as a basis for planning, the road network and transportation system were developed in more detail as land use plans were developed. The significant enhancements to the Rosemary Heights Central Neighbourhood road network — as compared to the LAP road network — include:

- Realignment of the proposed collector road located east of 156th Street (named 156A Street for planning purposes), between 36th Avenue and 40th Avenue and south of 34th Avenue;
- Realignment of the Rosemary Heights Ring Road in the northern portion of the neighbourhood;
- Retention of the Rosemary Ring Road in the northern portion of the neighbourhood;
- Retention of the present alignment of 36th Avenue but closing the street to through traffic by developing two cul-de-sacs;
- Retention of the present alignment of 34th Avenue rather than closing a section between the ring roads as proposed in the LAP; and
- Implementation of traffic calming techniques to manage traffic within the neighbourhood and reduce the amount of through traffic and moderate speeds on 34th Avenue.

2.4.4 Description of Road Network

The proposed road network for the Rosemary Heights Central Neighbourhood is illustrated in Figure 2.17 and is described below.

Road Classifications

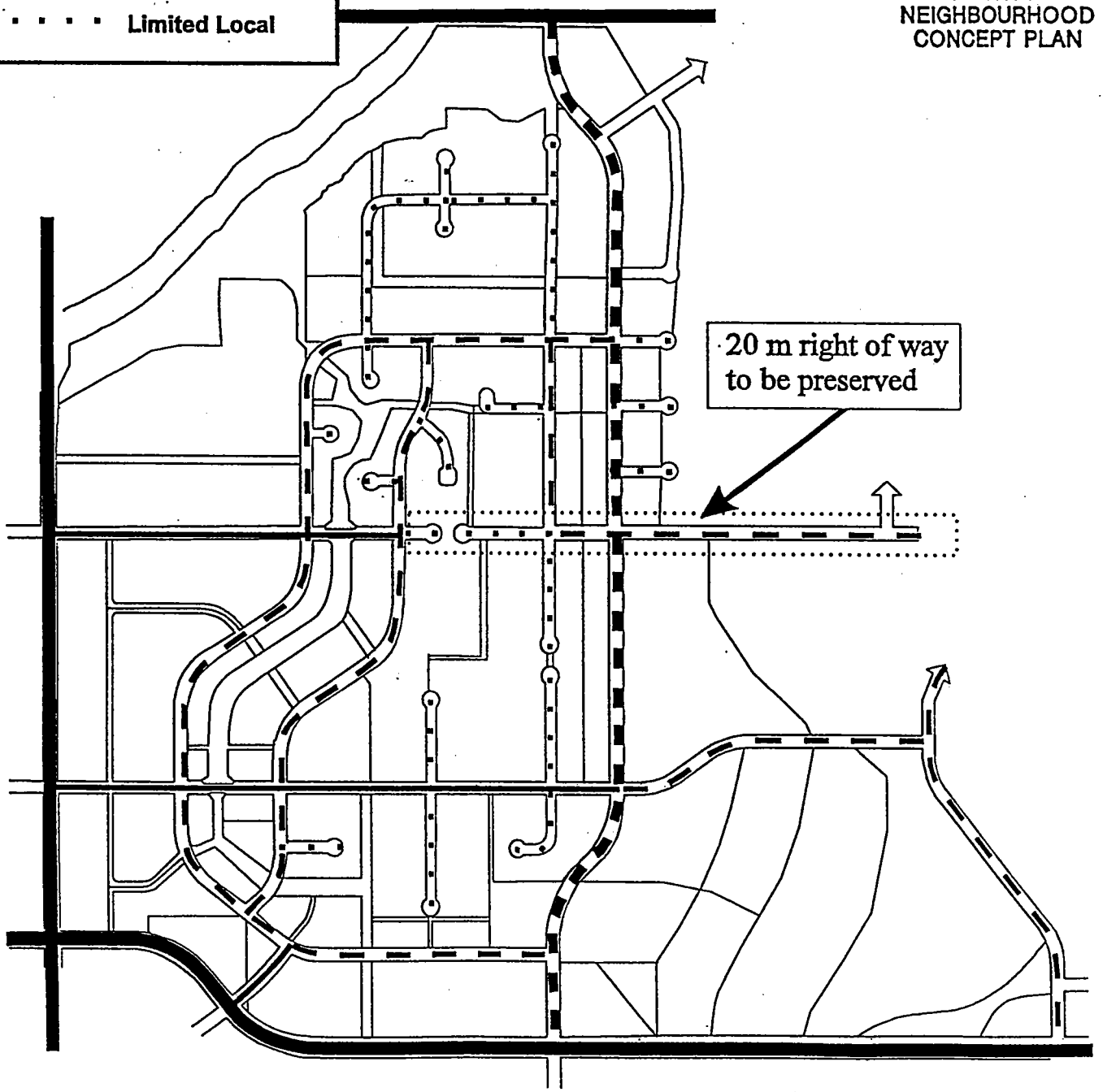
The key characteristic of the road network is a *hierarchy of roads*. Within and adjacent to the Rosemary Heights Central Neighbourhood, roads are classified as provincial highways, arterial roads, collector roads and local streets, as described in the table in Figure 2.17 and described in Table 2.1 (on following pages).

Figure 2.17
Road Network

- Arterial
- Major Collector
- Limited Collector
- Through Local
- Limited Local

ROSEMARY HEIGHTS

CENTRAL NEIGHBOURHOOD CONCEPT PLAN



0m 250m 500m 750m 1000m

NOTE: The exact location of the 36 Ave. Cul-de-sac will be determined by the City of Surrey.

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Table 2.1: Road Classifications

Class	Function	Number of Through Lanes in Each Direction	On-Street Parking	Bicycles, Pedestrians
Provincial Highway	Accommodate regional and provincial traffic. No access to adjacent properties.	1 or more.	None	Some restrictions apply.
Arterial Road	Accommodate through traffic. Minimum access to adjacent properties.	1,2 or 3	None	Wide curb lanes and sidewalks, or paved shoulders
Collector Road (limited & major)	Connection between arterials and locals, access to adjacent commercial properties.	1 or 2	One side or both sides	Wide curb lanes, sidewalks, paved shoulders, and bicycle lanes
Local Street	Direct access to adjacent properties. Minimum through traffic.	1	One side or both sides	Shared use of roadway, sidewalks
Lane	Rear access to residential properties, eliminating need for driveways.	n/a	No parking in lanes	Shared use of lane

All design features to be consistent with City of Surrey design criteria and applicable bylaws.

Design Standards

All road design standards incorporated into the proposed road network for the Rosemary Heights Central Neighbourhood are based on the City's current road design standards, as specified in the Surrey Subdivision and Development Bylaw. These are summarized in Table 2.2 on the following page. Key features of these design standards include:

- Collector roads within the Rosemary Heights Central Neighbourhood will be designed to accommodate both motor vehicles and bicycles. Wide curb lanes of 4.25m, as recommended in the City's *Bicycle Blueprint*, will be implemented to allow motor vehicles and bicycles to safely share the road;
- For major collector roads, pavement width of 12.2 metres allows for two travel lanes, one parking lane and two bicycle lanes; and
- On local streets, bicycles would share the roadway with motor vehicles.

Table 2.2: Road Width Specifications.

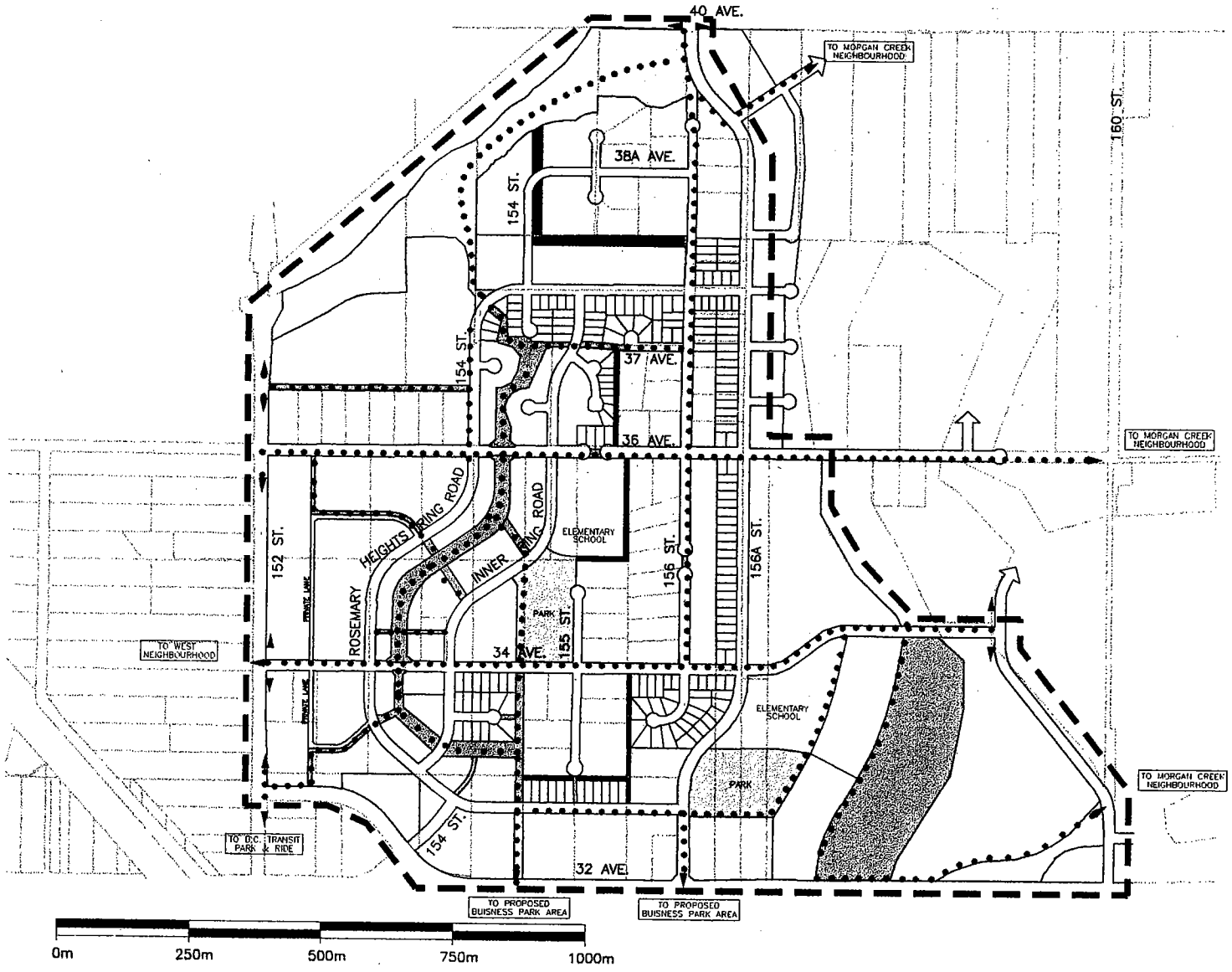
Road Classification	Dedication Width	Pavement Width
Collector Roads - Major - Limited	 22.0m 22.0m	 12.2m 11.0m
Local Roads - Through - Limited - Cul-de-Sac	 20.0 m 16.5m 16.5m	 8.5m 8.0m 8.0m

2.4.5 Pedestrians and Cyclists

Pedestrians and cyclists in the Rosemary Heights Central Neighbourhood would enjoy a wide variety of opportunities for access. The roadway and sidewalk system, combined with a comprehensive pathway system, would provide residents with opportunities for all types of trips (ie. commuting, shopping, recreational, etc.).

Opportunities for pedestrian circulation are illustrated in Figure 2.18. This diagram indicates the predominant flows of pedestrian movement within the neighbourhood. Using both collector and local street sidewalks, as well as the internal pathway system (see Figure 2.18), pedestrians would be able to access all areas of the neighbourhood. Sidewalks along direct collector routes would provide access to key destinations such as commercial areas, schools, transit stops, and parks. The internal pathway system would make use of all available parks and open space, providing a quiet pedestrian environment separated from motor vehicle traffic.

Cyclists would also enjoy a high degree of mobility within the Rosemary Heights Central Neighbourhood. As described earlier, road design standards that accommodate bicycles would be implemented on collector and local roads. Wide curb lanes or bicycle lanes would allow cyclists to travel safely travel throughout the neighbourhood. The internal pathway system would also be designed to accommodate cyclists. Thus, persons



ROSEMARY HEIGHTS

PROPOSED NEIGHBOURHOOD CONCEPT PLAN

PARKS & OPEN SPACE AND PEDESTRIAN CIRCULATION PATH

FIGURE 2.18

- ACTIVE PARKS
- LINEAR PARKS
- RIPARIAN OPEN SPACE
- GOLF COURSE
- BUFFERS
- PEDESTRIAN ROUTES

URBAN SYSTEMS

DATE: OCTOBER 1996 JOB NO.: 6107219.1

who do not feel comfortable cycling on roadways with automobiles would have an alternative route for their trips.

The internal pathway system could also be used by persons other than cyclists or pedestrians. The multi-use pathway concept integrates all types of users including joggers, persons in wheelchairs, dog walkers, and in-line skaters. Not only would the pathway provide a direct route for pedestrians and cyclists, it would also provide residents with additional recreational opportunities.

2.4.6 Transit

BC Transit has not indicated whether any changes to existing local transit services are planned to accommodate future development within the Rosemary Heights Central Neighbourhood. BC Transit staff report that transit planning for the area remains at the conceptual level. Comprehensive service route planning will begin when specific densities and rates of development have been determined.

The proposed Rosemary Heights Central road system allows for future flexibility to provide bus routes throughout the neighbourhood. Potential transit routes through the neighbourhood could potentially travel along 156A Street, 34th Avenue, the Rosemary Heights Ring Road or the Inner Ring Road.

The existing bus route operating along 152nd Street, currently serves the Rosemary Heights area. Pedestrian links to transit on 152nd Street are provided throughout the neighbourhood by means of sidewalks lining collector and local roads, and a comprehensive pathway system (see Figure 2.18). Adequate signage and safety features would be integrated into the design of the linear park and pedestrian pathways to direct people to transit stops and the nearby park and ride facility.

The South Surrey Park and Ride Facility provides additional transit options for Rosemary Heights residents. Located adjacent to the neighbourhood on the west side of 152nd Street, south of Highway #99, this facility would allow Rosemary Heights residents to combine transit with other modes for travel for their commuting trips.

2.4.7 Transportation Strategy

A detailed transportation strategy is described in Section 4 of this report.

2.5 Infrastructure Services

This section presents the broad objectives established for the provision of:

- Storm drainage;
- Sanitary sewer;
- Water supply; and
- Utilities (power, telephone, gas and cable vision).

2.5.1 Objectives

The following objectives apply to the provision of infrastructure services:

- To provide services to the Central Rosemary Heights NCP area which are consistent with the objectives of the LAP and the City's 10 Year Servicing Plan;

- To provide a drainage strategy which complies with the Ministry of the Environment, Lands and Parks and the Department of Fisheries criteria for control of storm water discharge and water quality;

- To provide a stormwater management strategy which accommodates the proposed land uses and meets the ultimate servicing needs for the area;

- To provide a sanitary sewer system to accommodate the proposed land uses which complies with the City's ultimate servicing concept for the area;

- To confirm that the infrastructure plan will be sensitive to environmental concerns and to the implementation of siltation and sediment control measures;

- To provide a trunk grid water system which has the capacity to meet the ultimate demands for both the West Neighbourhood (Sector #1) and the Central Neighbourhood (Sector #2) NCP areas at minimum cost;

- To provide the power, telephone, gas, and cable television utility companies with a development concept for the area with proposed road alignments and land uses which will permit them to plan their systems to meet the projected growth within the area.

2.5.2 Infrastructure Strategies

Detailed strategies for the provision of water, sanitary sewer, stormwater management and other utilities are described in Section 4 of this plan.

3. Development Guidelines

3.1 Introduction

This section describes the design guidelines which will apply to development within the Rosemary Heights Central NCP area.

3.2 Objectives

.1 The main objective of the guidelines is to facilitate the co-ordinated development of an identifiable, well defined, pedestrian friendly residential neighbourhood where a street oriented single family character defines the built environment.

.2 The design guidelines are intended to provide overall direction to achieve the intended neighbourhood character, preserve and enhance natural spaces, encourage pedestrian access to destination areas, facilitate social interaction, and achieve the overall development objectives defined in the final Neighbourhood Concept Plan.

.3 The overall identity and character of the neighbourhood will be largely determined by the appearance of the main streets, bike/pedestrian routes and public spaces used by the local residents. These urban elements also outline the overall image received by visitors to the neighbourhood.

.4 These guidelines focus on design principles that will be applicable through out the neighbourhood. They will facilitate the development of individual sites in a manner that is consistent and co-ordinated with the overall neighbourhood image.

.5 By forming part of the NCP, the guidelines will enable the co-ordinated design of this new neighbourhood by developers and the various City Departments. The guidelines will assist in the evaluation of specific development proposals by providing a reference point

regarding the degree to which they meet the urban design objectives for the neighbourhood in terms of streetscape, public spaces, urban form, and function.

.6 To achieve these objectives, the design guidelines have been formulated to focus on five different development elements, including:

- yards abutting public streets and linear parks,
- trees along streets,
- pedestrian/bike corridors, linkages, and buffers,
- streets, and,
- buildings.

3.3 Design Guidelines for Yards Abutting Public Streets and Linear Parks

.1 General

.1 Yards abutting the street have a strong impact in determining the character and livability of the street. The yards of multiple family sites and single family lots should help to unify the streetscape. The landscaping, definition of yard edges, and design of open areas along public streets should achieve continuity and be complementary.

.2 The following general guidelines are oriented to improve the quality of the streetscape and reinforce the street oriented single family residential character of the Central Neighbourhood of Rosemary Heights.

.2 Continuity of Front Yard Character

.1 To maintain the continuity and the quality of the streetscape, yards of townhouses, cluster or compact housing sites along a public street must be treated and landscaped as front yards of single family lots.

.3 Gates

.1 Gates are not permitted in multiple residential developments. If extenuating circumstances make this enclosure justifiable, gates should be located at the front yard setback line (7.50 m. from the property line), consist of swing doors, and adequate space must be provided in front of the gate for queuing and turn around of vehicles.

.2 Instead of gates, entrance to multiple family sites should consider the use of architectural or landscaping elements which identify the threshold between public and private property. Any minor structure used for this purpose must also be located at the dominant front yard setback line.

.3 A combination of walls, pavement change, landscaped medians, treed boulevards, arbours, trellises, pedestrian gatehouses, feature lighting posts, etc. are recommended for identification of the entrance to multiple residential developments.

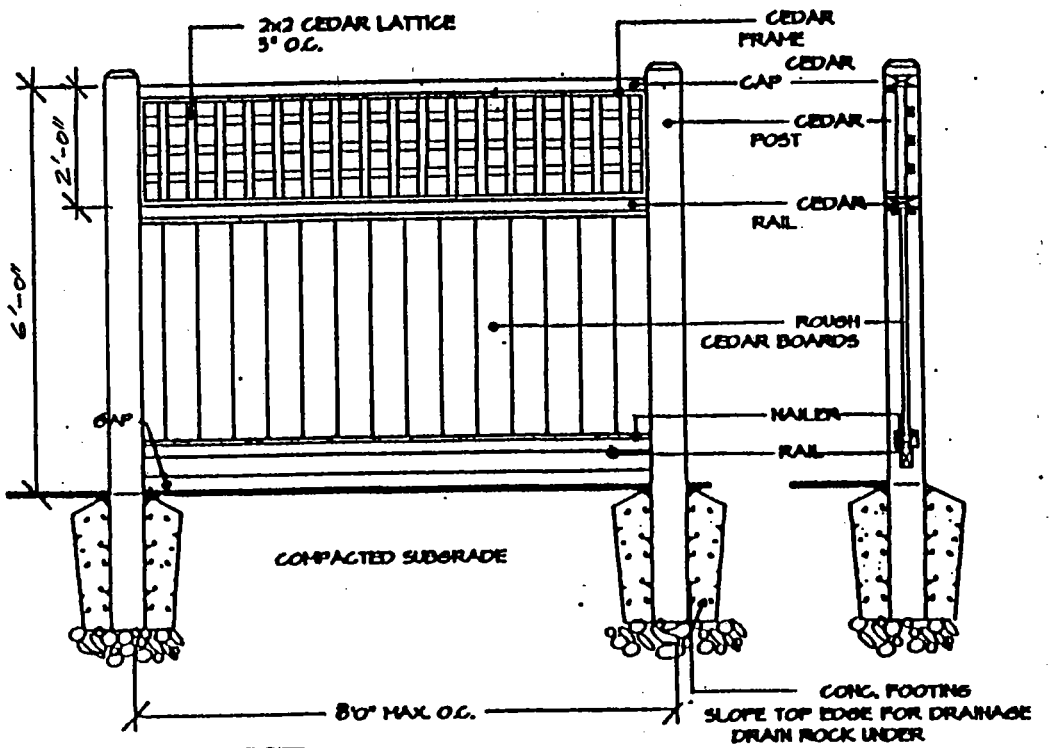
.4 Fences (See Figure 3.1)

.1 No chain link fences will be permitted in Rosemary Heights.

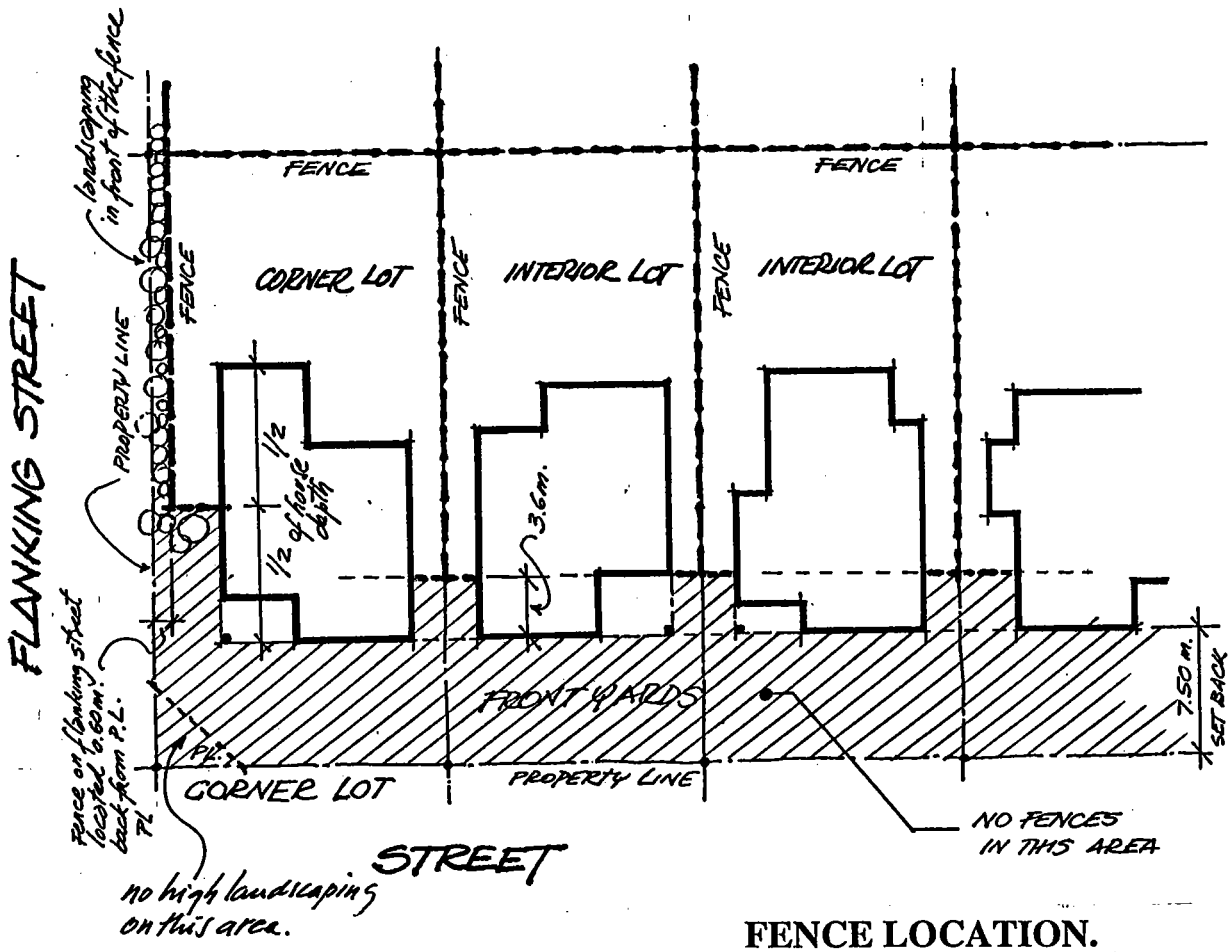
.2 No fences will be permitted in front yard areas of single family lots. Consistency of treatment of yards toward the street should be ensured by the use of shrubs and hedges as a standard boundary definition. This is also applicable to cluster and compact housing sites.

.3 Fences on Single Family Corner Lots

.1 All fences along side property lines abutting a flanking street should start at midpoint of the depth of the house. To maintain adequate sight angles at the intersection, only low landscaping should be planted at the corner of the site.



SIDE AND BACK YARD FENCE



FENCE LOCATION.

Figure 3.1

SF AREAS. LOCATION AND TYPE OF FENCES .

.2 To provide additional area for planting, reinforce overall livability, and improve views of fences along the flanking street, fences along the flanking street of a single family corner lot should not be closer than 0.60 m. from the side property line. This portion of private property between the fence and the property line should be landscaped (shrubs and climbers are suggested).

.4 Fences on Multiple Residential Sites

.1 To maintain the overall single family residential character of the neighbourhood, no fences will be allowed on multiple residential sites. If fences are unavoidable, transparent, low fences (wrought iron, picket fences, three board fences, low stone wall/wrought iron fence combination, etc.) are recommended in combination with landscaping on both sides of the fence.

.2 Continuous, straight fences should provide a 0.60 m. wide space in front of the fence for landscaping on private property. Articulation, with landscaping on both sides of the fence, is recommended as an alternative.

.5 Side and Back Yard Fences

.1 No fence along side and/or rear property lines should be higher than 1.80 m. The upper 0.60 m. of the fence should be latticed (see Figure 3.1).

.2 Fences between lots should not start less than 3.60 m. from the front yard setback. This distance is equivalent to the minimum permitted separation between units.

.6 Fences Along the Central Linear Park

.1 Rear yard fences on lots along this major corridor if required, should be transparent, no higher than 1.20 m., and used in combination with landscaping (wrought iron, picket fences, three board fences, low stone wall/wrought iron

fence combination, etc.) The intent is to increase the overall width of the corridor by *visually* incorporating the landscaping on private lots to form part of the Central Linear Park.

.5 Driveways

.1 To reinforce the pedestrian dominance on the street, achieve the integration/continuity of landscaping on front yards, and allow for boulevards with regularly spaced trees, the following conditions apply to all residential developments:

- In corner lots, the garage driveway should be provided from the secondary street.
- Wherever possible, driveways of single family lots should be paired to increase the spacing of sidewalk interruptions and curb let-downs. Visual separation between individual parallel driveways must be achieved by way of landscaping.
- Continuity of public sidewalk should not be interrupted by the pavement of driveways (sidewalk pavement should be continued across the driveway pavement).
- The use of paving materials other than asphalt and a strong definition of edges is recommended. The driveway should be treated as part of the front yard landscaping.

.6 Driveways/Garages on 156A Street

.1 In the absence of a lane west of 156A Street, the following specific conditions apply:

- Lots at any intersection with 156A Street must have their access driveway located on the secondary street.
- To reduce the number of sidewalk interruptions, driveways should be combined at the curb of the street. Driveways should be paired from the property line into the site.
- No garages doors shall directly front onto the street.
- Garages should be located toward the back or side of the house. A window should be provided on the side of the garage that is visible from the street.

- Wherever possible, habitable rooms should be provided above the garage.
- These provisions should be included in the required registered building scheme.

.7 Service and Parking Areas in Multiple Residential Sites

.1 Recreational vehicle, visitor/common parking areas, garbage container enclosures, satellite dishes, and other service elements should not be visible from a public street. If these structures are to be located toward the street, a 7.50 m. wide landscaped area (equivalent to front yard setback) must be provided toward the street. Shrubs and hedges should be considered to screen direct views to these service areas.

3.4 Design Guidelines for Trees Along Streets

.1 General

.1 Recommended trees along the major neighbourhood streets and trees at the entrances to the neighbourhood are shown in Figure 3.2, "Street Tree Planting Scheme". Recommended species have been chosen from the list of *Replacement Trees* recommended for boulevards as per "Schedule K" of the Tree Preservation Bylaw (No. 12880).

.2 The Parks and Recreation Department should be consulted for specific suggestions regarding pattern, spacing, frequency of species or possible changes to the species of trees recommended along any of the routes identified.

.3 It is desirable that planting of trees on street boulevards takes place after all construction and landscaping in the development area is complete. Monetary contribution for tree planting along the whole street by the City Parks and Recreation Department should be considered as an option.

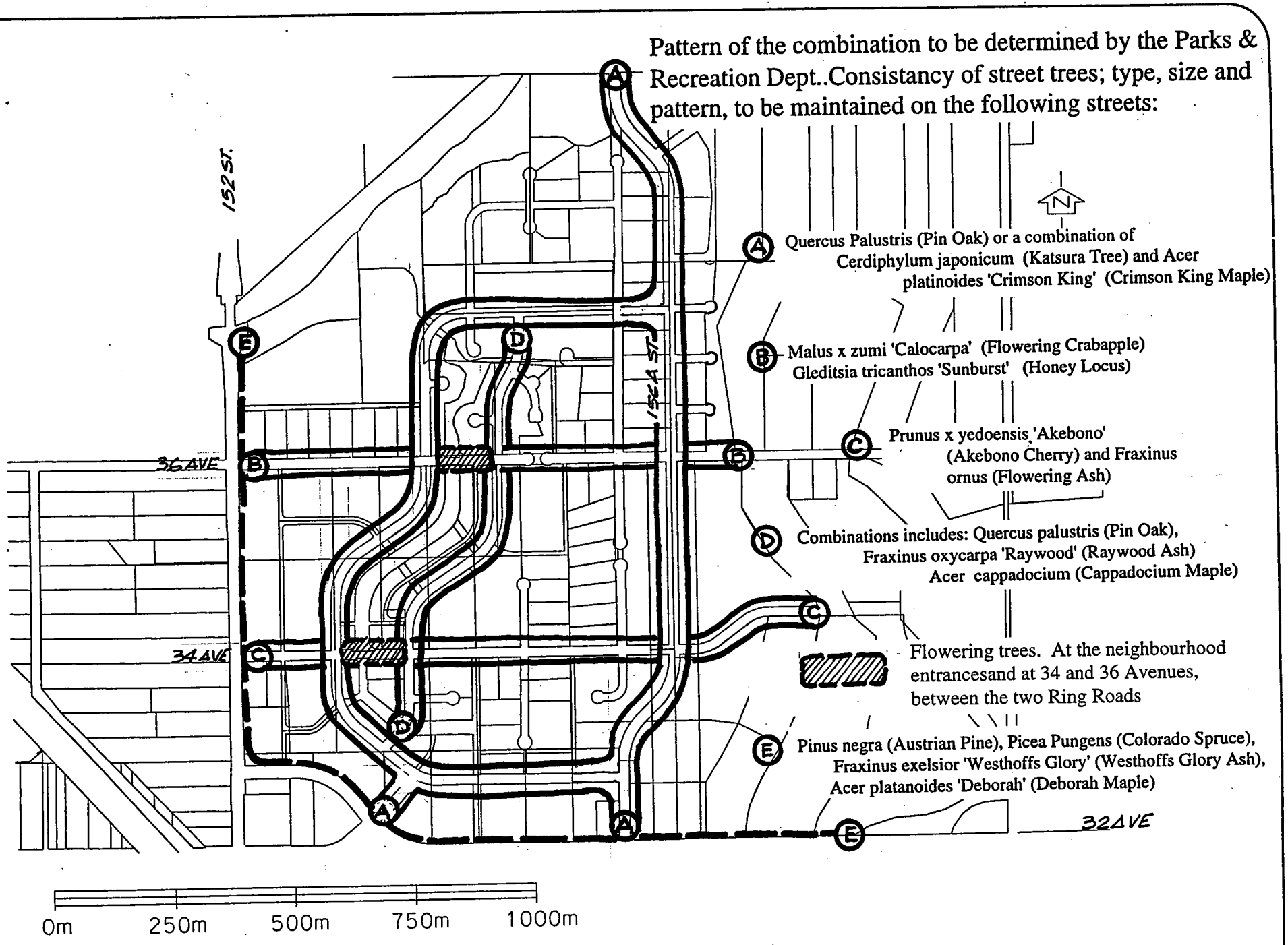


Figure 3.2

RECOMMENDED STREET TREES.

.4 Flowering trees in front yards are recommended to add colour and texture to the streetscape. Recommended trees along the same street include a combination of species in order to provide bio-diversity and to promote tree health by lowering the impact of common pests and diseases.

.5 To enhance the overall quality of the neighbourhood, the site layout design of new developments should retain and incorporate existing large clusters of trees. The "Tree Preservation Bylaw" is applicable to any new development in Rosemary Heights.

.6 Native trees must be retained through careful site planning and/or subdivision design. The publication "Saving Native Trees in the Pacific Northwest" is recommended as a reference on this matter.

.7 Tree planting on boulevards should meet the "Boulevard Tree Planting Standards" developed by Surrey Park Maintenance.

.2 Landscaped Buffer (32 Avenue/152 Street)

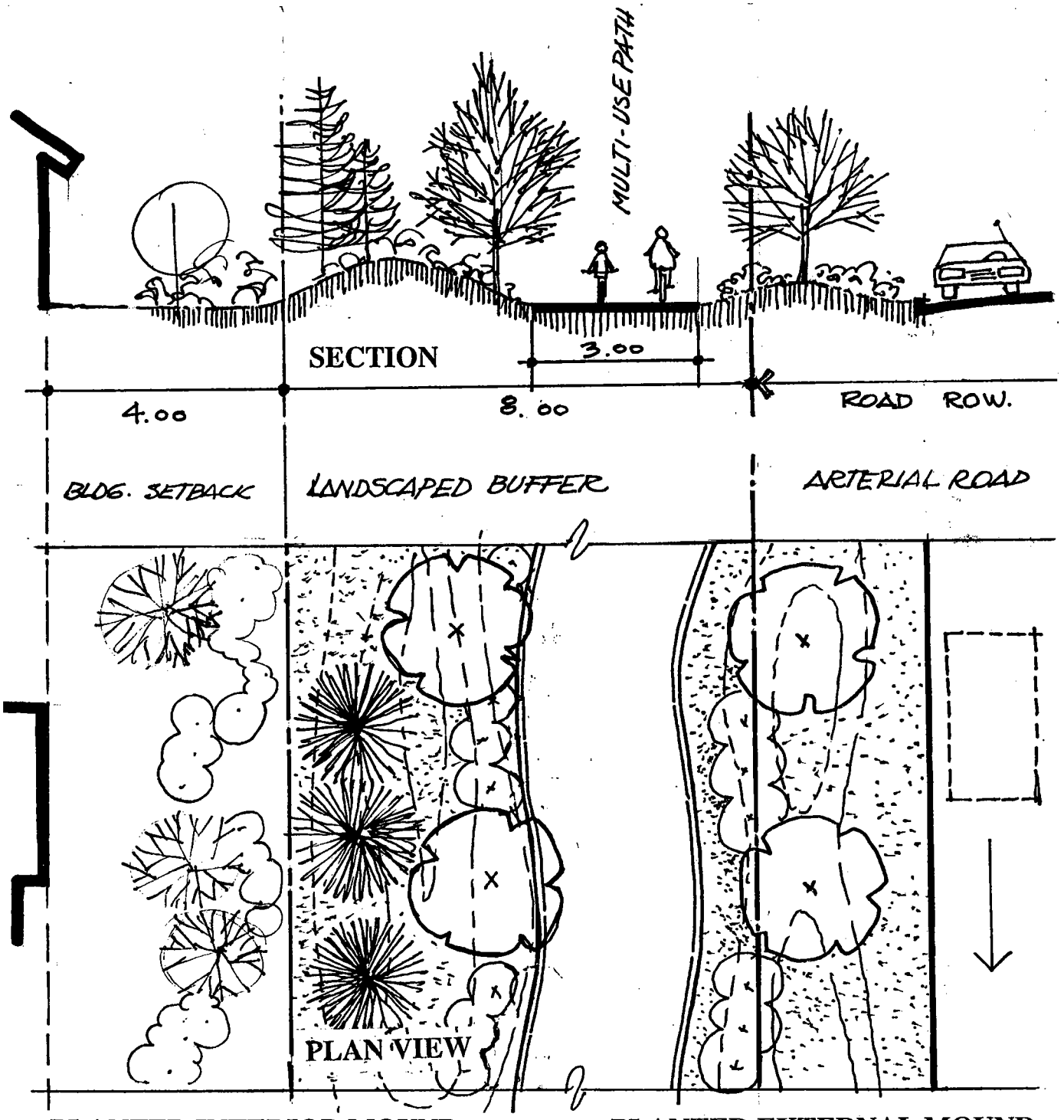
.1 A combination of a mound and landscaping is recommended for this perimeter buffer (See Figure 3.3). A minimum 4.00 m. setback from the buffer is recommended for all buildings along these two arterial roads.

.3 Neighbourhood Entrances

.1 Entrances to the neighbourhood at 36 Avenue and 34 Avenue (from 152 Street), and at 154 Street and 156A Street entrances (from 32 and 40 Avenues) should include a landscaped median (see Figure 3.7).

.4 Spacing of Trees

.1 Continuity and spacing of street trees should be maintained as much as possible. A gradual increase in spacing should be considered to satisfy the required distances to utilities.



PLANTED INTERIOR MOUND

Coniferous:
Pinus Nigra (Austrian Pine)
Picea Pungens (Colorado Spruce)

To be combined with deciduous trees and medium and large shrubs: Photinia, Portuguese Laurel, Barberis or similar.

PLANTED EXTERNAL MOUND

Deciduous:

Fraxinus Exelsior 'Westhoffs Glory' (Westhoffs Glory Ash)
Acer Platanoides 'Deborah' (Deborah Maple)

To be combined with low shrubs: Genista Lidia, Shrub Rose, Rosa Foetida or similar

Figure 3.3

LANDSCAPED BUFFER AND MULTI USE PATHWAY

.5 Caliper

.1 All trees should have a minimum calliper of 6-8 cm., branched at or above 1.3 m. No pruning of the scaffold branches or leader should be undertaken.

.6 Trees on Flanking Streets

.1 Sideyards that are located along flanking streets should be planted with fastigiate trees.

.7 Trees on Private Property

.1 At least two trees per every dwelling unit should be provided. At least one of these trees must be a flowering tree. Flowering trees should be planted on the yard toward the street or on the yard abutting the park where the unit is located along the Central Linear Park.

.2 Tree planting on front yards must be co-ordinated with the tree replacement plan required for every proposed development.

.8 Recommended Flowering Trees

.1 The following are some of the trees recommended for yards toward the street or the Central Linear Park:

- Stewartia (*Stewartia nonadelpha*),
- Ivory Silk Tree Lilac (*Syringa reticutata 'Ivory Silk'*),
- Stag's Horn Sunac (*Rhus typhina*),
- Magnolia (*Magnolia grandiflora*),
- Lavalle Hawthorn (*Crataegus lavallei*), and,
- Smoke Tree (*Cotinus coggygria*).

3.5 Design Guidelines for Pedestrian/Bike Corridors (Multi-use Corridors), Linkages and Buffers

.1 General

.1 These guidelines are applicable to the various components of the bike/pedestrian network (multi-use corridors) that extends throughout the neighborhood. The network provides bike/pedestrian access to community facilities, to the river front and to the City's public transportation corridors, while also offering additional opportunities for passive recreation.

.2 Rosemary Heights Local Pedestrian/Bike (Multi-Use) Network

.1 The design of all multi-use pathways should consider the guidelines contained in the document entitled "Review of Standards for Multi-Use Pathways" and the recommendations on gradients and physical design contained in Section B.1 of the "City of Surrey Bicycle Blue Print."

.2 Lighting of bicycle paths should consider the recommendations contained in the "Bikeway Design Supplement to the Urban Geometric Design Guide for Canadian Roads."

.3 The components of the local multi-use network; corridors, linkages and buffers have been classified in regard to width and local function within the local pedestrian/bike transportation network. The main components of the network are indicated in Figure 3.4.

(Note: *Corridor* refers to the right-of-way of the bike/pedestrian/linear open space network (multi-use corridors). *Path or pathway* refers to the paved surface for walking/biking contained within the corridor).

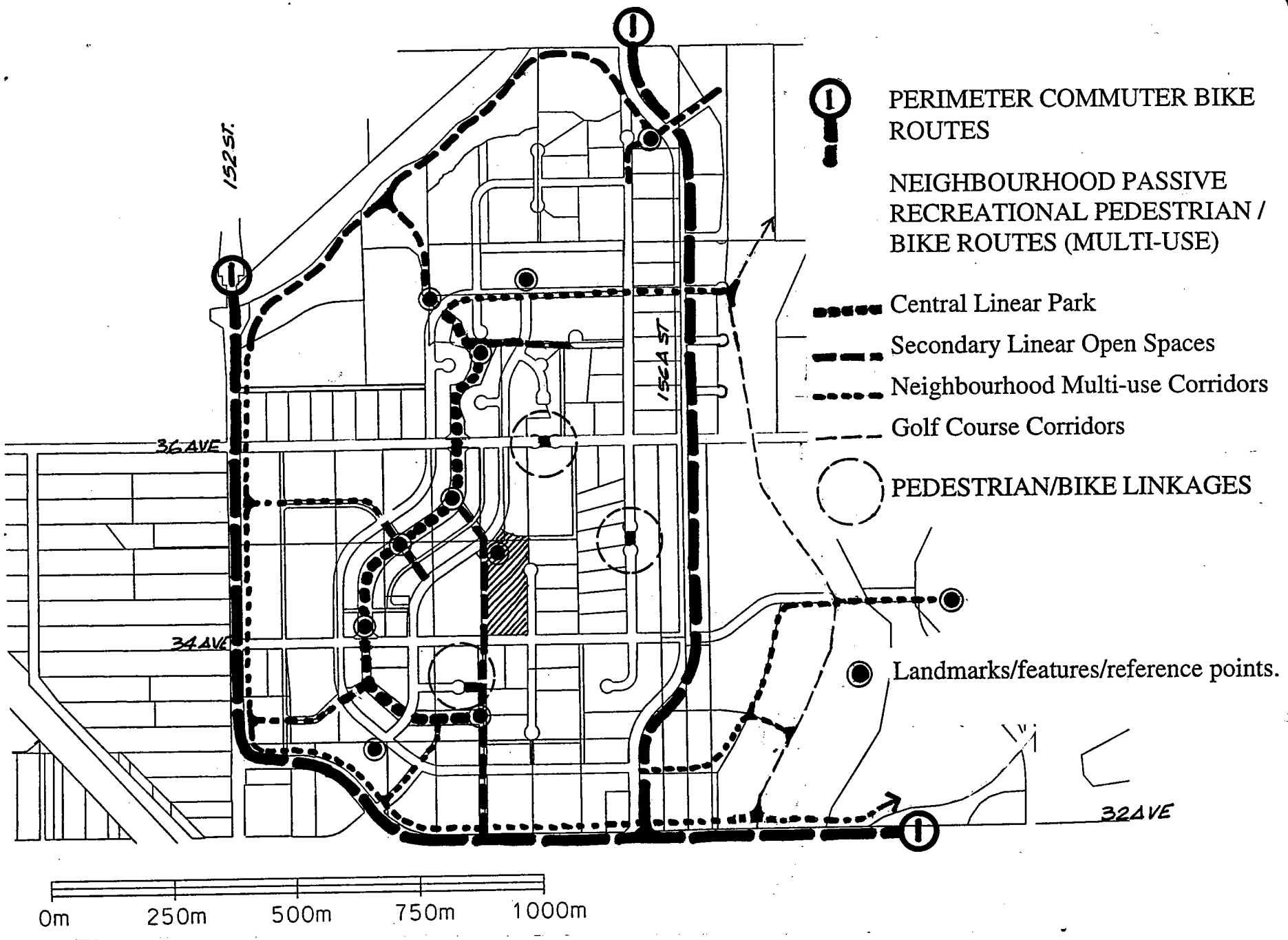


Figure 3.4

PEDESTRIAN/BIKE (MULTI-USE) CORRIDORS

.3 Perimeter Commuter Bike Routes

.1 These routes form part of the City wide bicycle route network. It is recommended that bike routes along 152 Street and 32 Avenue will consist of a 3.00 m. wide pathway incorporated in the required landscaped buffer along these two arterial roads.

.2 Until a new, special road standard is developed for 156A Street, the bike route along this street is proposed as two dedicated 1.50 m. wide lanes (one on each direction) within the paved portion of the right-of-way.

.4 Neighbourhood Passive Recreational Pedestrian /Bike Routes

.1 Multi-use pathways will be integrated as part of the linear park system, including the landscaped buffer strip at the edges of the neighbourhood and the trail along the Nicomekl River. The recommended width of the various portions of the local network are as follows:

- The width of all multi-use pathways will not be less than 3.00 m. wide except along the Central Linear Park where the minimum width of the pathway will be 4.00 m.. This width is required to accommodate various potential users (walkers, joggers, bikers). The pathway may meander within the total width of the pedestrian/bike corridor right-of-way.
- The widths of the various components of the system should reflect their hierarchical function within the local pedestrian/bike network. Width changes are also intended to maintain a strong sense of safety for its users (appropriate relationship between length and width of the corridor and height of abutting fences).

.5 Central Linear Park

.1 The average width of the corridor will be 30.00 m. Because a multi-use pathway along this linear open space has been identified as part of the Trans Canada Trail, the width of the pathway should be a minimum of 4.00 m.

.6 Secondary Linear Open Spaces

.1 These multi-use corridors are wide open space extensions of the Central Linear Park toward the Ring Roads. They provide access from the residential areas to the Central Linear Park and to various neighbourhood destination points. The average width of these corridors will be 15.00 m.

.2 The width of the corridor should flare out toward the intersection with the Central Linear Park and other multi-use corridors (See Figure 3.5).

.7 Neighbourhood Pedestrian/Bike (Multi-Use) Corridors

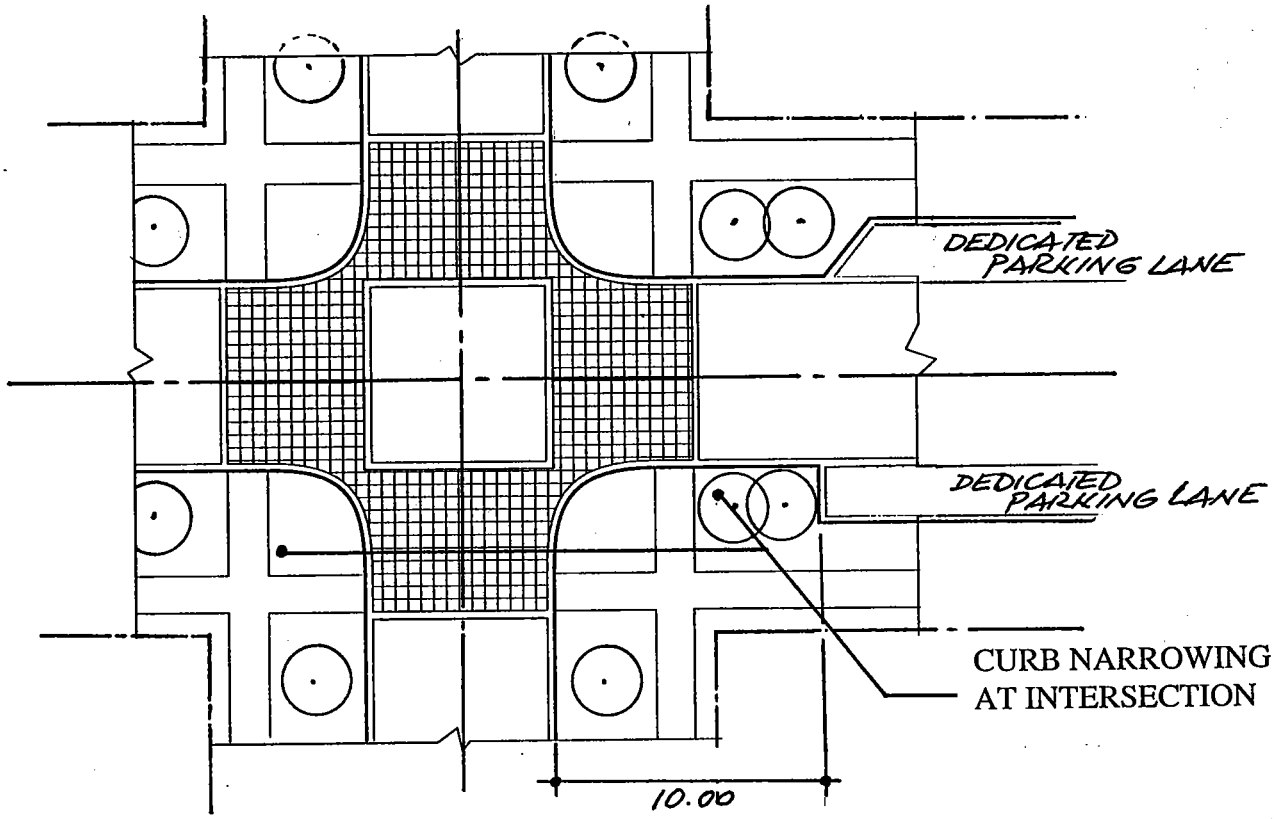
.1 These corridors complete the network into the residential areas. In a few cases, they continue on, or parallel the street. They also facilitate connections to the bike commuter routes and the corridor along the Nicomekl River. In some cases, the route might take place through multiple family development sites (i.e. through large sites along 152 Street). The recommended width for these corridors is 8.00 m.

.8 Golf Course Corridors

.1 These components of the network provide additional passive recreational opportunities by extending the internal neighbourhood network into wide open view areas along the western edge of the golf course. Width of these corridors will be determined based on safety aspects related to fairway layout, existing vegetation buffers, and site specific characteristics.

.9 Pedestrian/Bike Linkages

.1 These are pedestrian/bike (multi-use) corridors that generally connect two local streets. They help to expand and interconnect the local circulation network for pedestrians and bicycles through the streets of the neighbourhood.



PAVING AT RING ROAD INTERSECTIONS

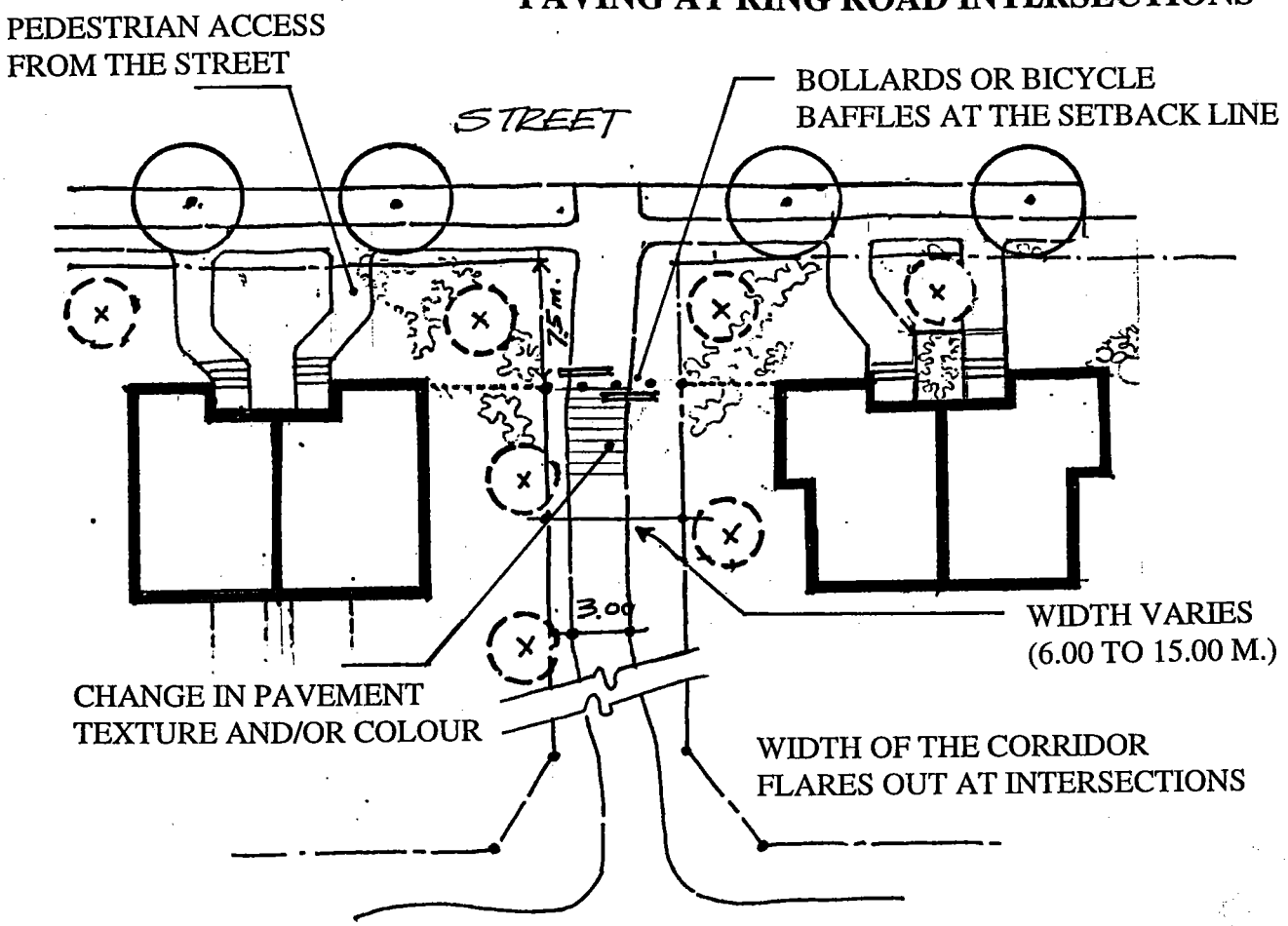


Figure 3.5

MULTI-USE CORRIDORS AND PATHWAYS

.2 To improve the perception of safety and avoid the tunnel, narrow passage effect the recommended widths are:

- 4.00 m. (3.00 m. pathway pavement width) if its length is 30 m. or less,
- 6.00 m. (3.00 m. pathway pavement width) if its length is between 30.00 and 60.00 m.

.10 General Treatment of Pavement

.1 The following specific characteristics and guidelines are applicable to the various components of the Rosemary Heights local pedestrian/bike network:

.1 An asphalt surface is recommended for all multi-use pathways of the local pedestrian/bike (multi-use) network, excepting the pathway along the western side of the Morgan Creek Golf Course. The edges of the pathway should be well identifiable.

.2 Bollards should be used at the approaches to an intersection of the pedestrian/bike (multi-use) pathways with a street. In the case of narrow pathways, hinged bicycle baffles should be used instead. These safety devices should be placed at the setback line from the street (See Figure 3.5).

.3 To accommodate street crossings, changes in texture and/or colour must be introduced to the pathway surface, starting at 5.00 m. before reaching the bollards or bicycle baffles.

.4 Direct connections from multiple residential sites to the pedestrian/bike corridors (if no multiple or direct access from individual units is provided) should be located central to the corridor's length.

.11 Central Linear Park Lighting

.1 No lighting is envisioned along the Central Linear Park. The purpose is to reinforce the natural character of this central open space.

.12 Safety Aspects

.1 Compliance with CPTED (Crime Prevention Through Environmental Design) recommendations should be considered in the design of components of identified corridors as follows:

- Clear visual continuity of the path must be ensured by careful direct continuity and alignment of the various portions of the pedestrian/bike (multi-use) network; including local streets that serve as linkages to complete the network.
- Sudden changes in alignment or interruptions of the corridors should be avoided. Their alignment and dimensions should provide wide views and avoid a service alley character.
- It is desirable that dwelling units located along the multi-use corridors should provide second floor windows and balconies toward the corridor to increase opportunities for casual surveillance.
- To help to develop a sense of ownership over these public spaces, the provision of arbours, low gates and sidewalks from individual units to the pedestrian/bike corridors is recommended.
- Lighting should increase the sense of security for both users and residents of the units fronting on to the corridors.
- Pedestrian scale, low level lighting that do not interfere with the privacy of adjacent residential units is favoured in all components of the network. Wall mounted lighting in units abutting the corridor may help to add to the corridor's lighting level and increase the user's (and resident's) perception of safety.

- Fences along these multi-use corridors should be transparent and provided in combination with landscaping. No fences should extend within the area of the required building setback from the street.
- Landscaping within multi-use corridors that are 6.00 m. wide or less should consider low shrubs and plants only. In these cases, trees should be planted at various setbacks from the path; on private yards abutting the corridor, to avoid a tunnel effect.

.13 Landscaped Buffer

.1 The landscaped buffer strip along 32 Avenue and 152 Street should consider a 0.60 to 0.80 m. high landscaped mound (See Figure 3.3). With the provision of a 3.00 m. wide pedestrian/bike (multi-use) pathway as part of the buffer strip, construction of a sidewalk within the road right-of-way may not be necessary.

3.6 Design Guidelines for the Streets

.1 General

.1 The overall character of Rosemary Heights will be mostly defined by the width of the streets from building face to building face, pavement textures and the way that the buildings and associated uses relate to the street.

.2 The following general guidelines are focused on providing opportunities for residents social interaction and in achieving a strong residential neighbourhood character; where pedestrians, not the vehicles, define the design and characteristics of the street.

.3 The guidelines indicate the intent of achieving a special character for the neighbourhood streets and recognize the need to revise the City's present road standards to achieve these general objectives.

.4 The development of specific cross sections (and processing of associated variance permits) that will help to achieve the desired character of the streets in Rosemary Heights will take place through continued cooperation between the NCP Steering Committee and the Engineering and Planning Departments.

.2 General Design Principles for the Streets

.1 Where possible, and appropriate to the context, the distance between buildings across the street should be reduced by narrower right-of-way and/or by reduced front yard setbacks.

.2 Roads standards unique to Rosemary heights will be defined through further discussions between the Steering Committee and the City's Planning and Engineering Departments.

.3 In townhouse, compact or cluster housing sites located along the Ring Roads, all units should have access to the garage from the site's internal driveway.

.3 Treatment of Intersections

.1 All intersections should consider curb extensions (narrowing) to reduce the crossing distance for pedestrians and lower vehicle's speed. Curb narrowing (chokers) and landscaping (with trees) should be considered every 6 to 8 on-street parking spaces.

.2 Different texture, decorative pavers or other, should be used at the major street intersections (i.e. at intersections with the Ring Roads) and at the Central Linear Park crossing of the commercial street (see Figure 3.5).

.3 The number of traffic signs at the interior of the neighbourhood should be minimized. Other traffic control devices are preferred. Wherever possible, if traffic signs are unavoidable, they should be grouped and mounted on light posts in the immediate area; single traffic signs on a single pole should be avoided.

.4 Special Pavement

.1 Decorative pavers or other pavement that adds texture and colour differentiation should be used at the entrances to the neighbourhood and on the neighbourhood commercial street (34 Avenue between the two Ring Roads). The sidewalks of the commercial street should also consider unique pavement pattern and formal tree planting on grates (see Figure 3.6 for general concept).

.5 On-Street Parking

.1 A concrete band, separating traveling lanes from on-street parking lanes should be used to identify all on-street parking areas. Recommended on-street parking areas are identified in Figure 3.7.

.6 Street Lighting

.1 The type of lamp post and single luminaire used in Morgan Creek, or equivalent, should be used throughout the Rosemary Heights neighbourhood. This type of public lighting should be primarily oriented to serve pedestrians (lower, with a gentler glow and placed at shorter intervals - see Figure 3.8).

.2 Lamp posts and double luminaires (see Figure 3.9 for general concept), which may permit attachments for hanging flower baskets and/or banners should be considered at the following locations (on the median or on the boulevard):

- along the commercial street, between the two Ring Roads,
- along 156A Street entry area from 40 Avenue and 32 Avenue,
- along 34 Avenue and 36 Avenue entry area from 152 Street, and,
- along 154 Street entry area from 32 Avenue.

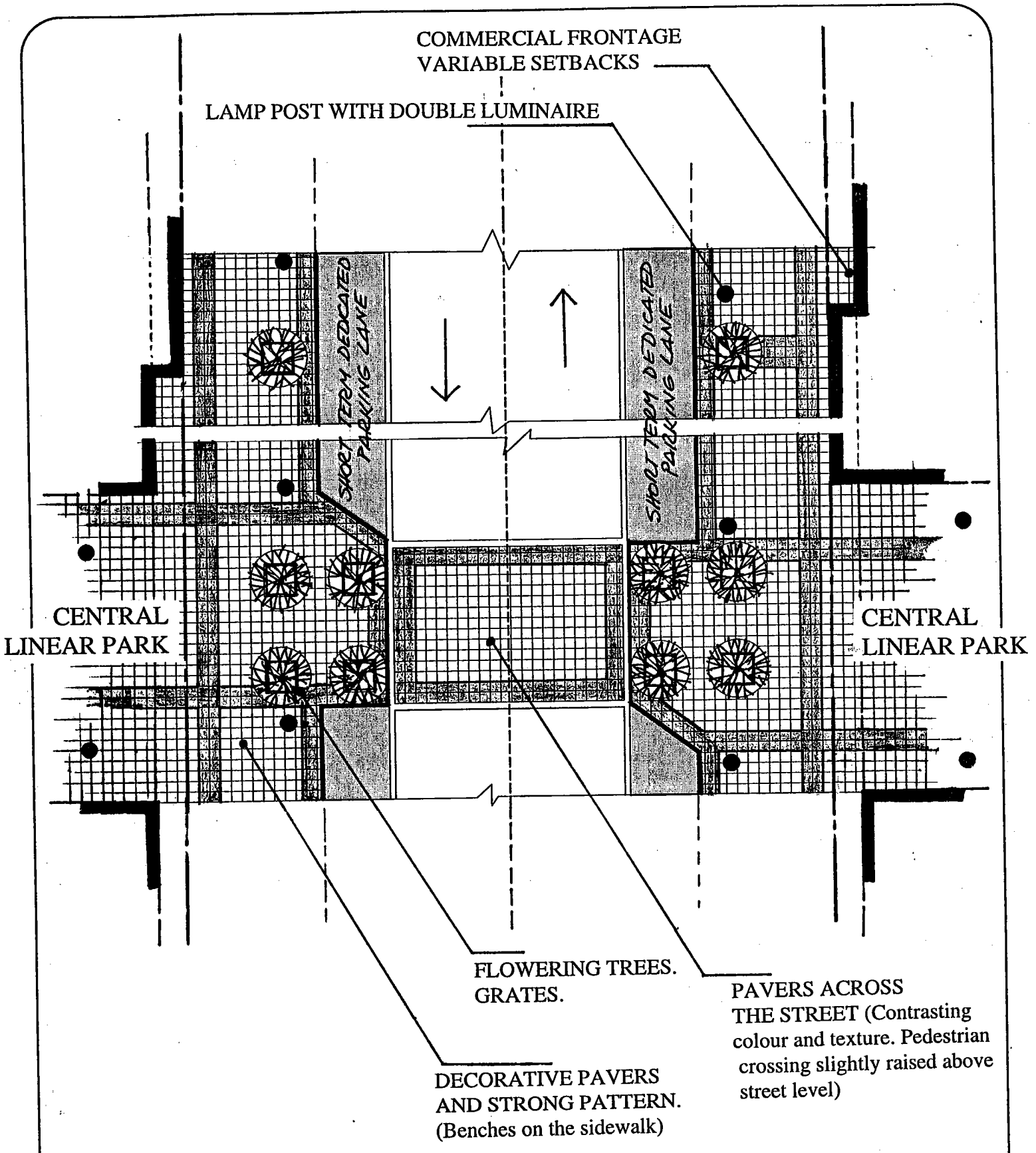


Figure 3.6

COMMERCIAL STREET. DEVELOPMENT CONCEPT

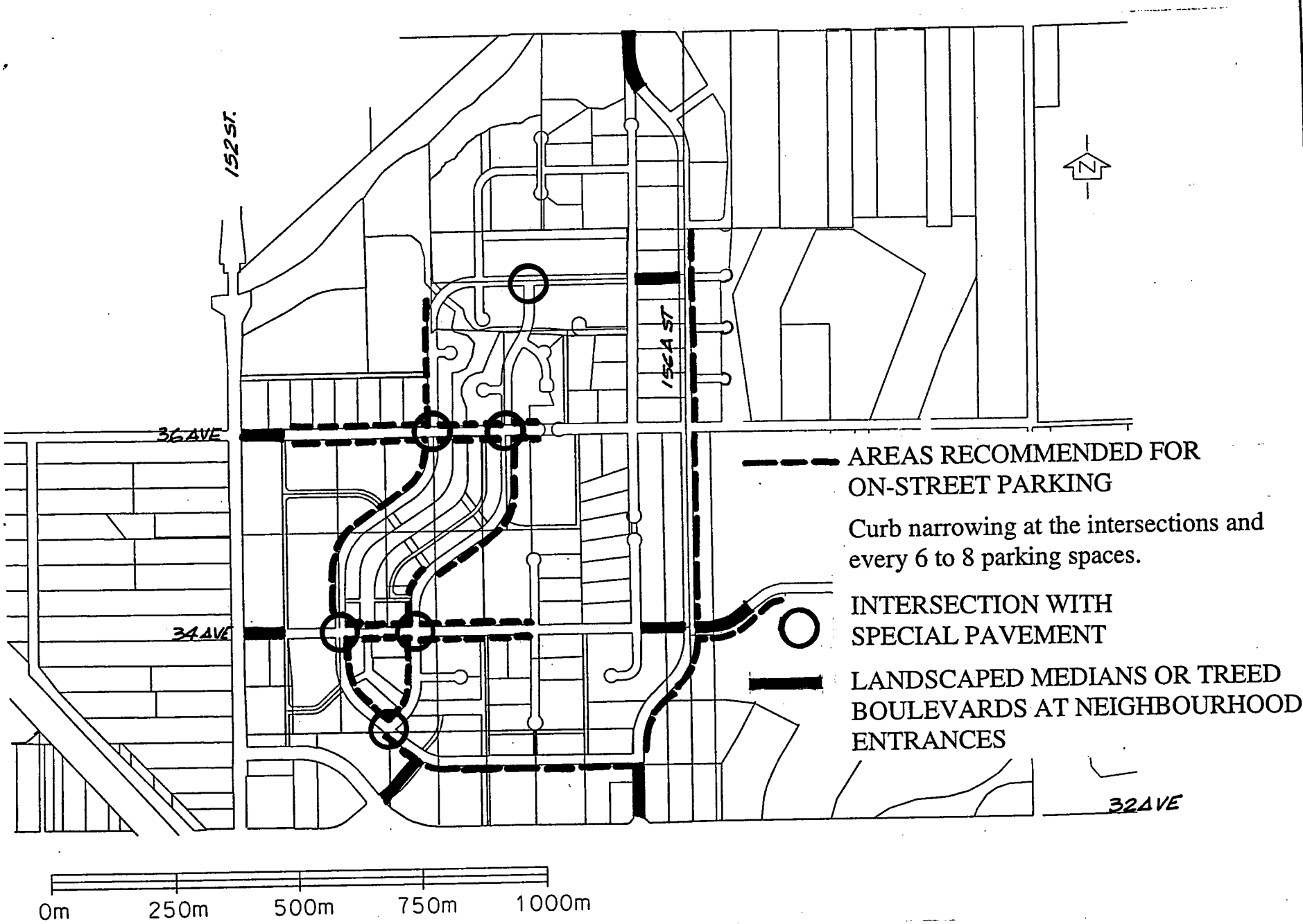
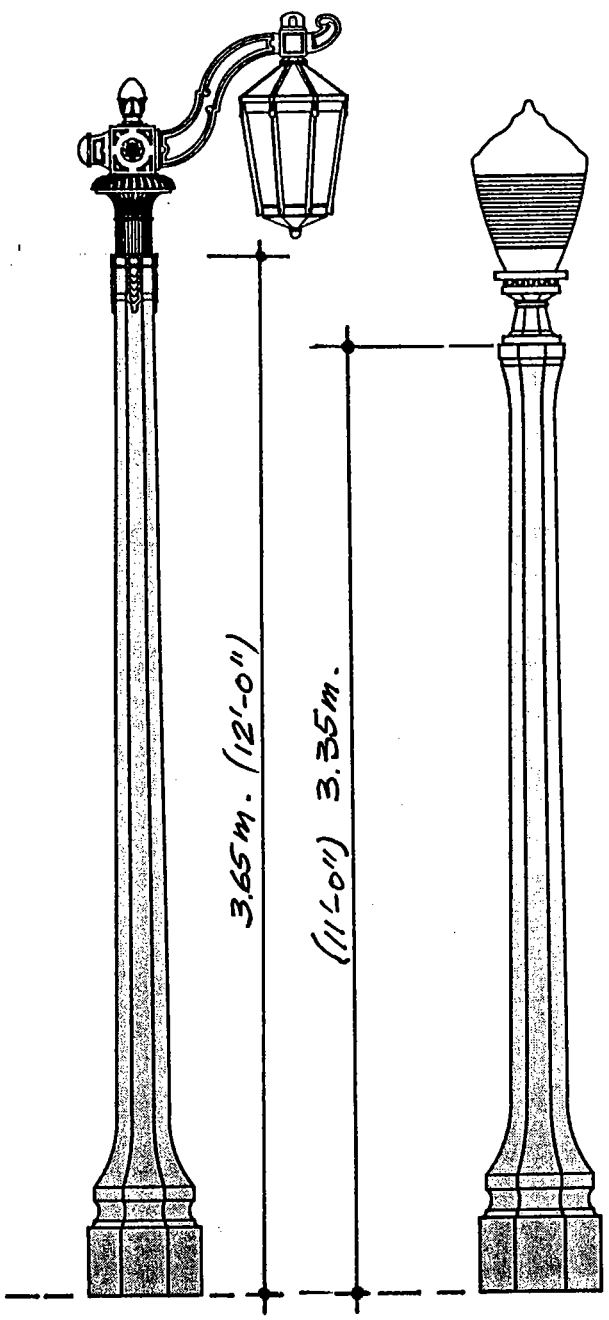
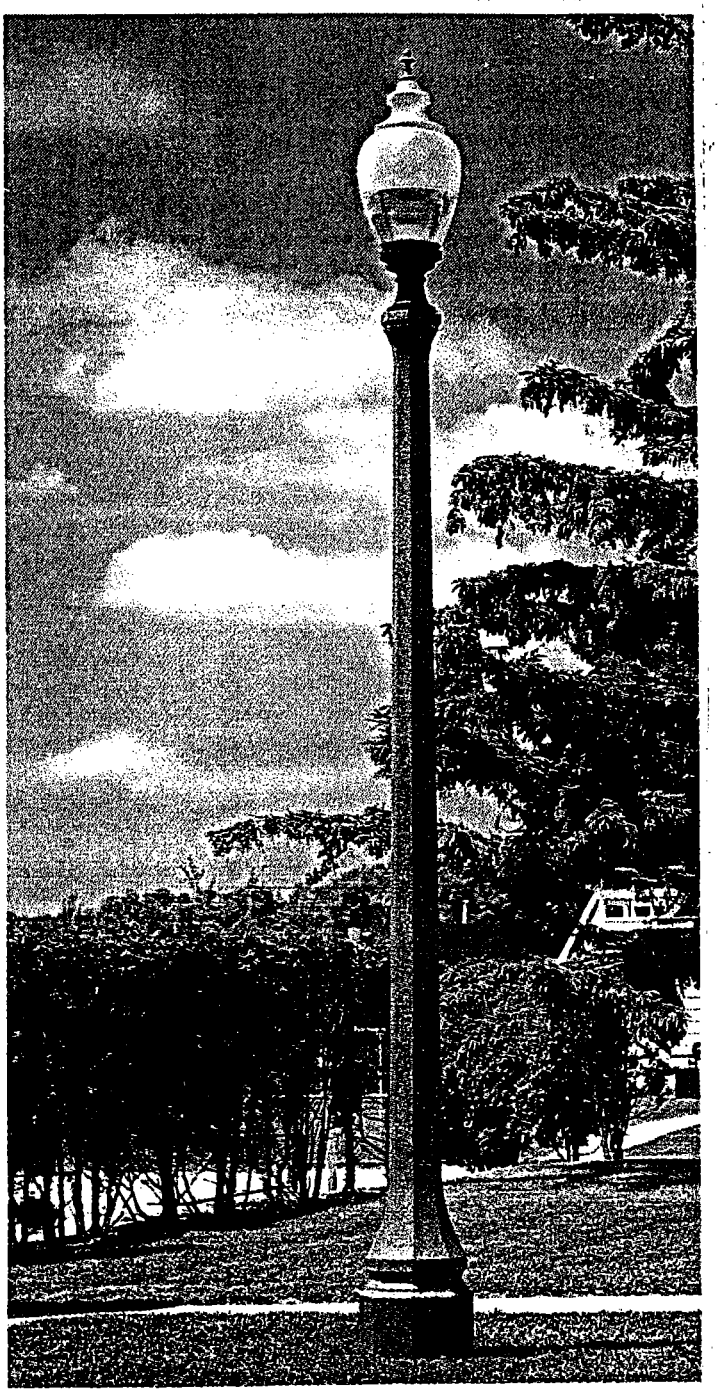


Figure 3.7

ON-STREET PARKING

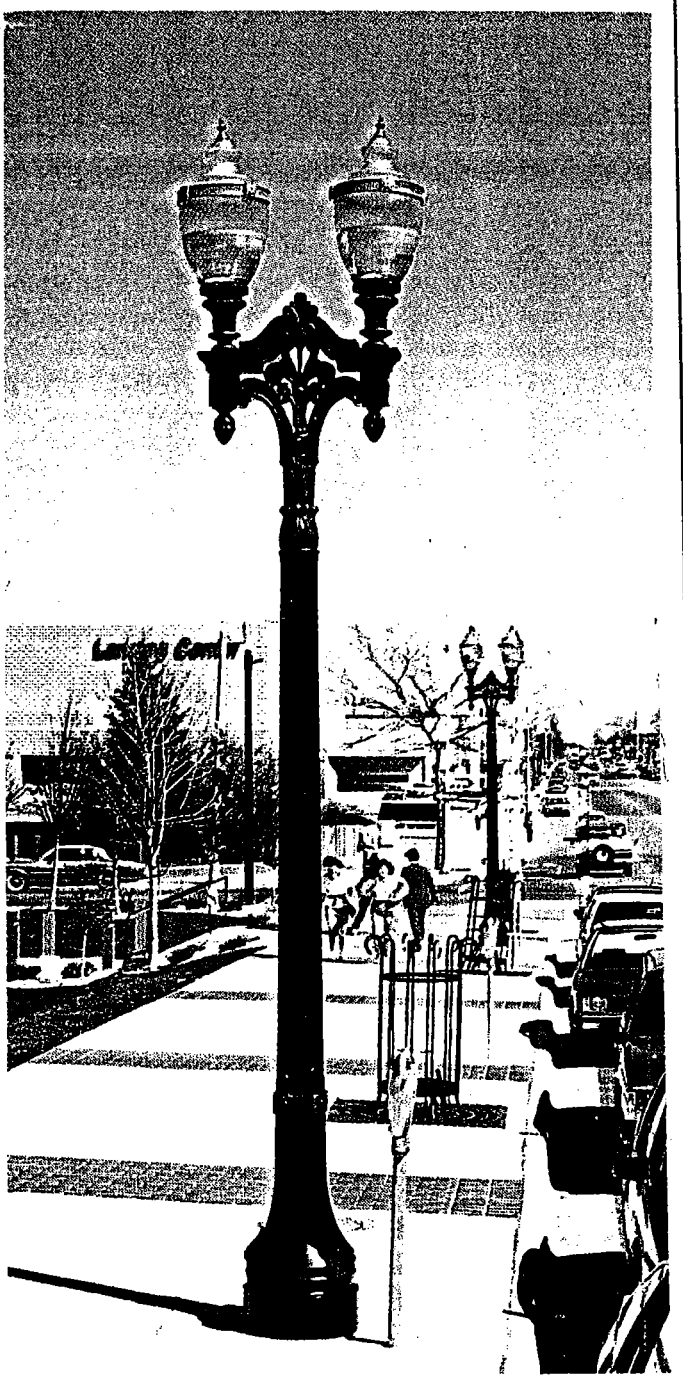




RECOMMENDED TYPE OF LAMP POST AND SINGLE LUMINAIRE (OR EQUIVALENT)

Figure 3.8

STREET LIGHTS. RESIDENTIAL AREAS.



RECOMMENDED TYPE OF LAMP POST AND DOUBLE LUMINAIRE. (OR EQUIVALENT)

Figure 3.9

STREET LIGHTS. COMMERCIAL AND ENTRANCE AREAS.

.3 For consistency from project to project, the type of lamp, its height, intensity, intervals, etc., will be co-ordinated by Engineering through the servicing agreement process.

3.7 Design Guidelines for Buildings

.1 General

.1 This set of guidelines focuses on achieving a harmonious architectural relationship and co-ordination among buildings, and the relationship between buildings and the street. It is expected that the presence of some architectural details through out the neighbourhood and the establishment of several landmark/reference points will achieve a unity of character and provide a strong identity to Rosemary Heights.

.2 The development of focal points in the linear open space is recommended at intersections points of view corridors, streets or linear parks (amenity buildings, cluster of existing trees, resting and/or observation structures, arbours, gateways, landmarks, etc.). These elements will act as reference points within the neighbourhood. Location of these focal points are indicated in Figure 3.4.

.3 The design of buildings should achieve architectural coordination and lend visual integration among the various projects in the area. Individual proposals should convey the strong single family character of the neighborhood.

.4 Site layout and designs should be based on the principles of defensible space and provide ample opportunities for casual surveillance of public spaces (CPTED). These principles attempt to strengthen two kinds of basic social behavior, territoriality and natural surveillance.

.5 Site planning and building designs should be responsive to the contours and natural features of the site, and the specific conditions of the area (views, noise, slopes, etc.).

.2 Design Guidelines for Residential Areas

.1 The design of townhouses, compact and cluster housing proposals along a public street should have a strong single family character. Layout of the units should focus on the street. Pedestrian access from the street must be considered for all units along a public road.

.2 Garages should not be the dominant element on the streetscape or dominate the facade of the single family units. (Also, see "Driveways" in Section A. "Design Guidelines for Yards Abutting Public Streets and Linear Parks"). To achieve this objective, the following is recommended:

- No carports or port-cocheres will be permitted in Rosemary Heights.
- Garage doors should not occupy more than 40 % of the house frontage unless the garage is recessed at least 1.00 m. from the front line of the house.
- Panel glazing, if used in the garage doors must complement the top of the garage opening and shall not be the sunburst style.
- Garages should preferably be located behind or on the side of the house.

.3 To retain some of the existing flavour of the area, the design of single family, townhouses, cluster and compact housing units fronting on to the street should incorporate; as a dominant facade component, one or more of the following architectural features/elements:

- Gable roof components with a 12/12 slope; gabled dormers; pitched roofs.
- Strong roof overhangs/eaves projections.
- Louvered ventilation on gables, etc.
- Bay windows; windows with muntins and mullions; french doors.
- Porches; verandahs; horizontal siding and wide trim, etc.

- Stucco should only be used in combination with other exterior finishing material.
- The maximum height of a roof overhang over the main entrance to a house should not exceed more than 1½ storeys.

.4 No vinyl siding will be permitted as exterior cladding material.

.5 No flat roofs will be permitted anywhere in Rosemary Heights. The recommended range of roof slopes is between 8/12 to 12/12.

.6 No metal or red roof tiles will be permitted in Rosemary Heights. Roof tiles and duroid will be permitted if they resemble cedar shakes in terms of texture, form and colour.

.7 Townhouse clusters along the local streets should provide a variety of forms, details and groupings that relate to a single family street character, and should comply with the following:

- Clusters of townhouses fronting on the Ring Roads should not contain more than two units, except on sites located in close proximity to the commercial area where a more continuous street frontage may be desirable.
- The design of clusters along the street should not be repetitive, and duplex clusters should avoid the mirror image effect.
- Where townhouse, cluster or compact housing units front on single family residential areas, the quality of materials and overall design of these units should be compatible with the single family units across the street.
- Simple forms and dominant gable roofs are recommended for townhouse clusters, cluster housing or compact housing units fronting on to the Ring Roads.
- To achieve a visual diversity within the project, variations in building height, separations, roof lines and setbacks may be considered between clusters or units.

.7 Townhouse corner units, and any housing unit exposed to side views should provide sufficient architectural detailing to the side and street fronting elevations.

.8 In order to achieve privacy on porches, verandahs, patios/decks of units located toward a public street (at a reduced setback) or toward the Central Linear Park, the finished grade of the dwelling units should be between 0.60 to 1.00 m. above the level of the sidewalk or the Central Linear Park. No retaining walls are allowed along the property lines unless required as a result of strong natural site conditions.

.9 Retaining walls, where absolutely necessary, shall not exceed more than 1.20 m. in height. and landscaping must be provided in front. The distance to a retaining wall from any property line should be at least equal to the height of the retaining wall (1.20 m. maximum). A smooth finished grade or ground level transition from lot to lot is preferred.

.3 Commercial Areas/Main Street

.1 Commercial Uses/Parking Areas

.1 Parking lot and loading areas for commercial areas should be located behind the buildings, screened and away from direct views from the street. Access to parking areas is recommended from a service lane or driveway at the back of the commercial buildings.

.2 A combination of low planter/wrought iron fence (max. 1.00 m. high) is recommended; in combination with wide canopy tree planting, to enclose and screen parking areas from views from adjacent residential areas.

.2 Retail Commercial Frontage

.1 The main commercial street should achieve continuity of frontage along both sides of 34 Avenue. Height of the

buildings along the main street should not be more than 9.00m.

.2 It is desirable that at least 80 % of the commercial frontage, at street level be dedicated to retail, eating establishments and/or personal service stores. Residential uses are preferred above ground level but a residential/professional office uses are acceptable if they provide a strong local residential character.

.3 Commercial Uses/Setbacks

.1 Continuous frontage and minimum front yard setbacks should be considered for developments along this street. Larger setbacks and landscaping will be required along the Ring Roads frontages to achieve a soft transition to abutting residential setbacks.

.2 The second level above the street level should be setback from the ground floor level.

.4 Canopies

.1 Commercial developments along the Main Street should provide canopies over the sidewalk (1.50 m. projection is recommended) to achieve weather protection continuity along the whole length of the street.

.2 Round canopies are not permitted.

.3 Canopies should have a 30 degree slope toward the street and provide a 0.30 m. wide edge (fascia) for identification signage purposes. No sign or lettering will be permitted on the sloping part of the canopy.

.5 Signs

.1 In addition to the canopy identification signs, other recommended signage includes indirect lighting signs and neon, or lettering painted on the windows of the retail/office space. No backlit illuminated fascia bands, or pylon signs will be permitted in the commercial street.

The road and walkway construction standards will be confirmed with the Engineering Department and finalized at rezoning or development permit stage.

4. Infrastructure Service

4.1 Introduction

The Stage 1 NCP report, submitted in April, 1996, addressed engineering servicing on a preliminary basis. The following section is intended to supplement the information presented in the Stage I NCP report. This report addresses the provision of major roads and services in the Rosemary Heights Central neighbourhood. Concepts are presented for roads, transportation, drainage, sanitary and water.

The provision of services for the community are consistent with Surrey's long range plans and further clarifies both developer and City responsibilities. It is important to note, that due to the extent and cost of the major servicing required in this neighbourhood funding for the servicing will come from the development community. The City of Surrey is not in a position to front end any engineering infrastructure.

The servicing concepts within the report are only indicative of the general servicing needs and are not in any way deemed to represent detailed and accurate specifications of the subdivision and rezoning needs for individual applications in this NCP area.

4.2 Transportation and Roads

This section describes the transportation system within the Rosemary Heights Central Neighbourhood, comprising local and collector roads, pedestrian and bicycle facilities, transit services and on-street parking.

4.2.1 Road Network

The *Rosemary Heights Major Road Network Study* (completed in December, 1995) identified improvements required to arterial roads which border the Rosemary Heights Central Neighbourhood — 152 Street, 32 Avenue and 40 Avenue. These improvements include road widenings, turn bays at intersections and traffic signals, and are required in order to accommodate traffic generated by development in Rosemary Heights.

In this section, local street and collector road requirements within Rosemary Heights are identified, including traffic controls, laning requirements and on-street parking restrictions. Arterial road requirements are not described, except on 32 Avenue east of 152 Street, where relocation of the Highway 99 off-ramp requires that the road network be modified from that presented in the Stage 1 report.

Figure 4.2.1.1 illustrates the road network within and on the perimeter of the Central Neighbourhood. Key features of the road network include:

- Arterial roads serving the Central Neighbourhood include 152 Street, 32 Avenue and 40 Avenue. The *Rosemary Heights Major Road Network Study* indicates that in order to accommodate current traffic volumes, traffic signals are required on 152 Street at 32 and 40 Avenues. In order to accommodate future development in Rosemary Heights, 152 Street will need to be widened to six lanes between the King George Highway and 34 Avenue, and four lanes from 34 Avenue to 40 Avenue. 32 Avenue will need to be widened to four lanes west of 156A Street. Traffic signals will be required on 152 Street at 34 Avenue and 36 Avenue, and on 32 Avenue at 154 Street and 156A Street. Left turn bays will be required at all signalized intersections.

Figure 4.2.1.1
Road Network

- Arterial
- Major Collector
- Limited Collector
- Through Local
- Limited Local

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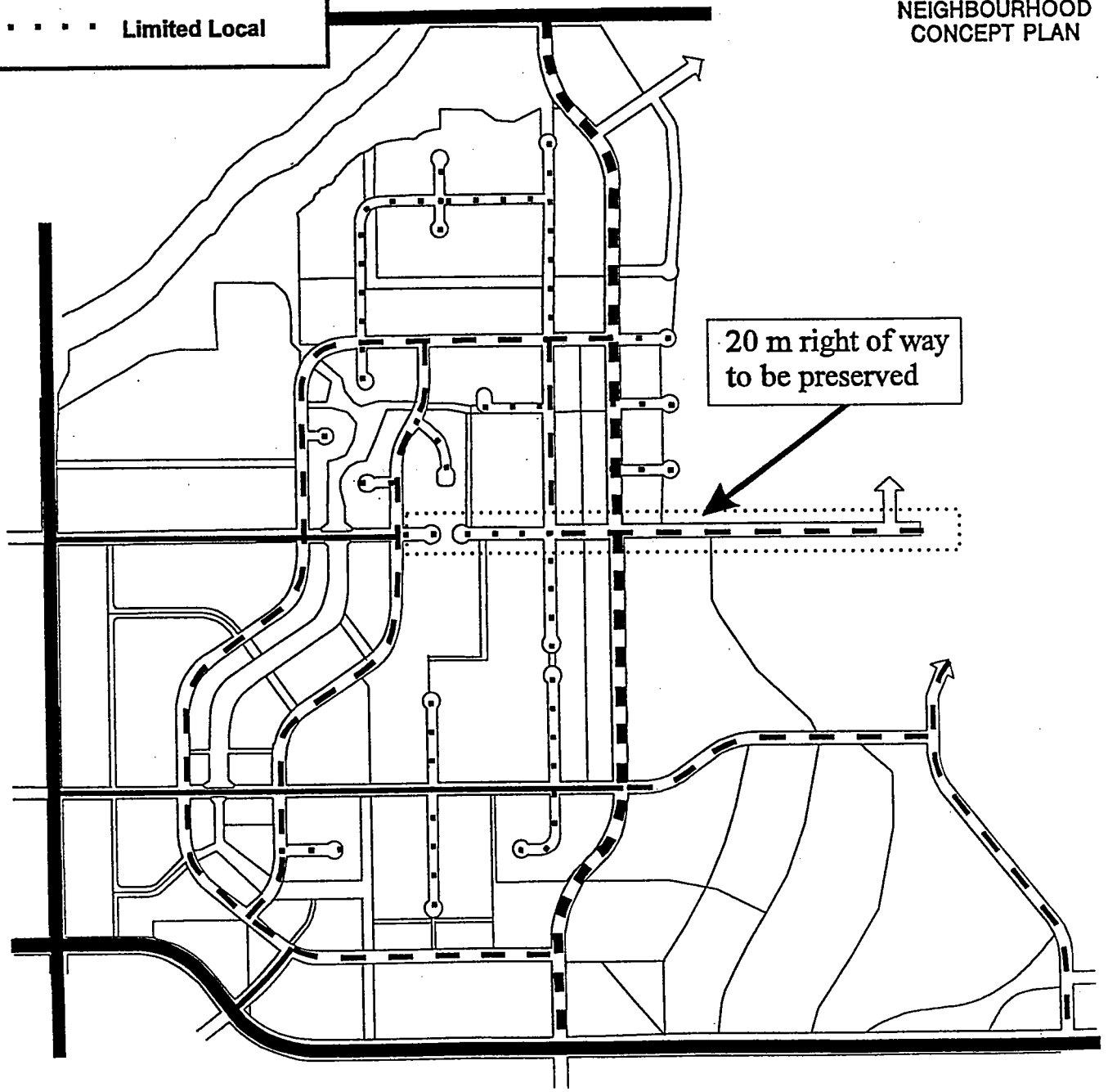

0m 250m 500m 750m 1000m

NOTE: The exact location of the 36 Ave. Cul-de-sac will be determined by the City of Surrey.

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- As part of Phase 2 of the planned South Surrey Interchange, the off-ramp from Highway 99 northbound will be connected to 32 Avenue, rather than to 152 Street as originally planned. In order to minimize the number of intersections and traffic signals along this section of 32 Avenue, 154 Street in the NCP has been relocated to the west to align with the off-ramp, creating a four-way intersection. As a result, the alignment of 154 Street overlaps the southern tip of the fire hall site, and might slightly impact the parking lot, resulting in a loss of one or two parking stalls.

  The off-ramp/154 Street intersection would be located approximately 290m from the 32 Avenue/152 Street intersection (the centre-to-centre distance between intersections is approximately 320m). Within this distance, left turn bays would be provided at 152 Street (westbound) and at 154 Street (eastbound), as illustrated in Figure 4.2.1.2. The latter would also permit left turns into and out of the fire hall.

- Collector roads within the Central Neighbourhood include 156A Street (a major collector), 34 Avenue (limited collector) and 36 Avenue (limited collector west of Inner Ring Road). The spacing of these collector roads mid-way between arterial roads is consistent with the City's policy on grid road network spacing. 154 Street is also designated as a limited collector road, providing a connection between the Rosemary Heights Ring Road and 32 Avenue.

- As per the City Council directive for 36 Avenue, opposing cul-de-sacs will be constructed east of the Inner Ring Road, thereby creating a closure of 36 Avenue in this location. The intent of this closure is to prevent through traffic from outside the Central Neighbourhood using 36 Avenue. See City of Surrey's Corporate Report #C325, Sept. 24, 1996 for details. The exact location of the cul-de-sac will be determined by the City.

- Opposing cul-de-sacs will be constructed on 156 Street between 34 and 36 Avenue, to prevent short-cutting. This cul-de-sac will be constructed upon the completion of 156A Street to a minimum of a half road, connecting to both 34 Avenue and 36 Avenue.

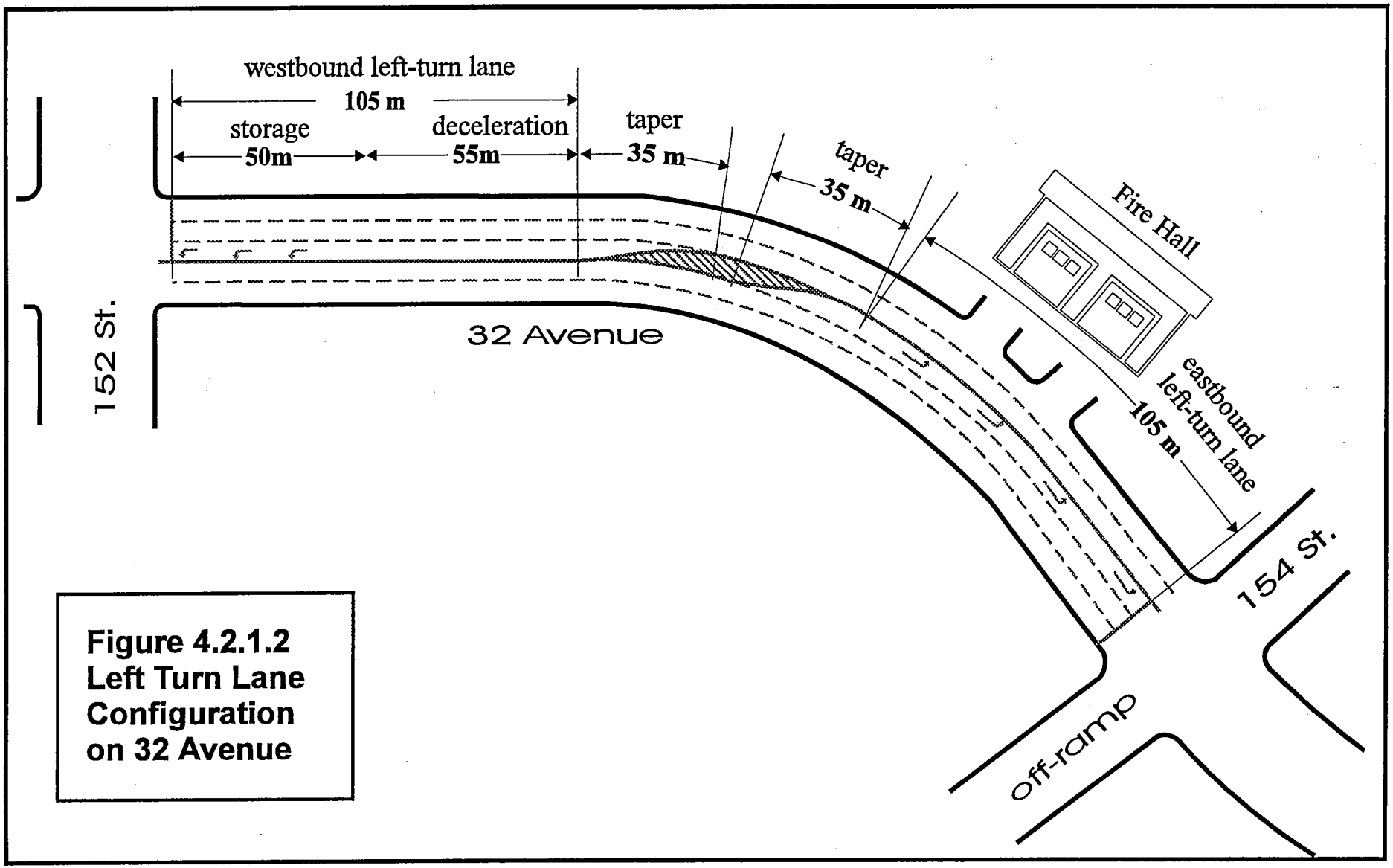

Figure 4.2.1.2
Left Turn Lane Configuration on 32 Avenue

- As per Subdivision Bylaw 8830, access to garden apartments on 152 Street between 32 Avenue and 36 Avenue will be via rear lanes. There is no direct access from 152 Street, in order to avoid traffic operations impacts on 152 Street.

- As described in the Stage 1 report, the road network within the Central Neighbourhood (collector roads and local streets) is a *redundant* road network. Multiple (or redundant) routes between any two destinations disperses neighbourhood traffic across the road network, providing direct access to neighbourhood destinations and avoiding congestion at access points.

Specific observations regarding the alignment and design of roads within the Central Neighbourhood include:

- The grade on Rosemary Heights Ring Road south of 37A Avenue would be as much as 10%. As the City's design standards permit grades of up to 12% on "local residential roads," a 10% grade on the Ring Road would be appropriate.

- A turning sight distance of approximately 170m is required on 156A Street at 40 Avenue (based on Transportation Association of Canada standards for a 60 km/h design speed). The location of the top of the steep hill on 156A Street south of 40 Avenue would provide a sight distance of at least 160m. Specific requirements and dimensions should be confirmed during design of 156A Street.

- In order to maintain a grade of no more than 8% on 156A Street south of 40 Avenue, a low retaining wall approximately 1m in height would be required for a distance of 110m on 156A Street. Because it is a low wall, it might be possible to avoid constructing the retaining wall and simply use earthworks. This issue should be resolved during design of 156A Street.

- The proposed Highway 99 off-ramp intersection on 32 Avenue is located on a horizontal curve, and as a result sight distances would be restricted for eastbound and westbound drivers approaching the intersection. This issue should be addressed by the Ministry of Transportation and Highways and the City during final design of

Stage 2 of the South Surrey Interchange. Potential remedies include advance warning signs (with flashing amber lights) and restrictions on development and landscaping on the northeast and southwest corners of the intersection, so as to increase sight distances.

- The resulting realignment of 154 Street to align with the Highway 99 off-ramp will place the 154 Street/Rosemary Heights Ring Road intersection on a crest vertical curve. Sight distance will not be a problem at this intersection if the vertical profile of the Ring Road is adjusted appropriately. Resulting grades on the Ring Road would be approximately 4.3% to the east of 154 Street, and 1.5% to the west.

Intersections

Forecast PM peak hour traffic volumes for the Central Neighbourhood are illustrated in Figure 4.2.1.3. These traffic volumes reflect conditions at full build-out of all Rosemary Heights neighbourhoods, anticipated to occur by 2010.

Intersection laning requirements for roads within the Central Neighbourhood are also illustrated in Figure 4.2.1.4 These are consistent with the *Rosemary Heights Major Road Network Study,* except on 32 Avenue where the 154 Street intersection has been relocated westward and signalized. As a result, the four lane cross-section on 32 Avenue east of 152 Street must be continued further east to 156A Street, rather than to the original alignment of 154 Street as indicated in the *Rosemary Heights Major Road Network Study.*

Left turn storage lengths on neighbourhood roadways at signalized intersections are summarized below, based on peak hour volumes of turning vehicles (with a 25% allowance for peaking).

- 34 Avenue, westbound left turn — 50m (the distance between 152 Street and the lane is approximately 85m, which allows for a 35m taper and a left turn storage length of 50m).

- 36 Avenue, westbound left turn — 40m (this is the minimum storage length required by the City — the actual length required is 22m).

Figure 4.2.1.3
Forecast PM Peak Hour Traffic Volumes (w/o 36 Ave. Closure)

(Full Build-out, 2010)

200 **Forecast Corridor Directional Volume**

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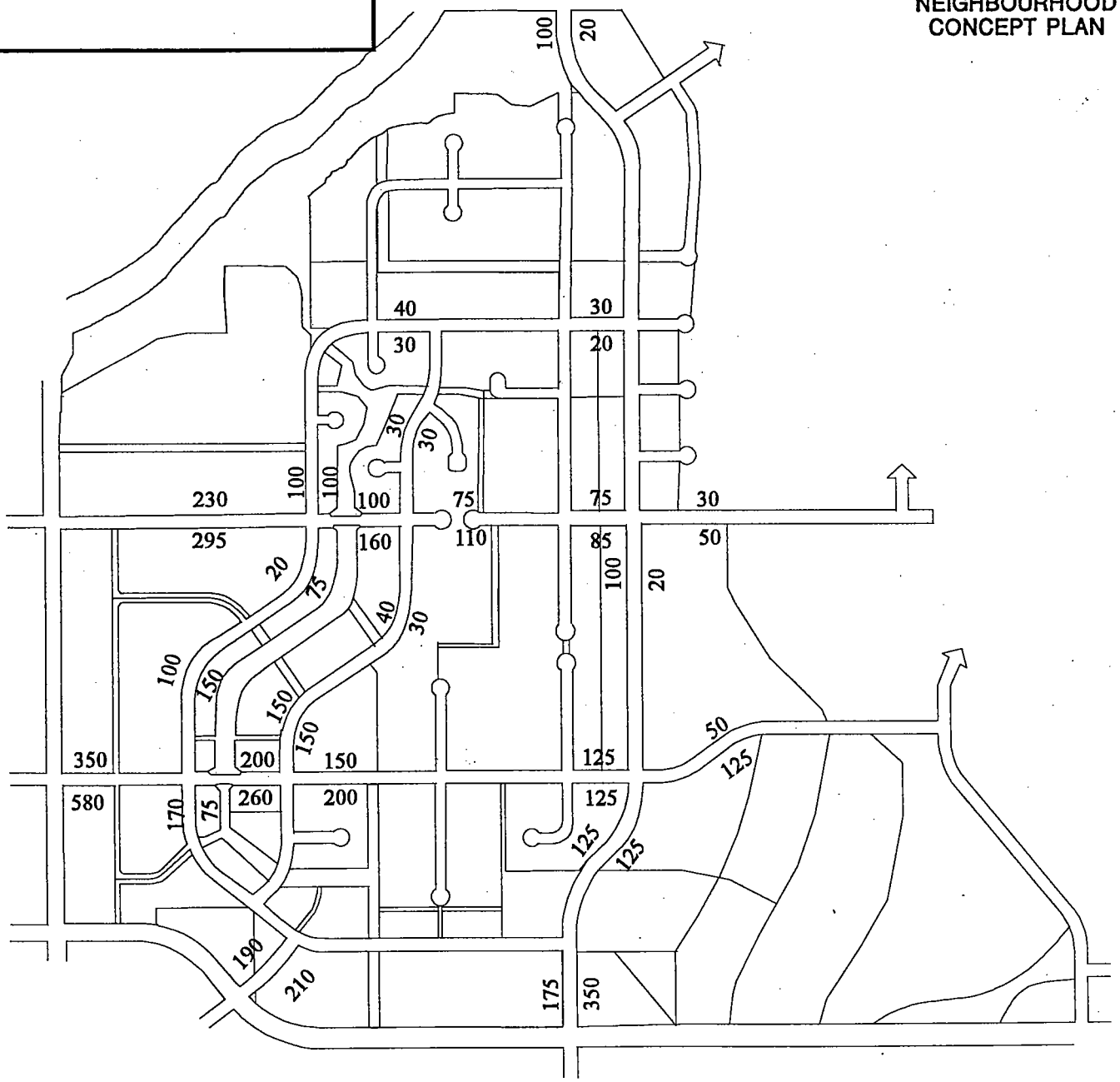

0m 250m 500m 750m 1000m

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Figure 4.2.1.4
Intersection Laning Requirements

(Full Build-out, 2010)

Intersection Geometry for Signalized Intersection

Intersection Geometry for Unsignalized Intersection

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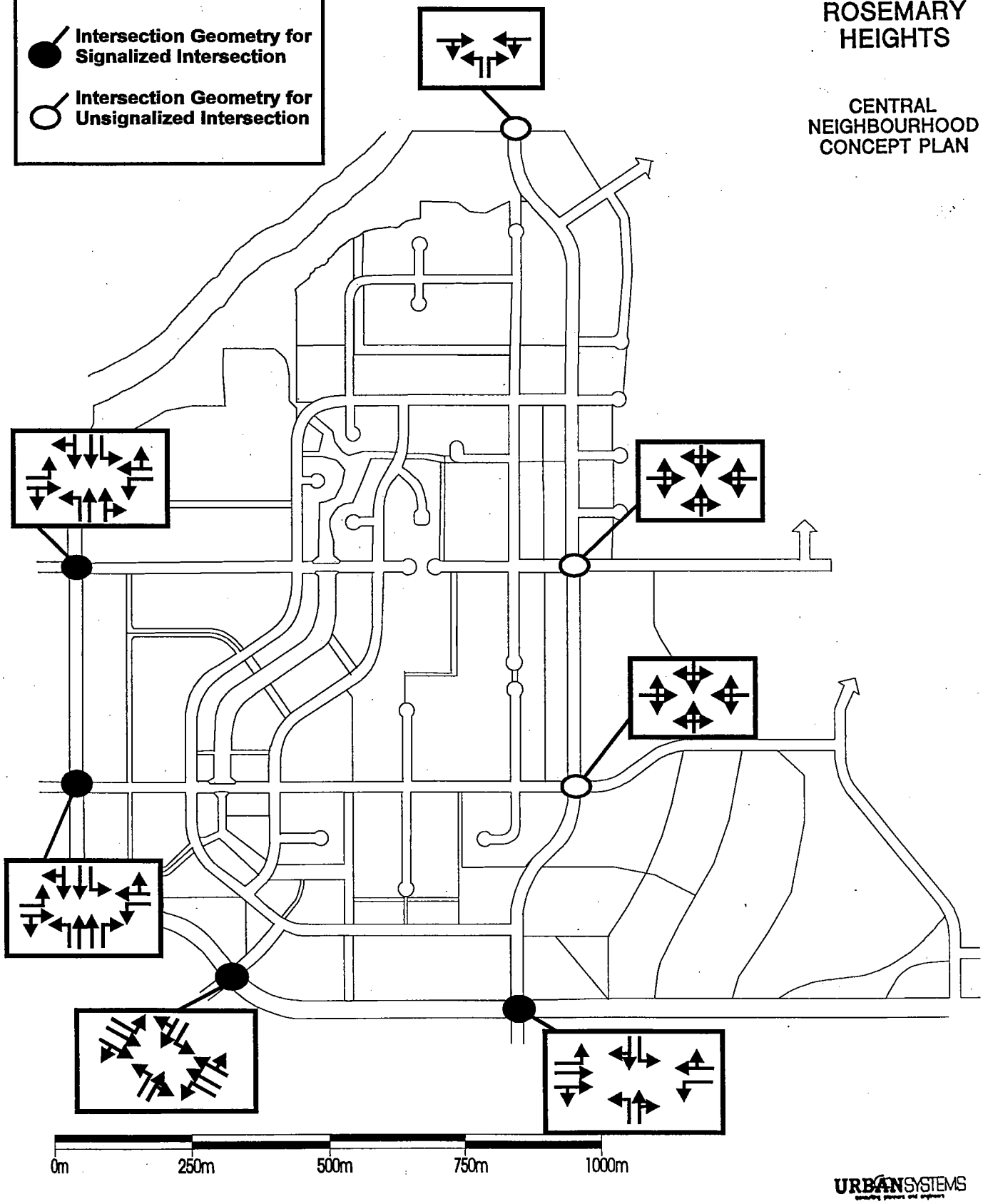
CENTRAL NEIGHBOURHOOD CONCEPT PLAN



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- 154 Street, southbound left turn — 40m (this is the minimum storage length required by the City — the actual length required is 8m).

- 156A Street, southbound left turn — 40m (this is the minimum storage length, required by the City — the actual length required is 28m).

Traffic Controls

Traffic controls are illustrated in Figure 4.2.1.5, and are described below.

- **Traffic signals.** Consistent with the *Rosemary Heights Major Road Network Study,* traffic signals will be located on 152 Street at 32, 34, 36 and 40 Avenues. On 32 Avenue, traffic signals will be located at:

  - 154 Street/Highway 99 off-ramp. Signals are required primarily to accommodate vehicles turning left from the off-ramp to 32 Avenue — up to 90 vehicles are forecast to make this movement during the PM peak hour. Analysis indicates that this signalized intersection would operate at level of service B during the PM peak hour. Due to the close proximity to the fire hall, signals at the off-ramp/154 Street intersection should be coordinated with the fire hall signals.

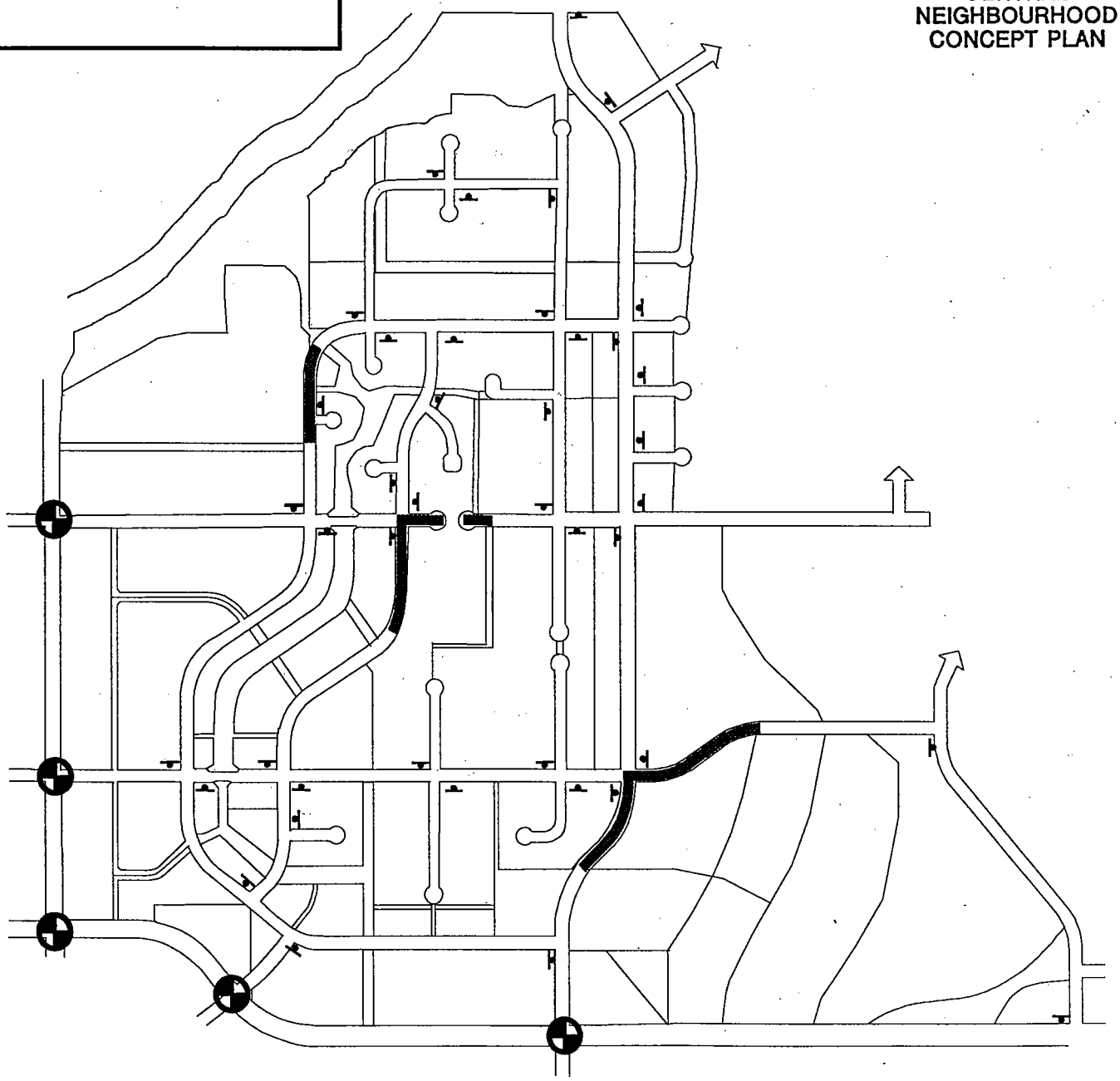
  - 156A Street. This will be a four-way intersection, with a roadway providing access into the Business Park on the south side of 32 Avenue. In the Local Area Plan, it was originally anticipated that the Business Park roadway would connect to 32 Avenue at 154 Street. Because of the highway off-ramp relocation, however, the City has indicated that the Business Park roadway would be aligned with 156A Street. Analysis indicates that this signalized intersection would operate at level of service D during the PM peak hour, primarily as a result of the high-volume northbound-to-westbound left turn movement. This left turn would operate at level of service D, and all other movements would operate at levels of service C or D. It should be noted that the cycle length for this signal was reduced to 60 seconds, as compared for a 73-second cycle length at the 154 Street/32 Avenue intersection.

Figure 4.2.1.5
Traffic Controls

- Signals
- Stop Sign
- School Zone (30 km/hr)

ROSEMARY HEIGHTS

CENTRAL NEIGHBOURHOOD CONCEPT PLAN



0m 250m 500m 750m 1000m

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- **Stop signs**. As summarized below, analysis of intersections within the Central Neighbourhood indicates that all intersections will operate at an acceptable level of service as unsignalized intersections.

Stop Sign Summary

Intersection	Minor Street Left Turns	Level of Service for Minor Street Left Turns
156A St. at:		
• RH Ring Rd. (south)	eastbound	B
• 34 Ave.	east/westbound	B/B
• 36 Ave.	east/westbound	A/A
• RH Ring Rd. (north)	east/westbound	A/A
34 Ave. at:		
• RH Ring Rd.	north/southbound	D/B
• Inner Ring Rd.	north/southbound	C/B
36 Ave. at:		
• RH Ring Rd.	north/southbound	B/A
• Inner Ring Rd.	north/southbound	A/A
• 156 St.	north/southbound	A/A
RH Ring Rd. at:		
• 154 St.	northbound	B
• Inner Ring Rd. (south)	southbound	B
• Inner Ring Rd. (north)	northbound	A
• 156 St.	north/southbound	A/A
All others	varies	A

Traffic control at intersections within the Central Neighbourhood will be provided by stop signs. The recommended orientation of stop signs is indicated in Figure 4.2.1.5. Because the function of a stop sign is to assign priority at an intersection, stop signs in the Central Neighbourhood are oriented so as to assign priority to traffic on the roadway which is of a higher classification (for example, a limited

collector road is of a higher classification than a through local street). In only two cases — at the intersections of the Inner Ring Road and the Rosemary Heights Ring Road — are classifications on all approaches the same. In these locations, a single stop sign is used on the "T" approach to assign priority to the through movement.

- **School zones** should be established on collector roads and local streets at the two elementary schools and one private school, as illustrated in Figure 4.2.1.5. Speed limits in these school zones would be reduced to 30 km/h (applicable between 8:00 a.m. and 5:00 p.m. on school days).

Access and Circulation

In order to provide for efficient circulation on neighbourhood roadways, the following guidelines should be applied to site plans for commercial, multi-family and institutional developments within the Central Neighbourhood.

- As per the Traffic Bylaw, all driveway accesses should be located such that the distance between the driveway centreline and the centreline of a nearby signalized intersection is at least 50m.

- Access to neighbourhood commercial uses on 34 Avenue can be provided along 34 Avenue, provided that driveway accesses are located at least 50m from adjacent intersections (centreline-to-centreline distance). For driveway accesses along Rosemary Heights Ring Road and Inner Ring Road, every effort should be made to maximize spacing from adjacent intersections and achieve the desired 50m distance. This spacing may not be achievable in some areas, however, in which case an absolute minimum distance of 20m should be used. Truck loading and commercial deliveries should be accommodated on-site.

- The elementary school at 36 Avenue/Inner Ring Road is assumed to share parking with the adjacent park, in which case the primary school access should be provided from the Inner Ring Road. However, the school district has not confirmed a site plan for this school site. Alternatively, the primary school access could be provided from

36 Avenue via the Inner Ring Road intersection. This issue will be resolved in the future. All accesses should be located a minimum of 60m from the intersection, to avoid conflicts between school traffic and vehicles travelling through the intersection. If a student drop-off/pick-up zone is desired, it should be located on-site, or on the east side of the Inner Ring Road at least 60m south of 36 Avenue, as illustrated in Figure 4.2.1.6.

- The primary access to the elementary school at 156A Street/34 Avenue should be provided from 34 Avenue. All accesses should be located a minimum of 60m from the intersection, to avoid conflicts between school traffic and vehicles travelling through the intersection. If a student drop-off/pick-up zone is desired, it should be located on-site, or on the south side of 34 Avenue at least 60m east of 156A Street, as illustrated in Figure 4.2.1.6.

- The primary access to the private school west of Rosemary Heights Ring Road between 36 Avenue and 37 Avenue should be provided from Rosemary Heights Ring Road. A Secondary right in/right out access should be provided from 152 Street. All accesses should be located a minimum of 60m from the intersection, to avoid conflicts between school traffic and vehicles travelling through the intersection. If a student drop-off/pick-up zone is desired, it should be located on-site. If off-site drop-off/pick-up zone is required, it should be on the west side of Rosemary Heights Ring Road, as illustrated in Figure 4.2.1.6.

On-Street Parking

As identified in the Stage 1 report, on-street parking would be permitted on local streets and collector roads. Parking would not be permitted in lanes, as parked cars would obstruct other vehicles due to the relatively narrow width of the lane. Parking is also not permitted on arterial roads.

Appropriate parking restrictions within the Central Neighbourhood include:

- Limited local streets and cul-de-sacs are to be constructed with a 8.0m pavement width. Due to the low traffic volumes on these roadways, there is no need to restrict parking. Where there are parked cars on

Figure 4.2.1.6
Parking Restrictions

No Parking

School Drop Off /Pick Up

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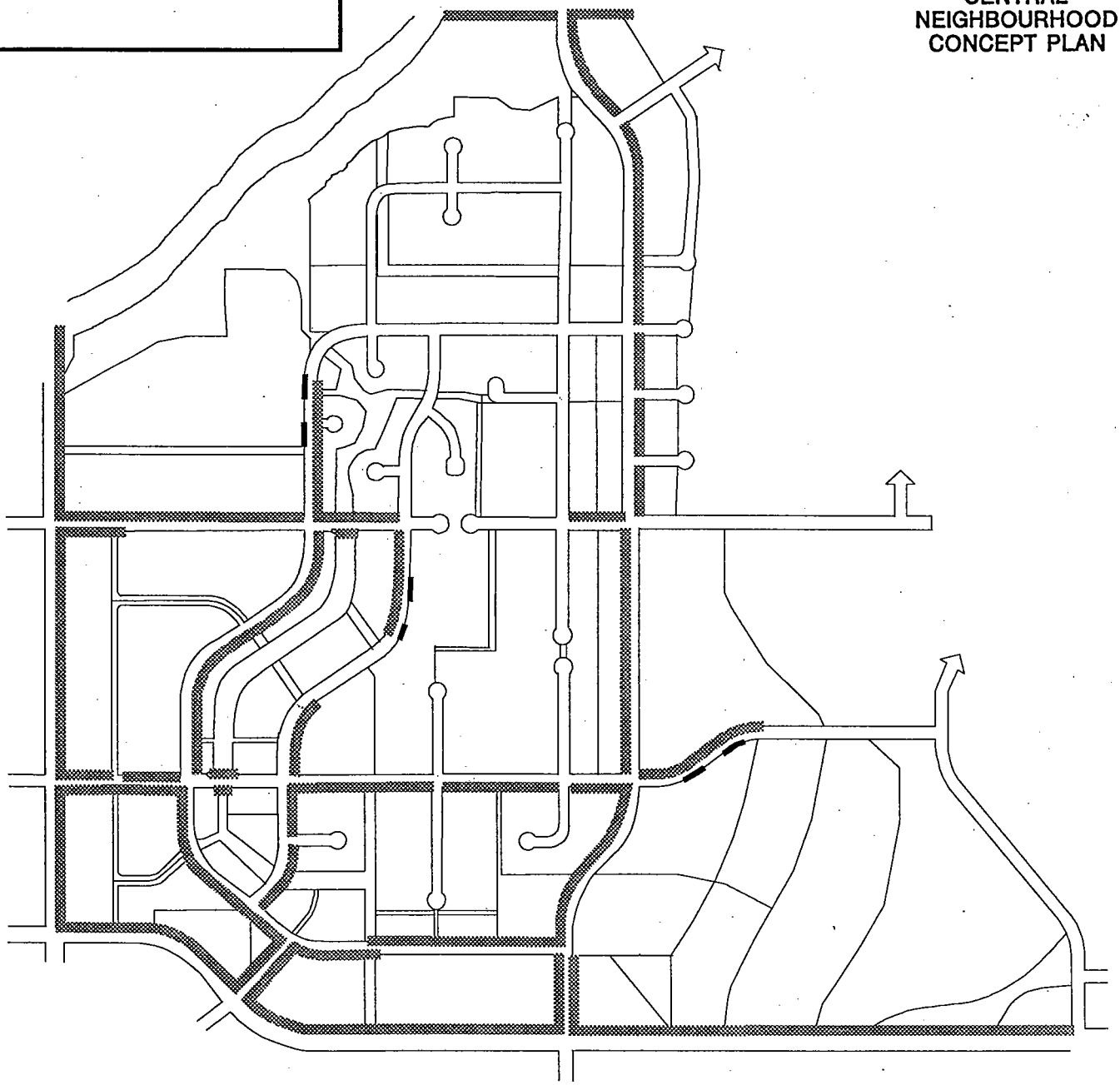

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both sides of a street, traffic would be reduced to one direction at a time, which simply means that an oncoming vehicle would have to wait for a vehicle to pass before proceeding.

- Through local streets are to be constructed to a 8.5m pavement width. Parked cars on both sides of the street would reduce the available pavement width to approximately 4.5m, which is adequately wide for two oncoming vehicles to pass if drivers proceed carefully.

  In most locations on through local streets in the Central Neighbourhood, the number of cars parked on-street will be low, as adjacent residential dwellings will have on-site parking. In the vicinity of the neighbourhood commercial centre and townhouses, however, there is potential for a significant amount of on-street parking. In order to avoid operational or safety problems, it is recommended that parking in these areas be restricted to one side of the through local streets, as illustrated in Figure 4.2.1.6.

- Limited collector streets are to be constructed to a 11.0m pavement width. This provides for a 2.4m parking lane and two 4.3m travel lanes. Figure 4.2.1.6 indicates appropriate parking restrictions on the following limited collector streets:

  - 34 Avenue — parking should be prohibited on the south side of 34 Avenue west of 156A Street, as there will be a greater number of dwelling units on the north side of this roadway. Parking should be restricted on both sides between 152 Street and the Rosemary Heights Ring Road so as to avoid operational problems at the signalized intersection.

    In the section between the two ring roads, through the neighbourhood commercial centre, the roadway should be widened to 13.4m to permit parking on both sides. Additional right-of-way width and a development variance permit will be required. This will increase the supply of short-term parking and improve access to the commercial centre, particularly for pass-by trips (neighbourhood residents who stop on the way to or from home). This widening would require a development variance permit. It should be noted that at the linear park, parking would

be prohibited on both sides and the roadway would be narrowed to 8.6m.

- 36 Avenue west of the Inner Ring Road — parking should be prohibited on the north side of 36 Avenue, as there will be a greater number of dwelling units on the south side of this roadway. Parking should be restricted on both sides immediately east of 152 Street so as to avoid operational problems at the signalized intersection, and both sides at the linear park between the two ring roads, where the roadway would be narrowed to 8.6m (the curb should be extended on the south side of the street to create the narrowing, rather than narrowing equally on both sides).

- Parking should not be permitted on 154 Street, due to the short length of roadway and the number of intersections and accesses.

- Major collector streets are to be constructed to a 12.2m pavement width, which is not sufficiently wide to permit parking on both sides of the street while maintaining two 3.35m travel lanes and two 1.5m bicycle lanes. Consequently, parking on 156A Street should be permitted on one side of the street only, as illustrated in Figure 4.2.1.6.

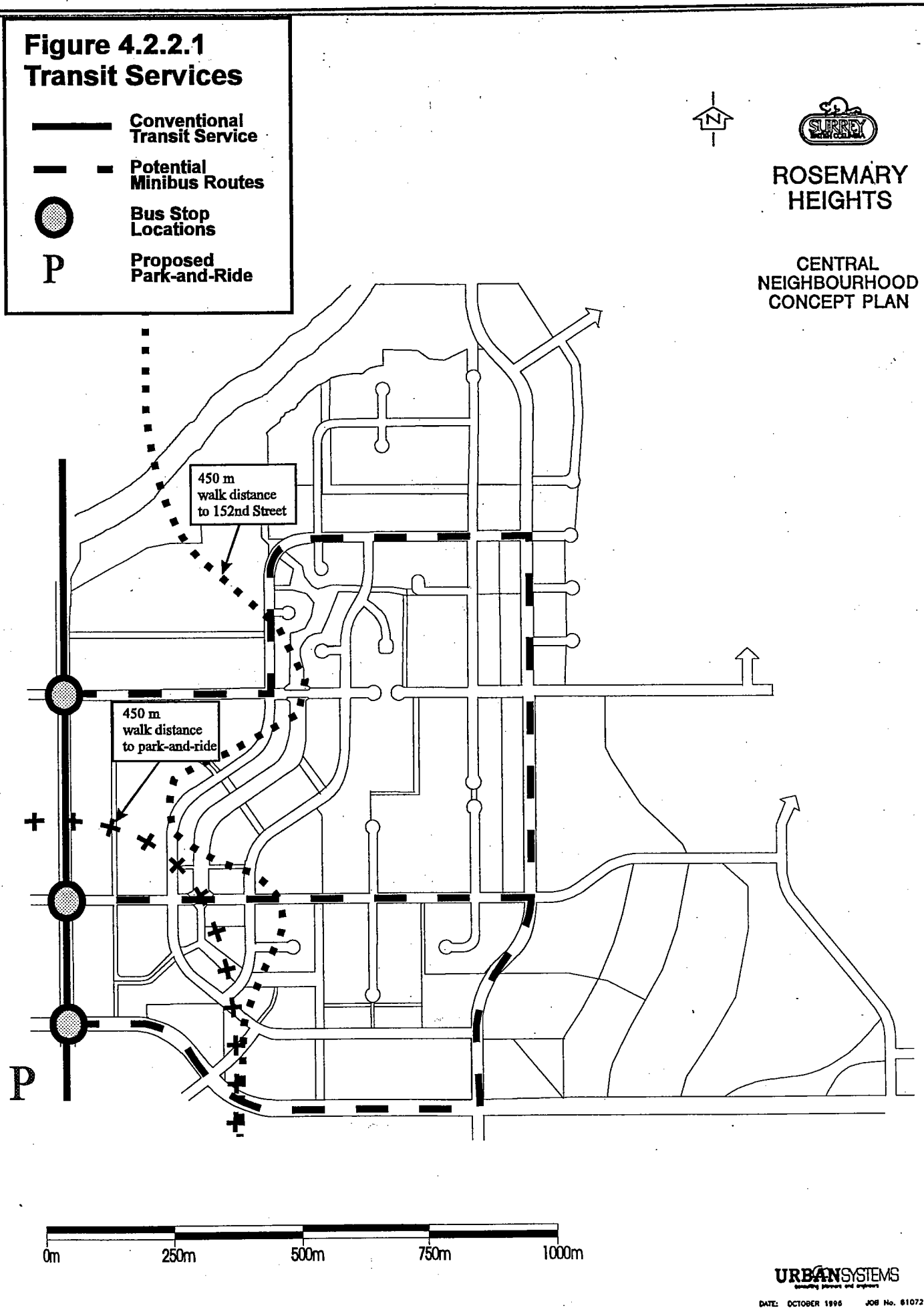
4.2.2 Transit

BC Transit has provided comments regarding future transit services in the Rosemary Heights area, based on a review of Stage 1 plans for the Central Neighbourhood. These comments have been incorporated into the provisions for transit services described in this section.

BC Transit's five-year regional transit plan and funding strategy — entitled TransAction 2002 — identifies several service improvements relevant to Rosemary Heights and the Central Neighbourhood in particular, including:

- Increased frequency of service on 152 Street. As illustrated in Figure 4.2.2.1, all garden apartments, commercial and institutional residential uses, plus approximately half the townhouses will be located within 450m walking distance of 152 Street. BC Transit has emphasized the need for "strong pedestrian links to 152 Street" in

Figure 4.2.2.1
Transit Services



order to maximize transit use within the Central Neighbourhood. These links are provided via 34 Avenue, 36 Avenue and linear parks. Bus stops on 152 Street would likely be located at 32, 34 and 36 Avenues, as illustrated in Figure 4.2.2.1.

- Conventional transit services (a 12m bus operating on a fixed route and schedule) would not likely be extended into the Central Neighbourhood. However, within the BC Transit's five-year plan may include pilot projects to evaluate the feasibility of alternative transit services, such as minibus services. Upon completion of the pilot projects, areas such as Rosemary Heights may be considered for such services.

  BC Transit indicates that their "usual practice is to treat any roadway of collector status or higher as potential roadways for transit service." Within the Central Neighbourhood, this means that a minibus service would likely operate along 34 Avenue, 36 Avenue, Rosemary Heights Ring Road and 156A Street, as illustrated in Figure 4.2.2.1. Given that it is not certain whether or not such a service would be provided, it would not be appropriate at this time to identify future bus stop locations.

- The existing Park-and-Ride facility on Cranley Drive south of Highway 99 is proposed to be relocated to the north side of Highway 99, in the triangular area between Highway 99, 32 Avenue and 152 Street. The Park-and-Ride facility is currently served by five bus routes, including express bus services to Vancouver. As illustrated in Figure 4.2.2.1, the majority of the neighbourhood commercial centre and the higher-density residential development in the southwest part of the Central Neighbourhood is within 450m walking distance of the proposed Park-and-Ride facility.

4.2.3 Bicycle and Pedestrian Facilities

Bicycle and pedestrian networks are identified in the Stage 1 report. In this section, end-of-trip bicycle facilities and locations for sidewalks are identified.

End-of-trip bicycle facilities complement the bicycle network. As noted in the City's *Bicycle Blueprint,* without end-of-trip facilities, many people will not consider cycling an attractive or even possible alternative mode of transportation.

In accordance with the guidelines presented in the *Bicycle Blueprint*, the following end-of-trip facilities should be provided within the Central Neighbourhood:

- Secure parking accommodates cyclists who need to store their bicycles for extended periods of time, and is the most effective type of parking facility in protecting against theft (theft of either the bicycle and some of its components or accessories) and inclement weather. Secure parking should be provided as follows:

  - For commercial uses (retail, restaurants), 1.0 secure parking stalls should be provided for every 500 m^2 GLA, or 1.0 stalls per 10 employees.

  - For multi-family dwellings, 1.5 secure bicycle parking stalls should be provided for each dwelling unit.

  - Secure parking at schools, community centres and other institutions should be determined by the Bicycle Coordinator and the Planning Department at the time of the development permit application.

- Bicycle racks are intended for short-term convenience parking, and are typically located outside grocery stores, banks, retail stores, schools and community centres. For multi-family dwellings and commercial uses, racks providing parking for a minimum of six bicycles should be provided outside each building, preferably located near the main building entrance in a visible location. For schools and community centres, the number of bicycle racks required should be determined by the Bicycle Coordinator and the Planning Department at the time of the development permit application.

- **Shower, changeroom and locker amenities** are typically only required by commuter cyclists at their place of employment, so that they may wash and change into work clothes. They also provide cyclists with a place to store clothing, which is sometimes difficult to transport by bicycle. Within the Central Neighbourhood, major employment locations include the neighbourhood commercial centre on 34 Avenue and the two elementary schools. Relevant guidelines from the *Bicycle Blueprint* include:

  - The number of required lockers should be equal to or greater than 1.4 times the number of required parking stalls. These should be distributed equally between both male and female changerooms.

  - For up to nine secure bicycle parking stalls, one generic (male/female) shower is required. For 10 to 29 stalls, one male and one female shower are required. For 30 to 64 stalls, two male and two female showers are required.

  - Wash basins should be provided equalling the number of showers required.

- In addition to locations within the Central Neighbourhood, secure bicycle parking (preferably in the form of bicycle lockers) should be provided at the proposed Park-and-Ride facility on the southwest corner of 152 Street/32 Avenue, as recommended in the *Bicycle Blueprint.*

Sidewalks

Sidewalks would be provided as described below, in accordance with the City's Subdivision and Development Bylaw.

- On arterial roads (152 Street, 32 and 40 Avenues) and through collector roads (156A Street), sidewalks would be provided on both sides.

- On limited collector roads, the Subdivision and Development Bylaw requires that sidewalks be provided on one side only, except in commercial areas where sidewalks are required on both sides. In

order to maximize pedestrian access and safety, it is recommended that in the Central neighbourhood, sidewalks be provided on both sides of limited collector roads — 34 Avenue west of 156A Street, 36 Avenue west of Inner Ring Road and 154 Street.

- On through local streets, sidewalks would be provided on one side only, except in commercial areas where sidewalks would be provided on both sides. Sidewalks should be located on the side of the street with the greatest residential dwelling density.

- On limited local streets, sidewalks would not be provided, as traffic volumes are very low and pedestrians can safely share the road with the few vehicles using these streets.

4.2.4 Phasing

Capital cost estimates for elements of the transportation system which would be funded through DCC revenues are summarized below. These estimates are known as "Class D" estimates, which means that they are preliminary estimates based on limited site information, and consequently indicate only the approximate magnitude of cost of the proposed projects. These estimates are based on unit cost data.

Item	Estimated Cost*
Traffic signals:	
• 152 St./34 Ave.	$85,000
• 152 St./36 Ave.	$85,000
• 32 Ave./Off-Ramp/154 St.	$85,000
• 32 Ave./156A St.	$85,000
Totals	**$340,000**

* Estimated costs include 35% for engineering, contingency, administration and GST.

4.3 Drainage

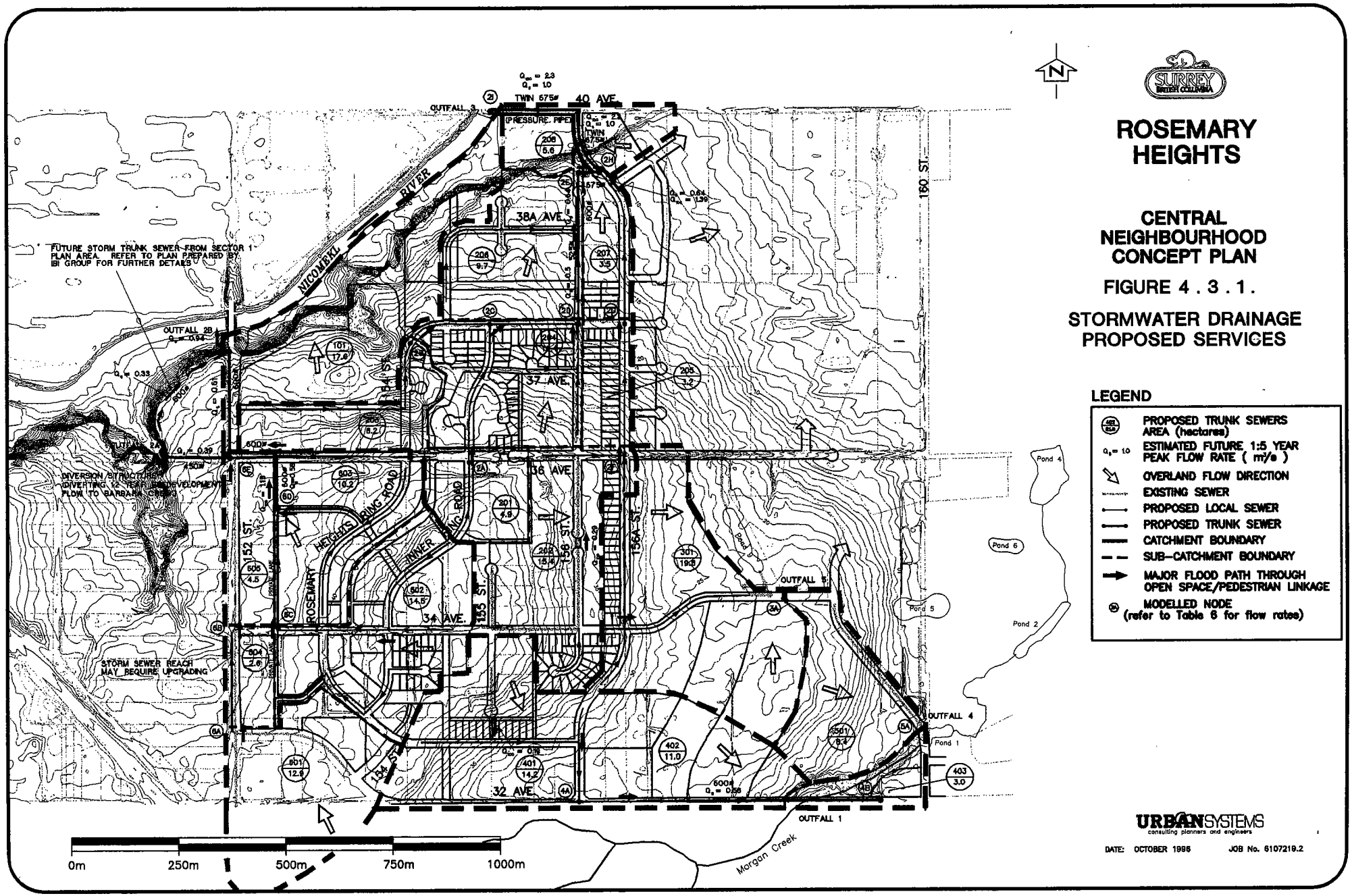
The objective of this section is to summarize the effects of the proposed development on existing downstream drainage systems and to present the conceptual design for the required drainage and stormwater management infrastructure. The detailed stormwater drainage report is attached as Appendix C.

The intent of the storm drainage system is to safely, economically and being sensitive environmentally route the minor and major stormwater flow from the Central Rosemary Heights NCP to the Nicomekl River and Morgan Creek. The proposed drainage infrastructure is shown in Figure 4.3.1.

The proposed drainage infrastructure plan was prepared in coordination with the Morgan Creek/Old Logging Ditch Master Drainage Plan (New East Consulting Services Ltd., April 1996) and the Elgin Creek 1995 Master Drainage Plan Update (I.D. Group/Duncan & Associates Engineering Ltd., January 1996). The design engineers (Aplin & Martin Consultants Ltd.) for the neighbouring Morgan Creek Development to the east, were also consulted regarding stormwater discharge east of 156th Street.

Study Area

The study area is located adjacent to the Nicomekl River approximately 6,500 metres upstream of Mud Bay and is subject to tidal fluctuations. Detention in the uplands this close to the river would not restrict flows significantly enough to reduce the flooding problem in the lowlands. The same level of flooding in the lowlands would be expected with or without detention in the Rosemary Heights uplands. As a result, from a flood control perspective, stormwater detention for those lands discharging directly to the Nicomekl River is unwarranted. Discussions with both City and MELP staff has confirmed this approach. The minor (1:5 year) stormwater runoff will be conveyed via storm sewers. Runoff during less frequent events will utilize overland flow routes in combination with the storm sewer system. While peak flow attenuation may not be required, measures to enhance water quality should be provided where feasible.



ROSEMARY HEIGHTS

CENTRAL NEIGHBOURHOOD CONCEPT PLAN

FIGURE 4.3.1.

STORMWATER DRAINAGE PROPOSED SERVICES

LEGEND

- PROPOSED TRUNK SEWERS AREA (hectares)
- Q_p= 1.0 ESTIMATED FUTURE 1:5 YEAR PEAK FLOW RATE (m³/s)
- OVERLAND FLOW DIRECTION
- EXISTING SEWER
- PROPOSED LOCAL SEWER
- PROPOSED TRUNK SEWER
- CATCHMENT BOUNDARY
- SUB-CATCHMENT BOUNDARY
- MAJOR FLOOD PATH THROUGH OPEN SPACE/PEDESTRIAN LINKAGE
- MODELLED NODE (refer to Table 6 for flow rates)

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The drainage study area, as defined in Figure 4.3.1, totals 175.5 hectares. Under existing conditions 28 percent of the study area discharges directly into the Nicomekl River between 155th Street and 152nd Street, while the remaining 72 percent discharge to various locations, including Barbara Creek, Morgan Creek (Titman Creek), the 36th Avenue ditch and east in the 40th Avenue ditch. The flow from Morgan Creek and the existing 36 Avenue and 40 Avenue east flowing ditches all ultimately discharge at the Old Logging Ditch flood boxes and pump station.

The future catchment boundaries will increase the area discharging directly to the Nicomekl River to 68 percent. The remaining 32 percent will discharge either to Morgan Creek or to the drainage infrastructure which includes detention ponds in the neighbouring Morgan Creek Development to the east.

While the majority of runoff from the Plan area will be diverted away from Barbara Creek, a diversion structure at the intersection of 36th Avenue and 152nd Street will be required to provide a 1:2 year pre-development base flow to Barbara Creek. The excess flows will be diverted north on 152nd Street directly to the Nicomekl River.

Minor Drainage System

Currently, the study area is serviced by a combination of open ditches and storm sewers. There have been no fisheries sensitive habitats identified within the study area. While the upland ditch system does not support fish directly, the ditches do provide valuable fish nutrients. In some cases, such as one existing ditch, east of 154 Street, this ditch is protected within a park/open space designation and does ultimately provide nutrients into the Nicomekl River. This Plan assumes that the sewer network will be sized for the 1:5 year storm event, in accordance with current City standards. Should developers wish to provide basements, providing a sewer system designed for the 1:100 year event will need to be revisited.

While Figure 4.3.1 identifies the routing of both local and trunk sewers, pipe sizes have only been identified for trunk sewers. A trunk sewer has been determined using the Surrey criteria which states that a trunk storm sewer shall be a system which services an area of 20 hectares or greater.

Although not a trunk sewer, the existing sewer on 152nd Street between the 32nd Avenue diversion and 34th Avenue is under capacity for the existing conditions. Future development is expected to increase peak flow to this sewer by an additional 50% during a 1:5 year event. Consideration may be given to upgrading this pipe reach in the interim if more detailed calculations and observed flow conditions necessitate upgrading. The future catchment boundaries will divert a significant catchment area from discharging to the 152nd Street sewer between 34th and 36th Avenues. As a result the capacity of the 152nd Street sewer between 34th and 36th Avenues will not be exceeded. Downstream of the proposed 152nd Street diversion structure, the existing sewer on 152nd Street is greatly under capacity and requires replacement to the Nicomekl River.

Discussion regarding specific outfall locations will be presented later in this section. Also, cost estimates and cost recovery strategies will be discussed in Section 6 of this Plan.

Major Drainage System

Stormwater runoff exceeding the 1:5 year storm event is considered to be major flow. Major flow paths are to be sized for the 1:100 year peak runoff flow rate. In most cases the major flows will be contained within the road right-of-way. However, in areas where the major flow can not be contained within a road or lane right-of-way, the major flow path is shown circled on Figure 4.3.1. At these locations the major flow path is contained within buffer or open space dedications. Overland channels or swales within these areas can provide sufficient conveyance. The City will need to ensure that ownership and maintenance of these areas are retained, or else the sewer may need to be sized for the 1:100 year event.

Due to topography, many of the road intersections may permit surface flow to split in two directions. Specifically, all intersections on 156A Street north of and including 36th Avenue. These must be designed to ensure the major flood path remains north on 156A Street to 40th Avenue and is not permitted to spill into the Morgan Creek catchment. Pavement crossfall adjustments or alternative methods will be necessary to ensure that catchment boundaries are maintained during a major storm event. In this plan sewer trunk sizes have only been determined to convey the 1:5 year runoff.

Outfall Locations

There are a total of five outfalls servicing the future development (Figure 4.3.1):

1. Morgan Creek at 32nd Avenue.
2. Nicomekl River at 152nd Street.
3. Nicomekl River at 40th Avenue.
4. Storm sewer on Morgan Creek Way (160th Street) at Morgan Creek.
5. Storm sewer on 34th Avenue 150 metres west of Morgan Creek Way (160th Street).

The last two outfalls have been adequately addressed by Aplin & Martin in the design of the Morgan Creek Development. The remaining three outfalls are required as part of this Plan.

1. Morgan Creek at 32nd Avenue.

The catchment area contributing to this outfall will decrease slightly from 29.9 hectares to 28.2 hectares following full development. However, the 1:5 year peak flow rate will increase from 0.30 cms to 0.58 cms.

A number of detention ponds have been constructed on-line of Morgan Creek between Morgan Creek Way and 34th Avenue as part of the Morgan Creek Development. The detention ponds were originally sized to detain flow from a large catchment south of 32nd Avenue. The intent was to protect Morgan Creek, north of 32nd Avenue, and the downstream ditches from the impacts of peak flow. The ponds have the capacity to control a much larger area than noted in the New East (April 1996) report for impacts on the drainage system, downstream of 32nd Avenue.

The three downstream ponds have been modelled using the pre-development condition for the lands south of 32nd Avenue and post-development condition for the lands north of 32nd Avenue. This is consistent with the approach used by Surrey in their analysis in the Old Logging Ditch MDP. As expected, the 1:5 year flow increases prior to

the first pond (1.08 cms pre vs. 1.33 cms post). The outfall for the 32nd Avenue trunk is located east of the Morgan Creek/32nd Avenue culvert. This bypasses the fish sensitive area of Morgan Creek between 32nd Avenue and Morgan Creek Way. The Creek can accommodate this modest increase without erosion in the 1:5 year event. At Pond 1 the flow is detained to a 1:5 year release rate of 1.11 cms, a 0.03 cms increase over the pre-development flow.

The flow is then routed into pond #2 and again detained with a new release rate of 1.06 cms in the 1:5 year condition. The discharge is then routed down Morgan Creek in the final pond #4. This pond directly services areas of the Morgan Creek development and is sized accordingly. The release rate from this pond is controlled to meet pre-development 1:5 year condition for the larger catchment including the NCP area.

Morgan Creek is protected by way of restrictive covenants between the private owners and the Ministry of Environment (MELP). The overall Morgan Creek stormwater management approach was approved by MOE during the development of the Morgan Creek residential community. The in-stream ponds and operational features have been accepted by MELP/DFO.

To ensure that there is no downstream impact on Morgan Creek between 32nd Avenue and Morgan Creek Way, a trunk sewer on 32nd Avenue is proposed. There are currently two large culvert crossings on 32nd Avenue west of Morgan Creek Way. The proposed 32nd Avenue trunk will bypass the first crossing (Morgan Creek) and continue on to a new outfall to the east. This second outfall by-passes the fisheries sensitive area and discharges close to the first pond. The channel from the outfall to Morgan Creek has already been armoured to protect this tributary from potential erosion. Given the condition of the channel, grade, vegetation and backwater elevation from the pond, discharge at this location will not require additional detention.

It is our understanding that the City of Surrey will require off-line detention to address the potential impacts of peak flow from land south of 32nd Avenue. The trunk bypass proposed for the NCP lands will help to reduce the size of the detention facilities identified in the April 1996 New East report.

2. Nicomekl River at 152nd Street

Currently, 49.4 hectares discharges into a ditch located within the 36th Avenue right-of-way from 152nd Street. Following full development this area will decrease to 44.9 hectares, however the 1:5 year peak flow will increase from 0.54 cms to 1.00 cms. While an outlet structure at Barbara Creek has been constructed to accommodate the 1:100 year runoff, there is concern about the sensitivity of Barbara Creek downstream of 36th Avenue.

While it is proposed to minimize discharge to this outfall to prevent further erosion, the MELP has expressed that base flows must continue to be provided to Barbara Creek. While Barbara Creek does not support resident fish, it does provide valuable nutrients to the Nicomekl River. An agreement in principal was reached with the MELP to provide base flow up to the peak 1:2 year pre-development levels, while the remaining post-development discharge would be conveyed directly north to the Nickomekl River in a new 152nd Street Storm Sewer.

Figure 4.3.1 showing the proposed stormwater drainage system indicates a new 450 ø sewer within the 36th Avenue right-of-way between 152nd Street and Barbara Creek. This assumes that the existing open channel in this right-of-way will be infilled and replaced with a storm sewer. The opportunity also exists to maintain this as an open channel to provide added nutrients to Barbara Creek.

The consultant (IBI Group) preparing the development plan for the Sector 1 Plan Area on the west side of 152nd Street has indicated the opportunity to eliminate the base flow requirement at 36th Avenue by providing additional base flows further upstream at 150th Street.

While this opportunity has been recognized, further review by IBI Group and a sign off from the MELP is required prior to being adopted. Therefore, this plan continues to identify a base flow provision at 36th Avenue.

The new trunk sewer on 152nd between 36th Avenue and the Nicomekl River will parallel the west side of the existing 250 ø storm sewer to the Nicomekl River.

The future 600 ø trunk storm sewer from the Sector 1 Plan Area, as shown on Figure 4.3.1, will discharge to the 152nd Street trunk at the top of the escarpment. The trunk sewer servicing both Plan Areas and the outfall will continue to parallel the existing 250 ø storm sewer within the 152nd right-of-way. Specific attention will be required during the design of the outfall to ensure the integrity of the bridge abutments and habitat areas are not compromised.

3. Nicomekl River at 40th Avenue

The catchment contributing to this outfall will undergo the most significant change following development. The area contributing to this outfall will increase from 20.1 hectares to 56.7 hectares. As expected, the 1:5 year peak flow rates will increase substantially from 1.02 cms to 2.29 cms.

This section of 40th Avenue is below the 200 year floodline (estimated at 2.5 m in elevation) and is subject to frequent flooding. Drainage along 40th Avenue is currently serviced by open ditches and it is not City policy to enclose ditches within the floodplain. However, various outfall options were reviewed, including:

- construct a dyke tie-in,
- utilize the existing open ditch, and
- install a twin pressure pipe system

There are land ownership and safety concerns with constructing a dyke tie-in, and utilizing the existing ditch may pose a liability risk to the City during flooding events. Therefore, the chosen option is to install a twin pressure pipes beginning on 156th Street with an invert elevation above 6 metres and continuing within the 156th Street and 40th Avenue dedication to the bank of the Nicomekl River for direct discharge through a flood gate. A twinned pressure pipe system is proposed to allow continued operation during maintenance periods. At the entrance to the pressure pipes on 156th Street, a storm inlet capable of handling the 1:100 year peak flow rate will be required. As long as the inlet is sufficiently designed, the pressure pipes will be capable of conveying the major flow, with a maximum surcharge elevation remaining below 6 metres in elevation.

During the design stage of this system a number of issues will need to be addressed:

(i) adequate access must be provided through the length of the system for maintenance purposes;

(ii) review the opportunities to construct the outlet such that the pressure systems discharges at an acute angle with the direction of flow in the Nicomekl River to minimize scour.

(iii) although not required during high flow conditions, dissipation measures will likely be required at the outfall for bank protection during low flow conditions.

4. Stormwater Quality Measures

In the evaluation and selection of stormwater quality Best Management Practices (BMPs) one must balance the needs of the fish and wildlife resource and practical considerations such as topography, soils, cost and designated land uses. To be effective in protection of the natural watercourse the following objectives were considered:

1. Protection of the natural watercourses to avoid erosion and loss of fish and wildlife habitat.
2. Establish short and long term water quality measures to protect fish habitat.
3. Optimize the stormwater system to be most cost effective while achieving environmental protection.

To evaluate various BMPs in meeting the objectives listed we considered criteria under two broad areas; source control and treatment control.

The criteria used in our evaluation included the following:

- capital and maintenance costs
- suspended solids and N and P removal
- soil conditions
- water course sensitivity
- topography
- implementation feasibility
- land use

The following BMPs were chosen for application in the Rosemary Heights Central NCP area:

Source Control

- street sweeping (provides nutrient control)
- catch basin cleaning
- sediment control - residential home builder responsibilities
  - gravel access pad
  - silt fencing of stock piled soils
  - interceptor ditches
- sediment control - developer responsibilities during off-site servicing
  - sediment control pond for the development
  - silt fencing to assist in erosion control
  - protection of leave strip areas
  - surface protection (grass, hydroseeding, mulching)
  - interceptor ditching
- overall community planning to avoid sensitive areas has been completed. eg. protection of the Nicomekl River area
- leave strip protections are incorporated into the land use plan
- disconnected roof leaders are required by the City of Surrey
- flow diversion to protect highly sensitive fish habitat and erodible banks
- the use of the "Stormceptor" should be considered for use in commercial as high density residential parking areas

Treatment Controls

- wet detention pond - for the 32nd Avenue catchment discharge
- vegetated filter strips - proposed to be integrated into the design of the commercial and multi-family developments

- highly sensitive riparian forests are preserved along the north boundary of the NCP (Nicomekl River)
- infiltration systems are not proposed in this NCP due to the soil conditions
- constructed wetlands are not available due to topography constraints and ownership issues

The City and development community will both have to actively participate in the implementation and on-going monitoring of stormwater quality measures to protect fish and wildlife habitat.

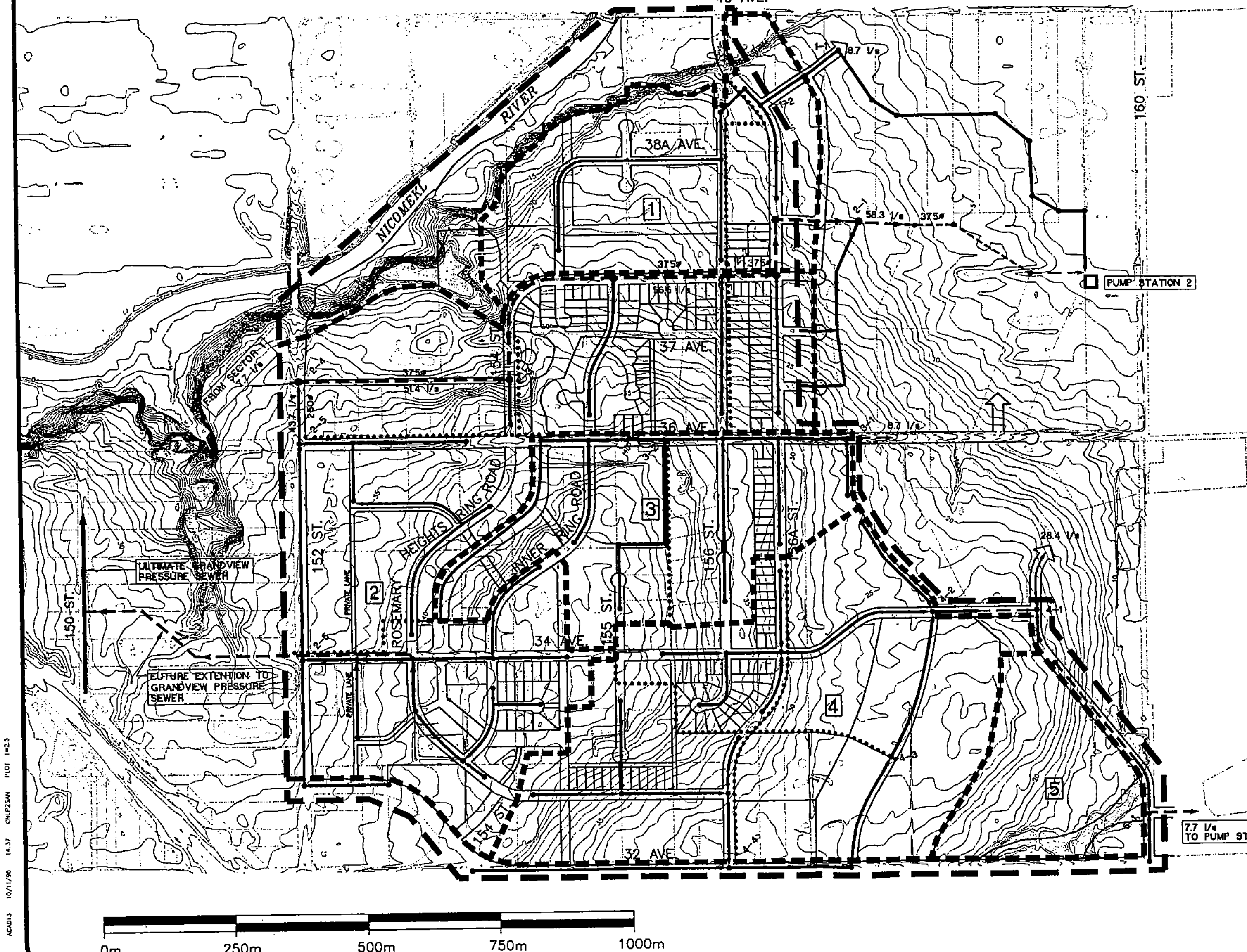
4.4 Sanitary

The sanitary sewer system is shown in Figure No. 4.4.1. The proposed system is designed to initially convey all flow from the NCP Area to the Morgan Creek Pump Stations. A connection from Sector 1, west of the NCP Area, will be made at Manhole 2-4, pipes downstream of this location have been sized to service an equivalent population of 1216 persons from this western portion of Sector 1 NCP.

The Morgan Creek pump station and the force main from it have been designed to serve a population of 10,650 people. The tributary area of this pump station include all NCP areas below 41.0 m elevation, the Morgan Creek golf course, and certain other areas to the south which are below elevation 41.0 m. The City of Surrey would like to minimize the dependency of areas on this pump station and also reduce the long term operating and maintenance costs for the future sanitary sewer systems in Rosemary Heights. It is also likely that the final population for the entire area will exceed the design population for the pump station. The combined population now projected for the Western (Sector #1) and Central (Sector #2) NCP areas exceeds the population projected by the LAP for these areas by approximately 2000 people, but is still below 10,650 people which is the capacity of the Morgan Creek #2 pump station. Final populations in other areas may similarly increase. Where feasible, sanitary flows must therefore be directed away from the Morgan Creek pump station.

The eastern portion of the Western NCP, between 152nd Street and Barbara Creek and north of 34th Avenue, cannot flow by gravity directly to the Crescent Road pump station. This area will flow to the Morgan Creek pump station through the connection at Manhole 2-4.

Flow upstream of Manhole 3-2, for all areas above 41.0 m geodetic, will ultimately be discharged into the force main along 36th Avenue. This will occur once the existing 200 mm forcemain from Crescent Road Pump Station is replaced with a larger pipe. For the interim lateral sewers upstream of Manhole 3-2, servicing land above 41 m geodetic elevation, will connect to the gravity sewer along 36th Avenue, but will be constructed to allow diversion into the 36th Avenue force main.



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CENTRAL NEIGHBOURHOOD CONCEPT PLAN

FIGURE 4.4.1.

SANITARY SEWER

LEGEND

— — — —	PROPOSED TRUNK SEWERS
————	PROPOSED LOCAL SEWERS
- - - - - -	EXISTING
■ ■ ■ ■	CATCHMENT BOUNDARY
··········	SUB-CATCHMENT BOUNDARY
[2]	CATCHMENT NUMBER
▬ ▬ ▬	NCP BOUNDARY

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Flow upstream of Manhole 2-6, for all areas above 41.0m geodetic, will ultimately be discharged to the Grandview Pressure Sewer. All flow upstream of the 41.0m contour is capable of flowing to the Grandview Pressure Sewer.

Until such time as the ultimate Grandview Pressure Sewer system through Sector 1 is built, flow upstream of Manhole 2-6 will be directed along the sewer servicing properties fronting 152nd Street. To provide for the ultimate connection to the Grandview Pressure Sewer the portion of the gravity sewer along 34th Avenue from Manhole 2-6 east to Rosemary Heights Ring Road will be twinned with a pressure sewer. The pressure sewer is to be constructed at the same time as the gravity sewer and will be at the cost of the developer. The manhole at 34th Avenue and Rosemary Heights Ring Road will be constructed to allow for diversion of flow into the pressure sewer at the time it becomes available for use.

No gravity service connections to the pressure sewer are permitted.

The portion of the 34th Avenue pressure sewer west of 152nd Street will be constructed as part of the Grandview Pressure Sewer; a final alignment will be determined at that time.

The existing City of Surrey 10 Year Servicing Plan does not include any improvements to sanitary systems which will benefit the Central Rosemary Heights area. Construction of sewers outside the NCP area, which flow through Morgan Creek, will likely be built by the developer requiring the service but certain portions of the sewers qualify as a "trunk" element and hence are proposed to be DCC elements. Similarly, the final improvements to the Morgan Creek pump station will likely be built by developers in the Central Rosemary Heights Area and are proposed to be eligible for DCC rebates.

The NCP Area is made up of 5 catchments all of which drain to connection points in the Morgan Creek Development Area. Connecting sewers, in Morgan Creek, exist for Catchment Areas 2, 3, 4 and 5, the connecting sewer for Catchment Area 1 is planned for construction on or after 1997.

Catchment Areas 4 and 5 have large developable parcels closest to the existing sewers and are likely to develop first. Timing for the other areas will depend on market conditions.

4.5 Water

The NCP area lies entirely within the 80 metre pressure zone. Supply to the area is derived from connections to the major grid network on 32nd Avenue at 144th Street and on 152nd Street at the King George Highway. The supply system is shown schematically in Figure No. 4.5.1. The proposed supply system has been configured to meet the needs of Sector 1 NCP, Sector 2 NCP and the Morgan Creek Development.

Minimum service pressures are met throughout the service area with the exception of those lands situated above the 46 m contour. Within this zone the best achievable service pressure during peak hour demand will be 270 KPA (39 psi). This effects an area of approximately 11 hectares.

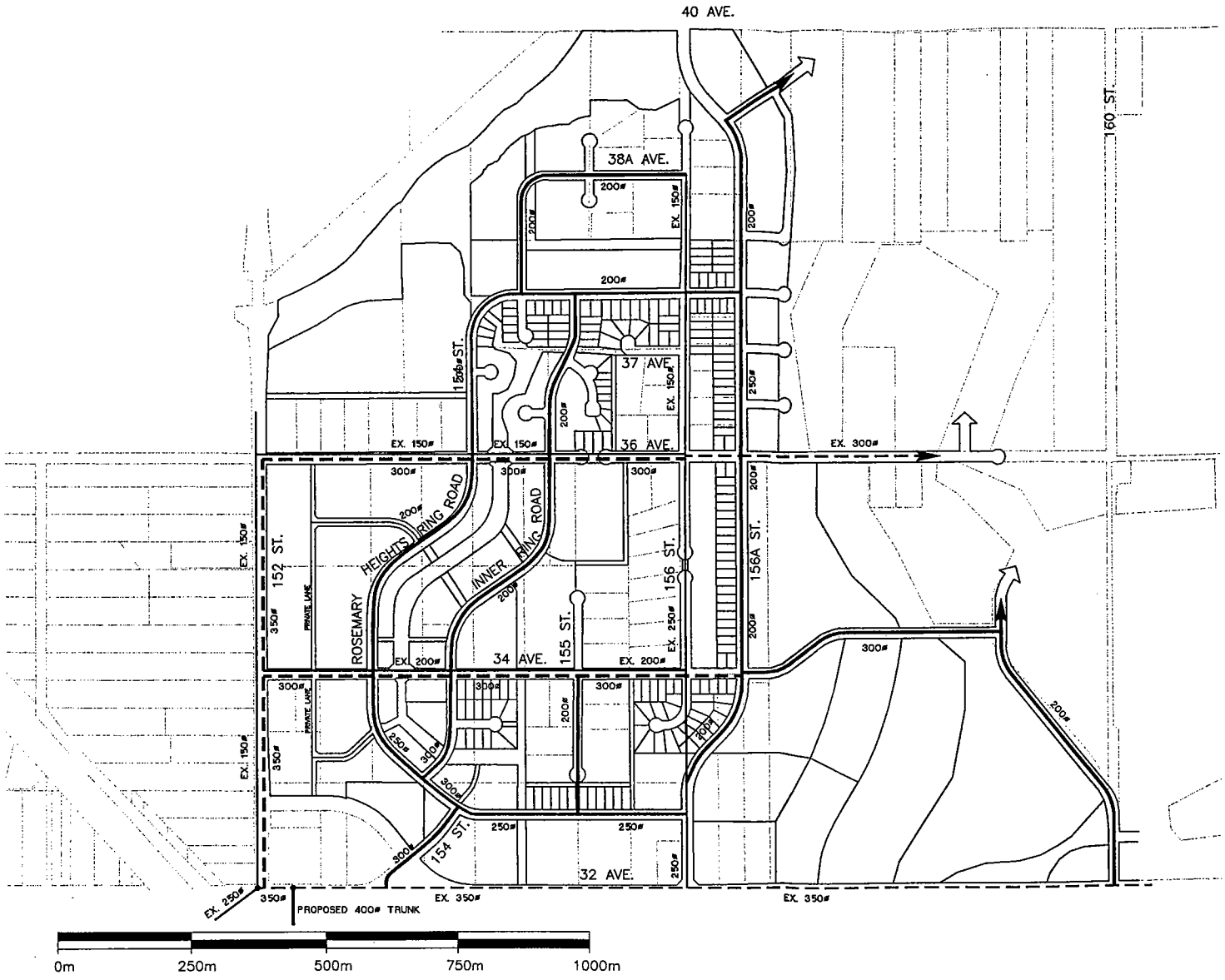
Ideally, a minimum pressure of 290 KPA (42 psi) is preferred. The obstacle in achieving this objective is the pressure zone limit of 80 metres which exists at the two main connection points for the supply system.

The difference between the ideal pressure and the achievable pressure is not considered sufficiently significant to warrant major changes to the supply system. In practice theoretical numbers often fall somewhat short of the results found from measurement in the field. In this case, the difference between the calculated pressure of 270 KPA and 290 KPA is within the range of differences found in the field when comparing theoretical pressures with measured pressures. For this reason the system as shown is considered adequate.

Fire protection criteria are met throughout the entire study area.

Construction of a 400ø mm grid water main is proposed along 152nd Street from the King George Highway to 32nd Avenue. This main is proposed in lieu of the main along 156th Street as proposed in the 10 year servicing plan. This revised alignment is 900 metres shorter and therefore considerably less costly.

There is an existing 150ø mm water main along 156 Street from 36th Avenue to 38A Avenue. The proposed development along 156th Street, north of 36th Avenue is Suburban ½ Acre and Suburban 1 Acre which is adequately serviced by this water main. Fire protection is



ROSEMARY HEIGHTS

CENTRAL NEIGHBOURHOOD CONCEPT PLAN

FIGURE 4.5.1.

WATER DISTRIBUTION PLAN

LEGEND

- EXISTING GRID WATER MAIN
- EXISTING LOCAL WATER MAIN
- PROPOSED GRID WATER MAIN
- PROPOSED LOCAL WATER MAIN

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presently provided by hydrants along this water main. This water main will be left in place to service properties north of 36 Avenue. For the remainder of the system, fire hydrants will not be permitted on lines smaller than 200ø mm.

The proposed distribution has been designed to provide sufficient water for peak hour domestic purposes. The system has also been designed to provide adequate water for fire protection during maximum day demand. The proposed system also provides for sufficient looping of mains to improve system efficiency and security.

The proposed water system is anticipated to be sufficient if every element comes into effect at the same time. If only a portion of the total system is constructed by an individual development, the size of the mains which are required may be larger than those indicated in this report. It will be the developer's responsibility to confirm the size requirements to provide adequate water to this development and to pay for any oversizing not deemed to be part of the ultimate grid or oversizing required to service the individual development needs.

4.6 Utilities (BC Hydro, Tel, Gas, Cable)

Power

The City of Surrey, as policy, requires that all new hydro service be underground. The exceptions to this are noted in the City's Subdivision and Development Bylaw #8830. We have reviewed the proposed servicing corridors and believe that within the NCP area underground servicing is possible. The City will have to ensure that as development incrementally grows that all new hydro services are placed underground. The 152nd Street and 32nd Avenue corridors may be exceptions given the cost of underground services on arterial roads.

It is worth noting that some of the City's current road cross sections require hydro and gas services in smaller corridors than currently supported by the utility companies. This is an on-going issue with the City and BC Hydro, BC Tel and BC Gas. The NCP can accommodate the City's standards.

BC Hydro has initiated an extensive public consultation process to determine the best siting for a new substation in South Surrey. The substation is necessary for growth in the Semiahmoo Peninsula area. Three sites are under consideration by the City, all of which are outside this NCP area. The preferred site is located south of 32nd Avenue, off of Croydon Avenue in the 3000 Block area. The site will be confirmed by BC Hydro and the City as BC Hydro's plans are finalized.

BC Tel and Cable TV

As with power, the present telephone system within the area is overhead on poles. The City's Subdivision and Development Bylaw #8830 states that all telecommunications wiring must be installed underground. To comply with this requirement, existing telecommunications wiring will be relocated underground in conjunction with the overhead power lines as development proceeds. All new telecommunication lines will be located underground.

BC Telephone Company has expressed a desire for a Remote Serving Unit (RSU) at a central location to serve the entire Local Area Plan (LAP) area which includes NCP Sectors #1, #2, #3 and the Morgan Creek

Development area. The area of land required for an RSU would be approximately equal to a single family lot. The utility company has suggested that a convenient location would be just to the west of the existing fire hall on 32nd Avenue. Service to this RSU would come from 16th Avenue and 148th Street.

A site west of the fire hall, between 154th Street and the Rosemary Heights Ring Road, may be a suitable location for the RSU. As the Stage II report proceeded, 154th Street had to be realigned to meet a proposed ramp from the future 32nd Avenue interchange. Given the current land ownership, the construction of 154th Street will severe a small site between two roads and the fire hall. This site may be suitable for the RSU. BC Tel will consider this and other sites in it's deliberation before finalizing a RSU location.

Efficiency and minimum costs for the installation of the underground system would be achieved if development were to radiate outwards from the location of the RSU. If the phasing of development cannot be achieved in this pattern, development will be required to absorb the extra costs of integrating overhead and underground systems.

BC Telephone has stated that no new telephone services can be provided within the area until an RSU is constructed. It will take BC Tel 1 year to get the RSU on-line. BC Tel requires either a right-of-way or ownership for the RSU site.

Gas

The gas system which presently exists within the NCP area will be improved and expanded as development proceeds.

5. Development Phasing

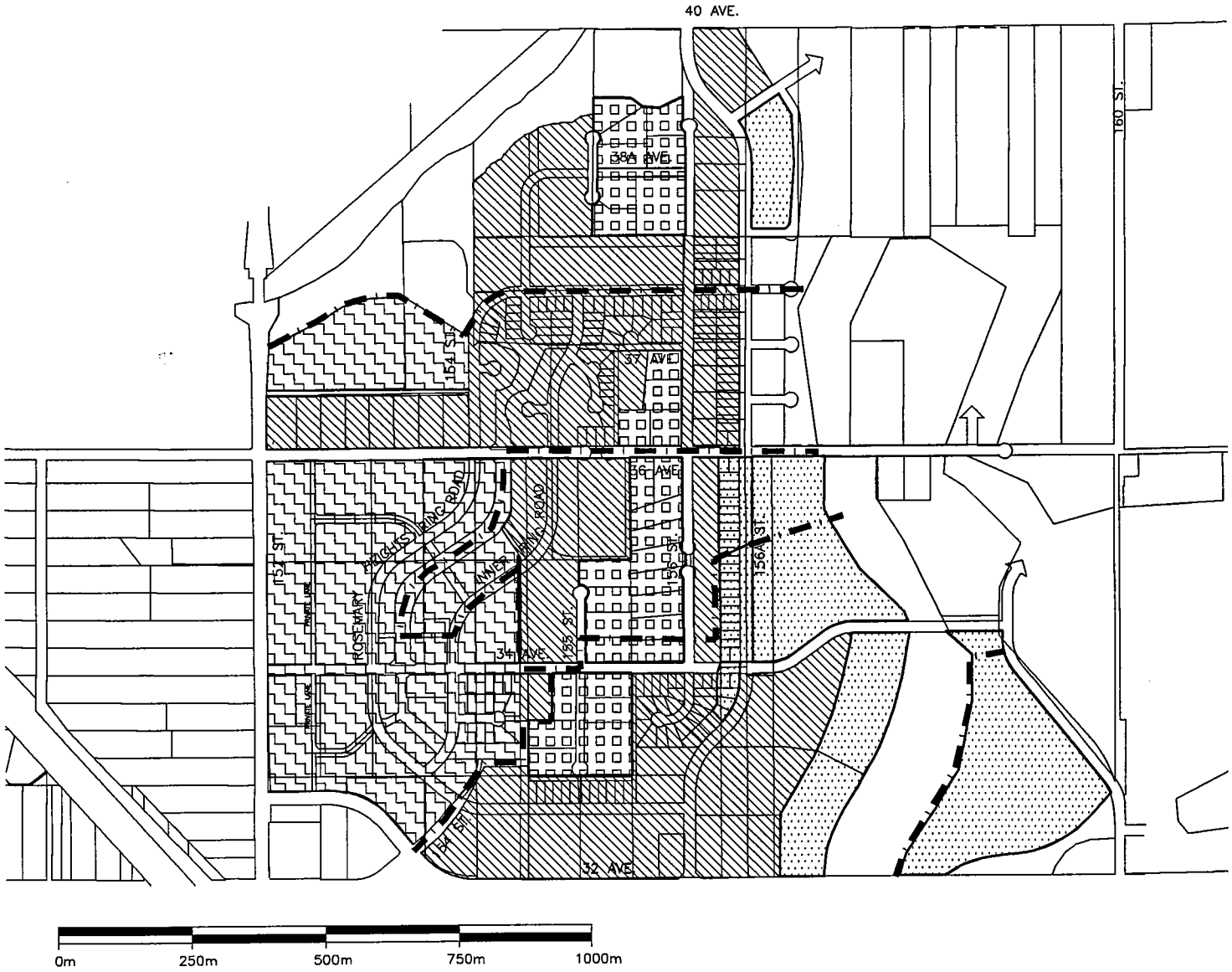
Major infrastructures to allow buildout the proposed NCP land use does not exist at this time. The only exception is the arterial road network which includes 152nd Street, 32nd Avenue and 40th Avenue. These roads will require widening and signalization in the long term but function today as part of the arterial road system.

A system of sanitary sewer trunks and pump stations exist to the east in the Morgan Creek development. These facilities are designed to accommodate the development of the Central NCP. The Central Neighbourhood must extend a trunk sewer on 37A Avenue to 152nd Street to make use of the existing Morgan Creek sewer system. It is logical that development, incrementally, move westward from 156A Street to optimize use of this existing service.

The existing water supply system is limited as noted in Section 4 of this report. As development proceeds in the NCP area, the existing water supply will be exhausted. At that time a major 400 mm ø water main will have to be extended northward from 152nd Street and the King George Highway to the NCP area. Once this main is in place, lateral grid mains would be extended eastward on 34th and 36th Avenues by developers. The 152nd Street water main is an integral part of the expansion of the NCP area.

The storm system is divided into three distinct catchments. The 32nd Avenue outfall is a logical extension of the Morgan Creek drainage system and is proposed to be built first. The second drainage catchment is in the northeast part of the NCP. This area is also next to Morgan Creek and would likely develop as the sanitary sewer is extended along 37A Avenue. Finally the 152nd Street catchment outfall and trunk storm sewer would be completed as development occurs on 152nd Street.

The overall staging is shown on Figure 5.1. The detailed major infrastructure servicing requirements of each phase are shown on Figures 5.2 to 5.4. The stages are broken down into three periods: 1 - 3 years;



ROSEMARY HEIGHTS

CENTRAL NEIGHBOURHOOD CONCEPT PLAN

FIGURE 5 . 1

STAGING

LEGEND

- STAGE 1 YEARS 1–3
- STAGE 2 YEARS 4–8
- STAGE 3 YEAR 9+
- EXISTING SUBURBAN DEVELOPMENT
- SANITARY SEWER CATCHMENT AREAS

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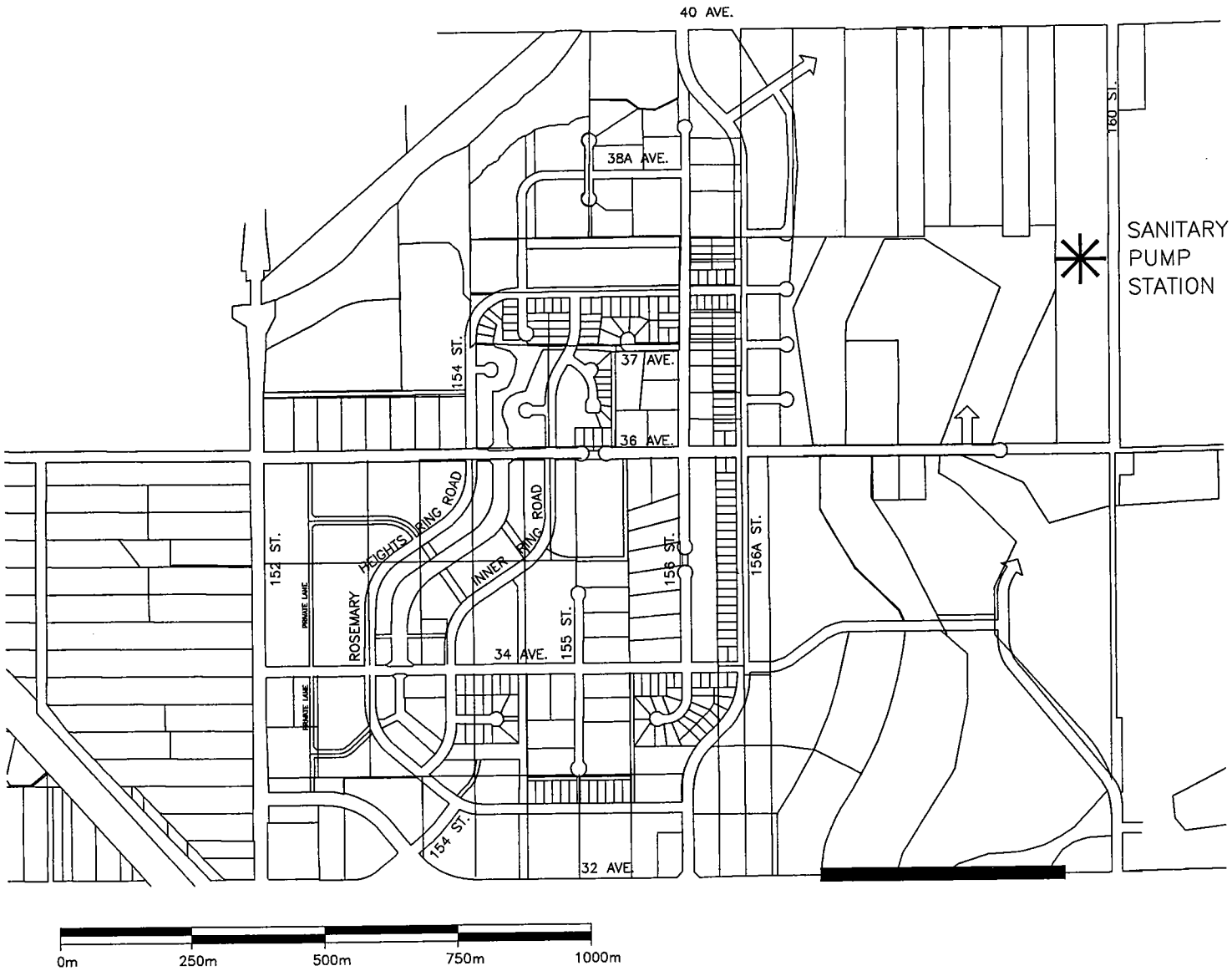

ROSEMARY HEIGHTS

CENTRAL NEIGHBOURHOOD CONCEPT PLAN

FIGURE 5 . 2

STAGE 1
DCC PROJECTS
YEARS 1 - 3

LEGEND

STORM

SANITARY PUMP STATION

URBAN SYSTEMS
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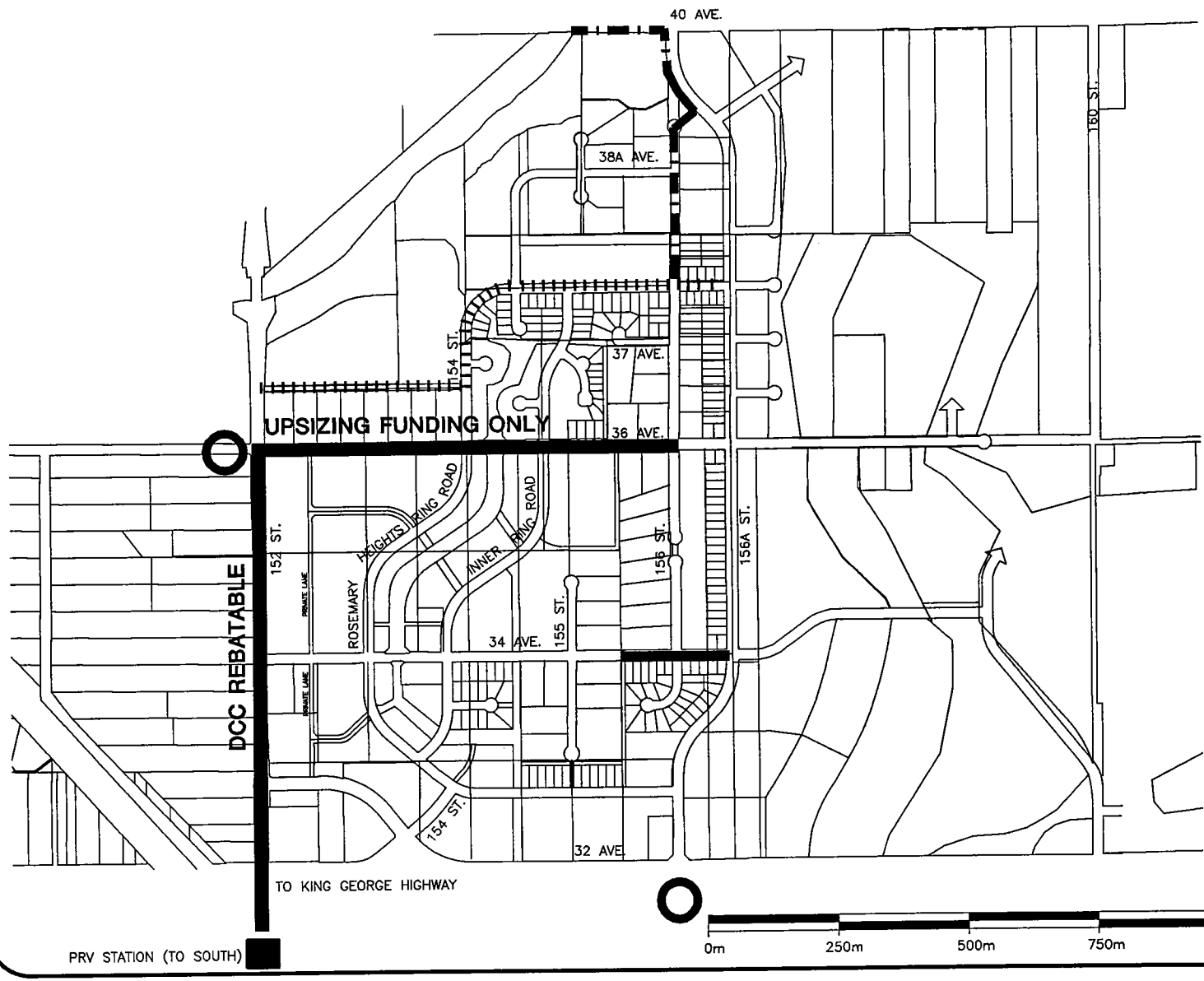

ROSEMARY HEIGHTS

CENTRAL NEIGHBOURHOOD CONCEPT PLAN

FIGURE 5 . 3

STAGE 2
DCC PROJECTS
YEARS 4 - 8

LEGEND

- WATER
- STORM
- SANITARY SEWER
- SIGNALS

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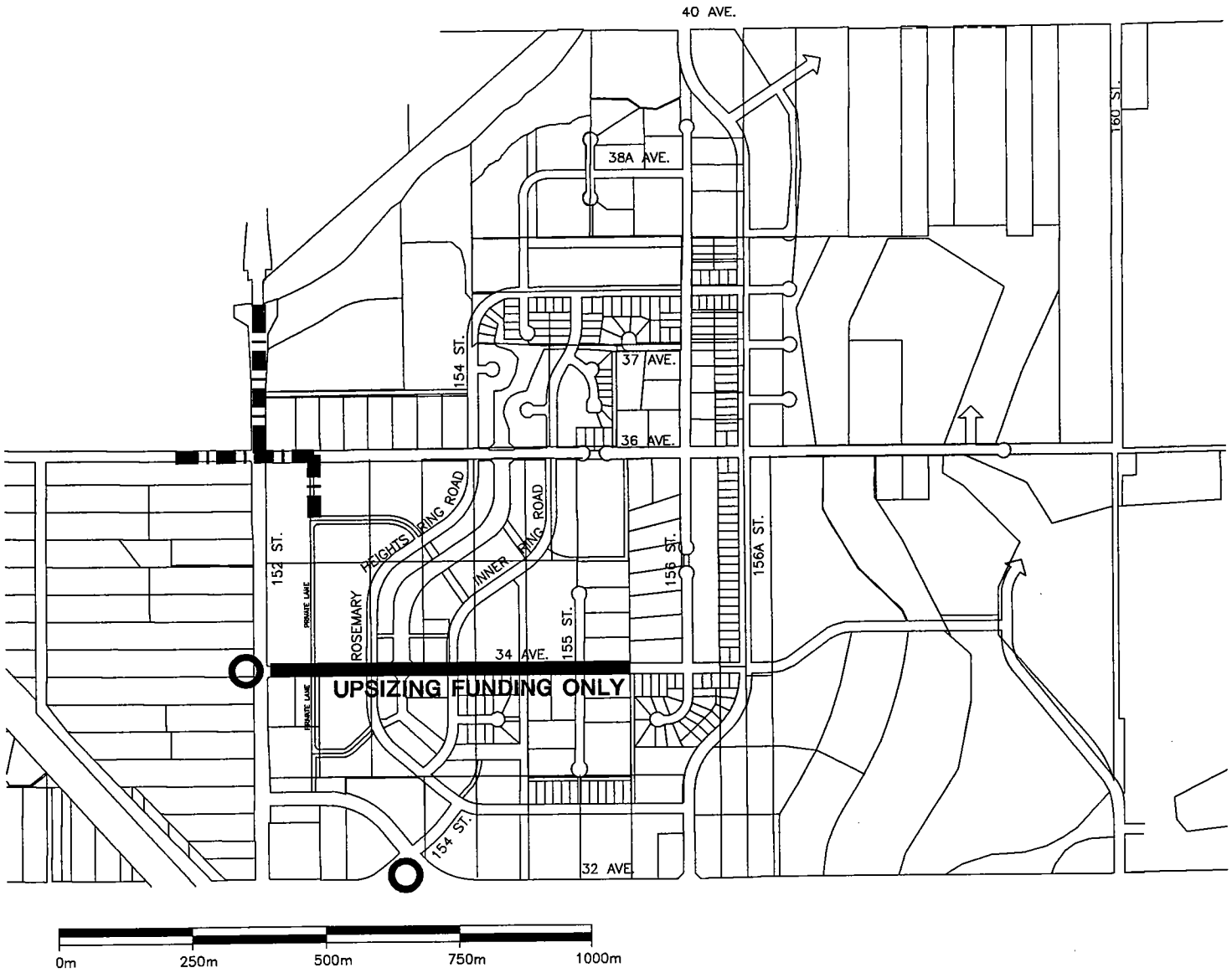

ROSEMARY HEIGHTS

CENTRAL NEIGHBOURHOOD CONCEPT PLAN

FIGURE 5 . 4

STAGE 3
DCC PROJECTS
YEARS 9 +

LEGEND

- WATER
- STORM
- SIGNAL

URBAN SYSTEMS
consulting planners and engineers

DATE: OCTOBER 1996 JOB No. 6107219.2

4-8 years; and 9+ years. It is anticipated that annual development would produce 150 units per year. The NCP has capacity for approximately 2042 units.

The overwhelming criteria driving the phasing is the high short term cost to develop. Unless development proceeds from the east, very high initial costs will have to be borne by developers for water mains, sanitary sewers and stormwater trunks and outfalls. If development incrementally moves westward from Morgan Creek, much of the initial costs can be postponed until the latter years of development in the area. As development proceeds a combination of DCC rebates and smaller developer financed infrastructure costs will help defer the initial high short term costs. This does not preclude development out of phase, but the costs and financing charges will likely make out of phase development cost prohibitive.

In summary, the broad staging strategy is as follows:

1. Staging strategy has been largely influenced by the need to minimize short term cash flow issues in the provision of services. Other factors are also relevant and should not be neglected.

2. Three major stages of development are proposed. These are shown on Figures 5.1 to 5.4. The staging of major infrastructure services are also shown.

3. The proposed staging of development is not to be interpreted legalistically. Development in subsequent stages of development (eg. Stages 2 and 3) can occur provided that developers in those stages "front end" all required services to allow development to proceed in that particular stage of development.

4. The anticipated growth is 150 units/per, with a build out of approximately 2042 units.

5. With the current City DCC credit policy, developers will have to build proposed major DCC elements at their costs. It may be possible for a number of developers to establish arrangements among themselves to jointly share the expense as required.

6. Infrastructure Financing and Funding

The City of Surrey has taken the following approach to infrastructure funding in the NCP area.

1. The long term DCC revenues and expenditures for major collector roads, water, sanitary and drainage works will likely balance or show a positive cash flow at buildout. This is for DCC revenues and expenditures within the NCP area. If the NCP's total DCCs are less than the expenditures, the NCP can still go ahead but the costs above the NCP DCCs will only be provided by the City when it meets with the City's priorities.

2. The short term annual DCC revenues and expenditures must also balance or the NCP development community must address the short term cash flow situation.

3. City Council has stated that sequencing of the various NCP's will not be supported at this time.

4. The City will not fund interim works.

5. The City-wide based DCC collection and expenditure program is the basis of all DCC capital works.

6. The City of Surrey is investigating an alternative method to assist developers who front end significant DCC elements. The approach has been accepted in principle by Council and a practise is currently being formulated for its implementation. The policy is not in place at this time and therefore cannot be the basis of the financial viability of this NCP.

Much of the required major infrastructure for the NCP is not in the current City 10 year plan. The development of the NCP will require approximately

$3.6 million of expenditure to support the proposed land use. Given the financial position of the City, this major expenditure will have to come from the development community. This section of the report describes the DCC works required, DCC revenues and expenditures, financial options and cash flow analysis. Appendix E defines the current funding methods available at the City of Surrey.

6.1 DCC Elements

The City of Surrey's 10 year capital plan includes engineering works which are required for both the existing and future needs of the community. Typically the existing needs are funded from general revenue monies or grants and infrastructure required for growth is principally (90%) funded by developers through Development Cost Charges (DCCs).

The City will only fund works which are included in the 10 year plan and DCC program. DCC works can either be built by the City or developers. Given the huge size of the DCC program and the time requirements for infrastructure to be built, developers typically build many DCC works and receive DCC rebates/credit for the works they build.

The City has specific criteria for a work to be included as a DCC element in their program. Tables 6.1a through 6.1d list each proposed eligible DCC item by service. Each item is broken down to show the estimated cost, type of proposed funding, suggested method of construction (by Surrey or developers) and the time period the work is required.

The tables also note whether the item is an addition to the current 10 Year Servicing Plan or a substitution. Substitution in this document for example, means an item which was shown in the 10 Year Servicing Plan on Road A but through refinement of the NCP servicing plan the item was moved to Road B. The purpose and scope of the work would not have changed. Only the alignment or length has been modified. All additional costs are noted.

Definition of the funding methods noted on the tables appears in Appendix E.

A description of how each item is proposed to be funded is listed in the tables. The year each item is required is included to clarify when works are necessary, based on the needs of the NCP area development.

While 156A Street has been classified as a major collector, it has not been included as a DCC element at this time. It is recommended that the widening of 156A Street be considered as an element in a proposed new policy to treat some proposed major collector widening as an "upsizing" element eligible for capital contribution from the City.

Discussions with the City would indicate a preparedness to entertain these options.

(Note that the proposed timing shown is based on projected development needs. The actual timing of construction by Surrey may differ. The NCP proponents recognize that Surrey is currently reviewing its 10 Year Plan. Following Council acceptance of the plan, specific timing will be provided in the revised plan. Only those DCC elements in the current 10 year plan [DCC elements] will receive DCC rebates/credits as per the current City policy. The proposed works in the NCP will be eligible if they are added to the 10 year plan [DCC elements].)

ROSEMARY HEIGHTS CENTRAL NCP
INFRASTRUCTURE FINANCING AND FUNDING

Table 6.1a

WATER

Item (Estimates) (Location) (3)	Type/Size of Works	Current or Addition	ID # Current 10 Year Plan	Amount Current Program (1993 $)	Additions to Program (Current $)	Eligible for DCC Program (Y/N)	Refinement of DCC Program	Addition to DCC Program	Type of Funding		Construction by (Surrey/Dev.)	Year Requested
									Existing Method (1)	Proposed Method (1)		
152 St: King George Hwy. - 32 Ave ($480,000)	Watermain 400 dia.	Current	#2,425	$300,000 (prorated from 10 year plan)	$180,000	Y	Y	N	DCCR	DCCR	Developer	6
Hwy #91 crossing ($80,000)	Watermain 400 dia.	Addition			$80,000	Y	N	Y	DCCR	DCCR	Developer	6
152 St: 32 - 36 Ave ($336,000)	Watermain 300 dia.	Current	#2,444	$240,000	$96,000	Y	Y	N	DCCR	DCCR	Developer	8
152 St:	PRV Station	Addition	N/A	N/A	$125,000	Y	N	Y	DCCR	DCCR	Developer	6
36 Ave: 152-156 Ave ($134,400)	Watermain	Current (40%)	#2,441	$108,000	$25,400	Y	Y	N	UPS	UPS	Developer	5, 7 and 8
34 Ave: 152-156A Ave ($151,200)	Watermain	Addition (40%)	N/A	N/A	$151,200	Y	N	Y	UPS	UPS	Developer	9, 10

NOTE: (1) Funding Methods (Current):

- Surrey Capital Construction Program — CAP
- DCC Rebate — DCCR
- Development Coordinated Works (Drainage, Arterial, Non-Arterial) — DCW
- Upsizing (Water, Sanitary) — UPS
- Frontage Latecomer — FLAT
- Area Latecomer (Sanitary Pump Station and Force Main) — ALAT

(2) Estimates are based on unit costs provided by Surrey. All estimates include a 50% estimating factor as requested by Surrey.

(3) 152 Street: King George Highway to 32 Avenue watermain cost to be shared between the West and Central NCPs.

ROSEMARY HEIGHTS CENTRAL NCP
NCP INFRASTRUCTURE FINANCING AND FUNDING

Table 6.1b

SANITARY

Item (Estimates) (Location) (2)	Type/Size of Works	Current or Addition	ID # Current 10 Year Plan	Amount Current Program (1993 $)	Additions to Program (Current $)	Eligible for DCC Program (Y/N)	Refinement of DCC Program	Addition to DCC Program	*Type of Funding* Existing Method (1)	Proposed Method(1)	Construction by (Surrey/Dev.)	Year Requested
2nd pump and generator ($150,000)	Pump and generator	Current	#4,046	N/A	N/A	Y	Y	N	Contribution	Contribution	Developer	1
37A Ave ($195,750)	Trunk	Addition	N/A	N/A	$195,750	Y	N	Y	N/A	DCCR	Developer	5
154 St. ($65,250)	Trunk	Addition	N/A	N/A	$65,250	Y	N	Y	N/A	DCCR	Developer	7
3650 Blk. ($174,000)	Trunk	Addition	N/A	N/A	$174,000	Y	N	Y	N/A	DCCR	Developer	8

NOTE: (1) Funding Methods (Current):

Surrey Capital Construction Program	CAP
• DCC Rebate	DCCR
• Development Coordinated Works (Drainage, Arterial, Non-Arterial)	DCW
• Upsizing (Water, Sanitary)	UPS
• Frontage Latecomer	FLAT
• Area Latecomer (Sanitary Pump Station and Force Main)	ALAT

(2) Estimates are based on unit costs provided by Surrey. All estimates include a 50% estimating factor as requested by Surrey.

ROSEMARY HEIGHTS CENTRAL NCP
NCP INFRASTRUCTURE FINANCING AND FUNDING

Table 6.1c

STORMWATER

Item (Estimates) (Location) (2)	Type/Size of Works	Current or Addition	ID # Current 10 Year Plan	Amount Current Program (1993 $)	Additions to Program (Current $)	Eligible for DCC Program (Y/N)	Refinement of DCC Program	Addition to DCC Program	*Type of Funding* Existing Method (1)	Proposed Method (1)	Construction by (Surrey/Dev.)	Year Requested
152 St ($428,000)	Trunk Sewers	Current	#3,206 and #3,205	$100,000 $100,000	$228,000	Y	Y	N	DCCR	DCCR	Developer	9
32 Ave ($266,500)	Trunk Sewers	Addition	N/A	N/A	$266,500	Y	N	Y	DCCR	DCCR	Developer	1 and 3 (3)
156 St : 40 Ave ($700,200)	Trunk Sewer	Current	#3,168	$350,000	$350,200	Y	Y	N	DCCR	DCCR	Developer	5

NOTE: (1) Funding Methods (Current):

- Surrey Capital Construction Program — CAP
- DCC Rebate — DCCR
- Development Coordinated Works (Drainage, Arterial, Non-Arterial) — DCW
- Upsizing (Water, Sanitary) — UPS
- Frontage Latecomer — FLAT
- Area Latecomer (Sanitary Pump Station and Force Main) — ALAT

(2) Estimates are based on unit costs provided by Surrey. All estimates include a 50% estimating factor as requested by Surrey.

(3) Part of this trunk is required in year 1 and part is required in year 3.

ROSEMARY HEIGHTS CENTRAL NCP
NCP INFRASTRUCTURE FINANCING AND FUNDING

Table 6.1d

ROADS AND TRANSPORTATION

Item (Estimates) (Location) (2)	Type/Size of Works	Current or Addition	ID # Current 10 Year Plan	Amount Current Program (1993 $)	Additions to Program (Current $)	Eligible for DCC Program (Y/N)	Refinement of DCC Program	Addition to DCC Program	Type of Funding		Construction by (Surrey/Dev.)	Year Requested
									Existing Method (1)	Proposed Method (2)		
36 Ave/152 St ($85,000)	Traffic Signal	Current	#4,556	$80,000	$5,000	Y	Y	N	CAP	CAP	Surrey	8
34 Ave/152 St ($85,000)	Traffic Signal	Addition	N/A	N/A	$85,000	Y	N	Y	N/A	CAP	Surrey	13+
156A St/32 Ave ($85,000)	Traffic Signal	Addition	N/A	N/A	$85,000	Y	N	Y	N/A	CAP	Surrey	7
32 Ave Ramp ($85,000)	Traffic Signal	Addition	N/A	N/A	$85,000	Y	N	Y	N/A	CAP	Surrey	11

NOTE: (1) Funding Methods (Current):

- Surrey Capital Construction Program — CAP
- DCC Rebate — DCCR
- Development Coordinated Works (Drainage, Arterial, Non-Arterial) — DCW
- Upsizing (Water, Sanitary) — UPS
- Frontage Latecomer — FLAT
- Area Latecomer (Sanitary Pump Station and Force Main) — ALAT

(2) Estimates are based on unit costs provided by Surrey. All estimates include a 50% estimating factor as requested by Surrey.

6.2 Financing Options

Three financial options were explored in view of short term cash flow problems. The pros and cons associated with each option are identified.

1. Joint Venture Agreements

Overall joint venture agreement with all owners and developers in the neighbourhood. This could entail the establishment of an NCP levy in addition to DCCs. This would eliminate the need for individual developers to front end major projects.

Pros: Eliminates the need for individual land owners/developers and the City to front end services.

Cons: Extremely difficult to get consensus on joint venture agreement. Difficulty distinguishing joint venture charges from DCC.

2. Alternative Funding Method

Revise the current practice of the City of Surrey to permit a broader funding method to assist developers who front end major DCC works. This may permit a developer who builds a DCC element to receive funds for the work up to the amount he paid using DCCs collected throughout the NCP not only his DCCs. The City has stated that should the policy be approved, it would only apply to major items. The City is concerned that the new alternative funding method may affect its DCC priorities. Also careful staging of services and development to minimize cash flow problems for financing of services. This would enable individual developers to front end services without major financial risk.

Preferred Option is Option 2.

Pros: Development would proceed in the short term rather than waiting for the City to provide services.
No up front expenditures by Surrey.

Cons: Need for individual developers and landowners to become involved in "front ending" services.
Developers may be financing some infrastructure for extended periods of time.

3. City of Surrey Capital Construction

Wait for the City of Surrey to be in a financial position to "front end" major services required for development to proceed. All cost recovery would be by DCC.

Pros: No need for developers to "front end" services.

Cons: Time frame for development in the Rosemary Heights Central neighbourhood may not be acceptable to landowners and developers.

Upon review of the three options the NCP Steering Committee endorsed pursuing option #2. This option would allow development to proceed in an orderly fashion, optimizing the existing services and place a moderate risk on the development community. While the City Council has endorsed in principle an alternative funding practise which would allow for the flexibility required in this NCP (see Appendix G), this practise has not yet been implemented by the City. At this time, the City Solicitor is considering the matter. The proposed approach is only intended to apply to major items, not all DCC items.

As the revised policy has not yet been implemented, the City is not in a position to support Option 2, (alternative funding method), at this time. Therefore, the only option available is to optimize the use of existing facilities and delay any major capital expenditures as long as possible.

The expenditure and revenue charts shown in Figures 6.3.1 and 6.3.5 demonstrate the expenditures required by the development community. In Stage 2, major capital expenditures are required for water and drainage works. The 152 street watermains requires a capital expenditure of more than $1 million. It may be possible to phase the works, but the 400 ø mm feeder watermain from King George Highway to 32 Avenue is estimated to cost $685,000. This is a significant cost. Given the current City policy,

the first developer to require the main will be required to build the main. This may not be possible for one individual and will likely have to be shared by a group of developers, possibly from both the west and central Rosemary Heights NCP areas.

The 40th Avenue trunk drainage works are impractical to phase. The works are estimated at more than $700,000. Under the current policy a developer or developers will have to build the works and receive some DCC credit. The extent of the DCC credit is solely based on the size of the development application that requires the work. For example if a small development requires the outfall then the DCC credit will not compensate the developer the full $700,000. The developer will either have to absorb the additional cost between his drainage DCC and the cost of the works or wait until Surrey or others build the drainage works.

The financial strategy for required major infrastructure services within the Rosemary Heights Central Neighbourhood is predicated on the following assumptions:

.1 While various projects meet the criteria established by the City of Surrey for DCC projects, the City is not in a financial position to "front end" the infrastructure projects in the short term which are required for development to proceed. Therefore, any shortfall in development cost charge revenues will have to be made up by financial contributions of developers in order for projects to proceed. In the long term, sufficient DCC revenues would be generated to offset servicing costs of major servicing projects (i.e. DCC projects).

.2 In view of the extensive financial involvement by developers in front ending the projects, the City is working towards a policy which would allow development cost charge revenues paid by subsequent developers to be used to compensate the initial developers who have "front ended" projects. The new policy is not in place and should not be assumed in any financial analysis. Should the policy be put in place, the area from which development cost charge revenues could be drawn for this purpose would include:

- the entire Central Rosemary Heights Neighbourhood;

- the West Neighbourhood for contributions to the watermain extensions south of 32nd and traffic signalization along 34th and 152nd Street;
- the East (Morgan Creek) Neighbourhood for contributions to 156A.

In summary, the strategy for the phasing of the development and meeting the financial constraints of the NCP are the following:

.1 Defer major costs for as long as possible in view of potential cash flow issue for developers "front ending" services. Optimize existing services. This is the rationale for the staging plan. Which shows development extending from the east to the west.

.2 Where there are insufficient funds for specific projects required for development, developers would pay for the required projects and would receive DCC credits as per the current DCC policy. Note that Surrey collects DCCs on a community-wide basis. The collection of DCCs are not placed in specific area funds. The City can decide where funds are expended annually and therefore can prioritize specific works in this NCP.

.3 Three major stages of growth are defined. Staging has been designed to avoid major cash flow problems for developers. Staging however is not prescriptive in that land in subsequent stages can be developed provided that developers pay for the required infrastructure projects up front.

.4 Should an alternative funding method be adopted by Council, it would likely only apply to major DCC elements.

.5 Should Council ultimately reject the revised DCC rebate practise, the development community of the NCP area would have to either initiate and fund the DCC infrastructure and use the existing DCC rebate policy or wait for the City to develop the DCC infrastructure as they see the priorities.

6.3 Cash Flow Analysis

The City of Surrey has taken the position that each NCP must ensure that both the short and long term DCC revenues and expenditures must balance. The implication of this is that should a large expenditure be required, such as a watermain extension, the NCP must have contributed enough DCCs to fund the extension or develop an alternative new revenue source. It is from this framework that the NCP reviewed various servicing strategies.

As part of the cash flow modelling, various growth scenarios were investigated. The growth projections varied from a very conservative number of units to a very optimistic projection. For the basis of the proposed model 150 units per year were used. That implied buildout of the NCP within 13-15 years based on 2042 new units. We have staged the development into three periods. Stage 1: years 1 to 3; Stage 2: years 4 to 8; and the final stage, years 9+.

The capital costs used for the analysis are included in Appendix D. The principle used for the staging was that as development moves westward from Morgan Creek, various infrastructure works will be required. For example, in the first three year period, part of the 32nd Avenue storm trunk will be required. This represented an expenditure of approximately $266,500 and a storm DCC revenue of $482,730. The net effect was a positive short term DCC cash flow. The long term cash flow model is shown in Figures 6.3.1 - 6.3.5 for each service.

The stage by stage analysis was completed to ensure a positive cashflow. The results were as follows:

1) **Water** - the annual cash flow was positive except for a minor deficit in the eighth year ($3,070). The long term cash flow from the DCC revenues and expenditures proposed in the NCP was a surplus of $680,520 DCC revenue from the NCP. The cashflow is only positive annually because the development community must be front significant costs to build the 152nd Street watermain.

2) **Sanitary**- the annual cash flow was positive except for a minor deficit in the first year ($28,500). The long term cash flow from the DCC

revenues and expenditures proposed in the NCP was a surplus of $1,133,180.

3) **Major Collector Roads** - the yearly cashflow was always positive. This is due to the fact that 156A Street was not deemed a DCC element. The long term cashflow from DCC revenues and expenditures proposed in the NCP was a surplus of $2,117,240.

4) **Drainage** - the annual cash flow was always positive except for a minor deficit in the first years ($24,250). The long term cash flow from the DCC revenues and expenditures proposed in the NCP was a surplus of $1,660,420.

The cumulative long-term DCC surplus from this NCP is estimated at nearly $5,591,360.

It should be noted that the cashflow analysis is only a model. Market conditions, densities, capital costs and other variables can adjust both the revenue and expenditure sides of the equation. The NCP has demonstrated that both on an annual and long-term basis the DCC revenues and expenditure are positive for the City.

Appendix H contains more detailed cash flow information and a map setting out a detailed (annual) staging strategy on which the cash flow analysis is based.

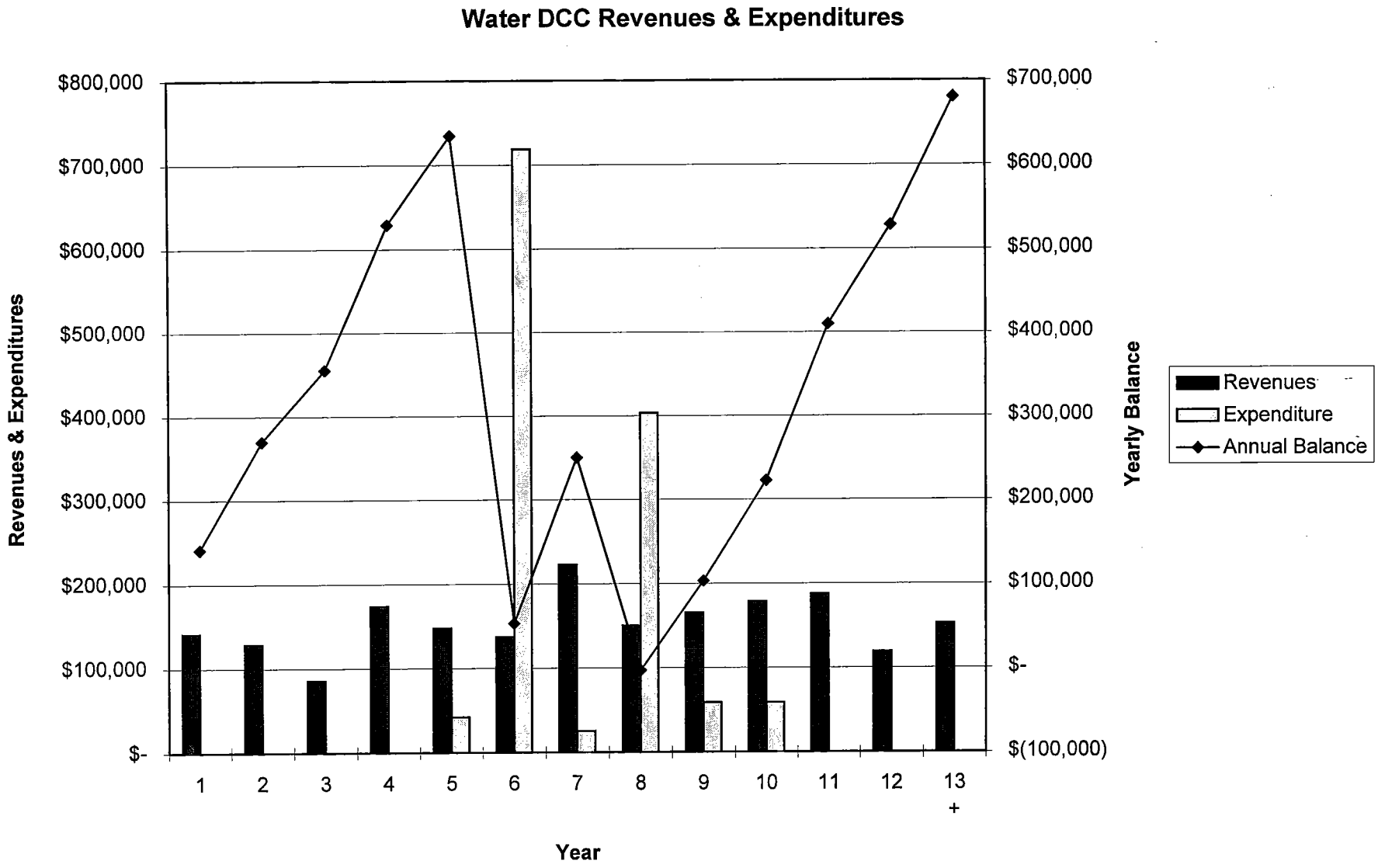
Water DCC Revenues & Expenditures
Revenues & Expenditures
$800,000
$700,000
$600,000
$500,000
$400,000
$300,000
$200,000
$100,000
$-
$700,000
$600,000
$500,000
$400,000
$300,000
$200,000
$100,000
$-
$(100,000)
Yearly Balance
1
2
3
4
5
6
7
8
9
10
11
12
13 +
Year
Revenues
Expenditure
Annual Balance

Figure 6.3.1

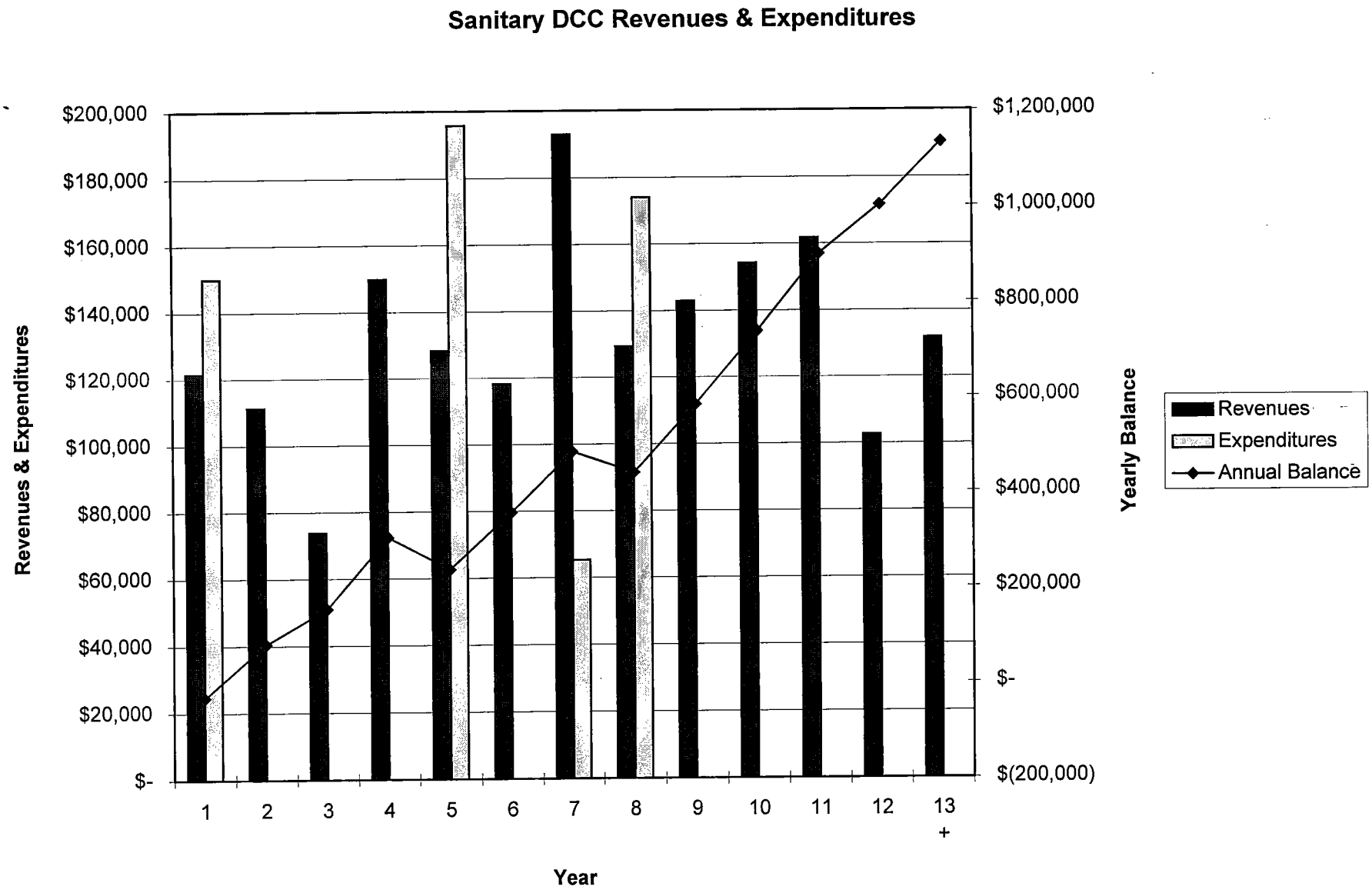
Sanitary DCC Revenues & Expenditures
Revenues & Expenditures
$200,000
$180,000
$160,000
$140,000
$120,000
$100,000
$80,000
$60,000
$40,000
$20,000
$-
$1,200,000
$1,000,000
$800,000
$600,000
$400,000
$200,000
$-
$(200,000)
Yearly Balance
1
2
3
4
5
6
7
8
9
10
11
12
13 +
Year
Revenues
Expenditures
Annual Balance

Figure 6.3.2

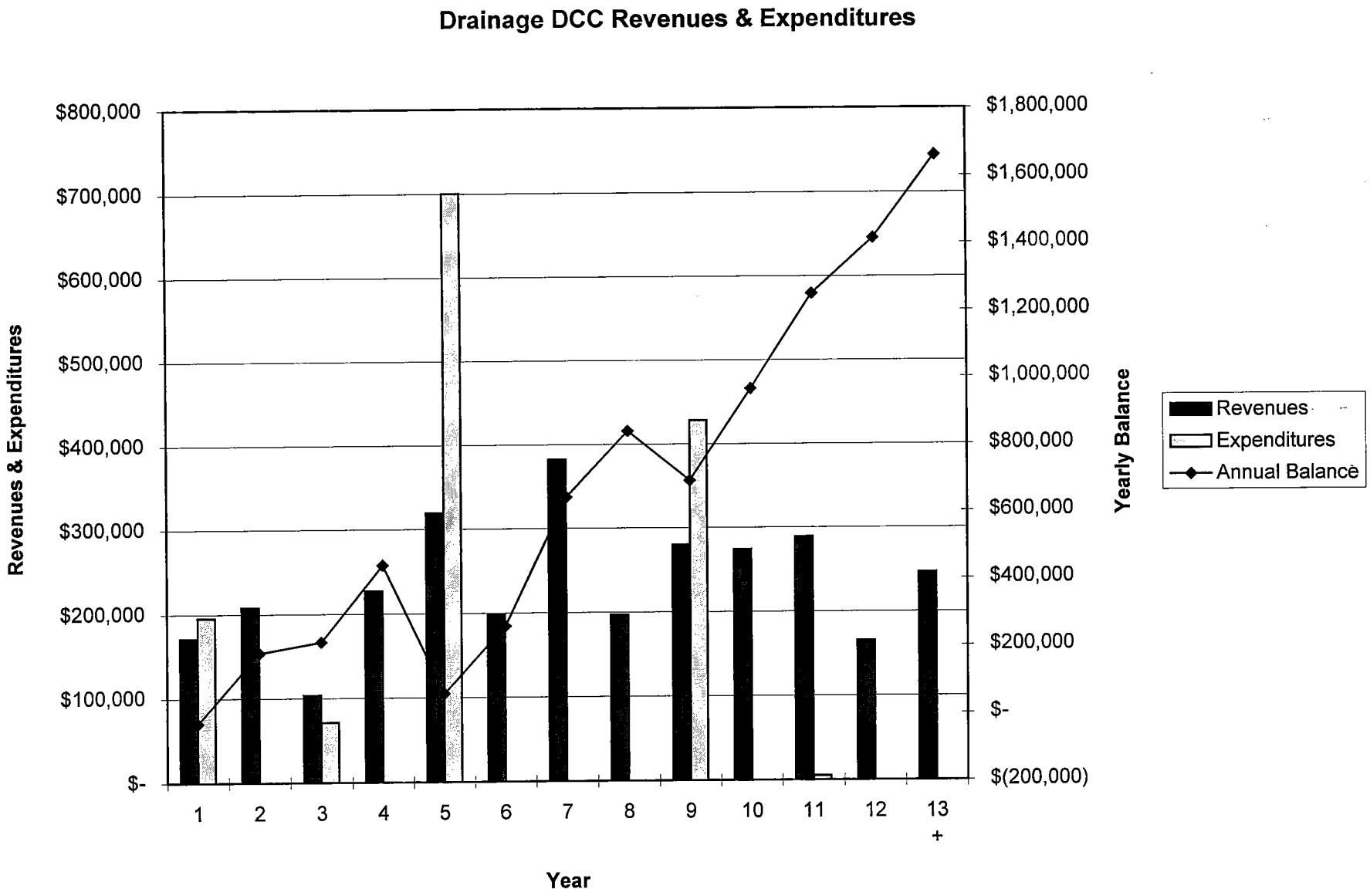
Drainage DCC Revenues & Expenditures
Revenues & Expenditures
Yearly Balance
$800,000
$700,000
$600,000
$500,000
$400,000
$300,000
$200,000
$100,000
$-
$1,800,000
$1,600,000
$1,400,000
$1,200,000
$1,000,000
$800,000
$600,000
$400,000
$200,000
$-
$(200,000)
1
2
3
4
5
6
7
8
9
10
11
12
13 +
Year
Revenues
Expenditures
Annual Balance

Figure 6.3.3

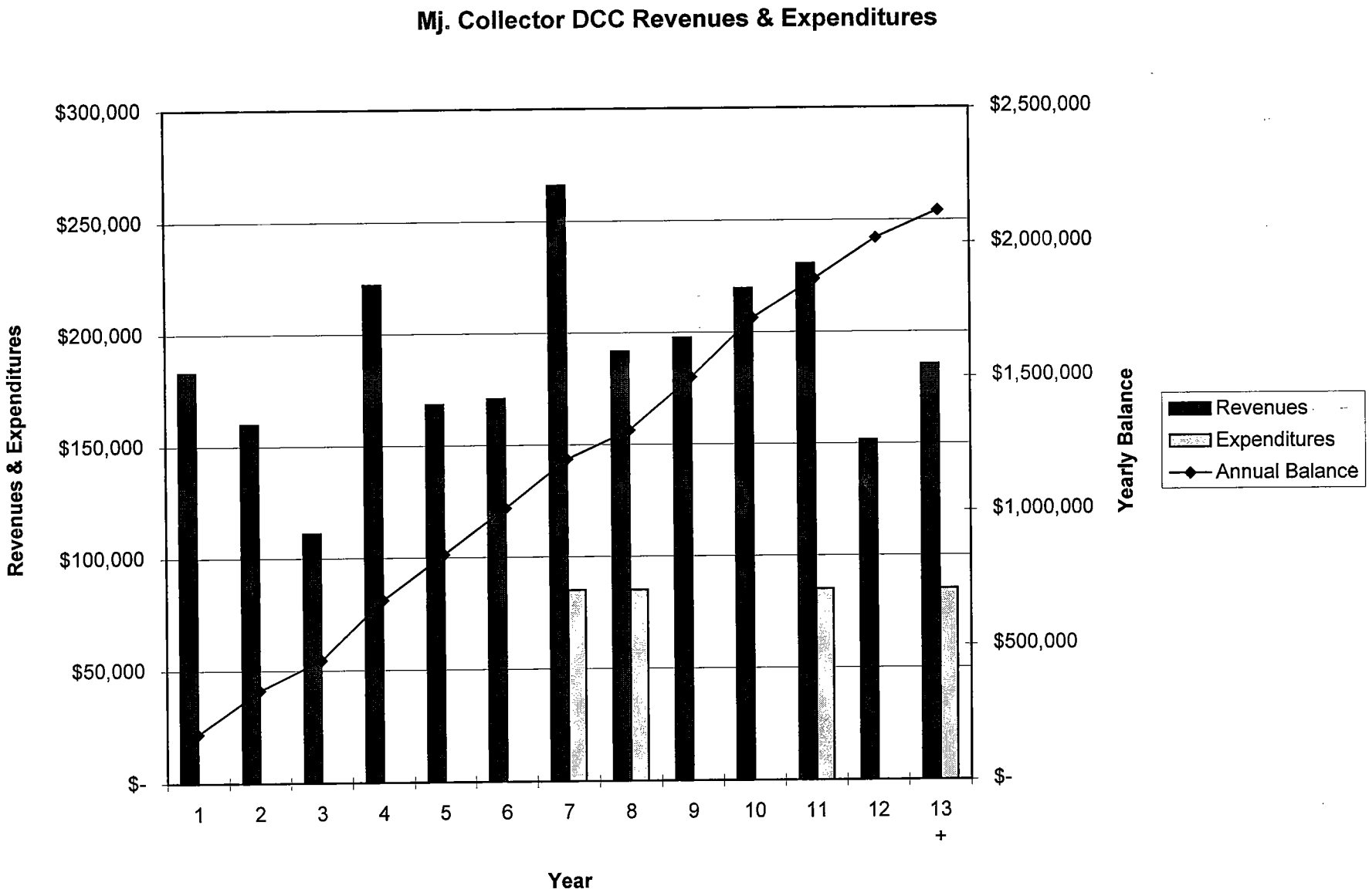
Mj. Collector DCC Revenues & Expenditures
Revenues & Expenditures
$300,000
$250,000
$200,000
$150,000
$100,000
$50,000
$-
$2,500,000
$2,000,000
$1,500,000
$1,000,000
$500,000
$-
Yearly Balance
1
2
3
4
5
6
7
8
9
10
11
12
13 +
Year
Revenues
Expenditures
Annual Balance

Figure 6.3.4

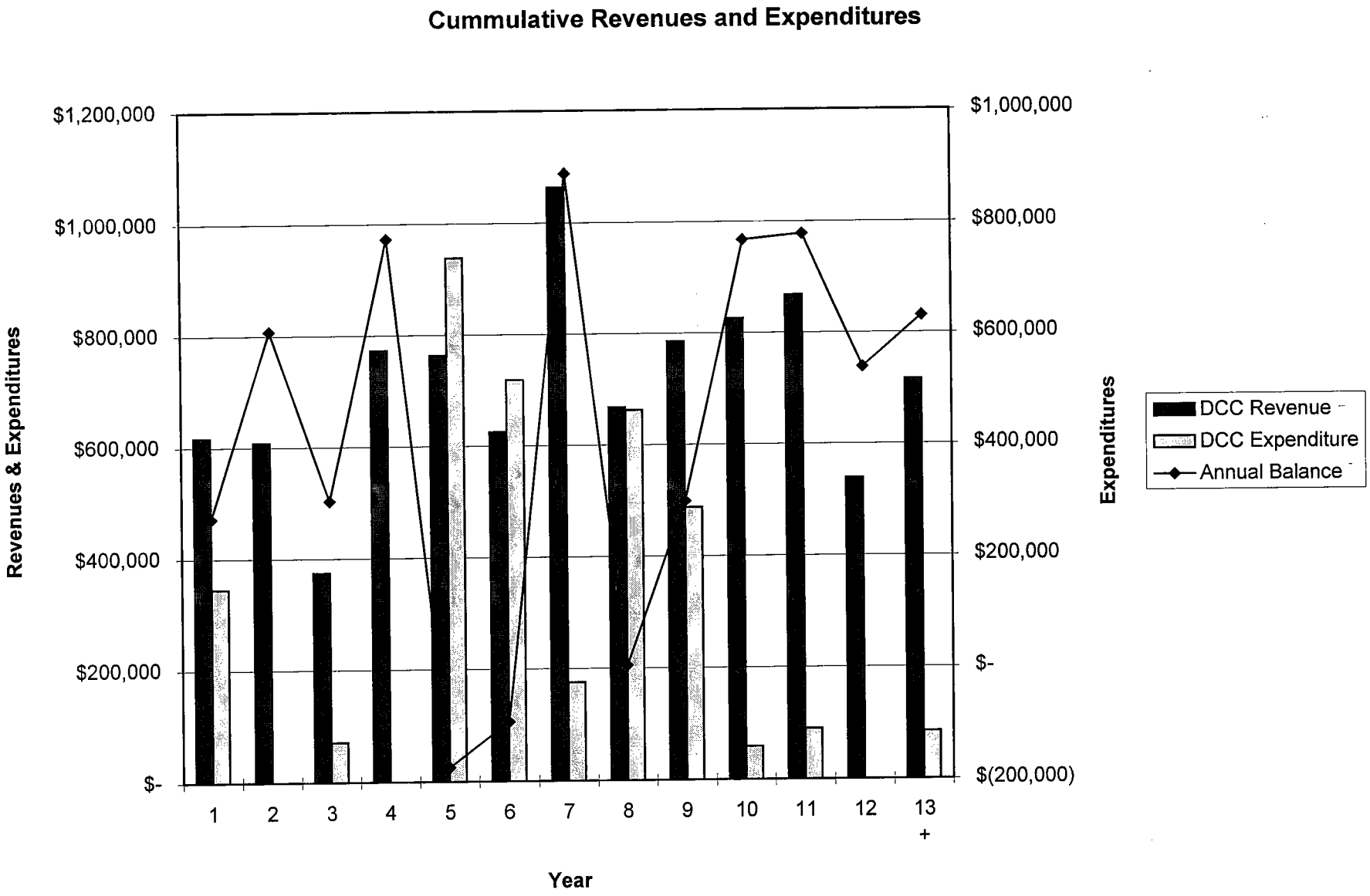
Cummulative Revenues and Expenditures
Revenues & Expenditures
$1,200,000
$1,000,000
$800,000
$600,000
$400,000
$200,000
$-
$1,000,000
$800,000
$600,000
$400,000
$200,000
$-
$(200,000)
Expenditures
1
2
3
4
5
6
7
8
9
10
11
12
13 +
Year
DCC Revenue
DCC Expenditure
Annual Balance

Figure 6.3.5

6.4 DCC Revenues and Expenditures

The following table summarizes the projected DCC revenues and construction costs for each engineering service. The revenues are based on the current DCC bylaw. Growth projections are based on buildout of a total of 2024 units. Both costs and revenues are in 1996 dollars.

The NCP proponents estimate an annual development rate of 150 units per year for a 12 year period. An example growth scenario is included in Appendix H.

Projected DCC Revenues and Expenditures At Buildout (1)

	Projected DCC Revenues	Projected DCC Expenditures	Surplus Balance
Sanitary Sewer	$1,718,180	$585,000	$1,133,180
Storm Sewer	$3,060,120	$1,399,700	$1,660,420
Water	$1,987,120	$1,306,600	$680,520
Major Collector Rd.	$2,457,240	$340,000	$2,117,240
Total	$9,222,660	$3,631,300	$5,591,360

(1) Note: It is recognized that the City of Surrey collects DCC's on a community basis not on a NCP or area basis. This table is presented only to show the financial impact of the NCP on the current 10 Year Plan. The table also shows the magnitude of additional works or refined construction costs required to service the NCP area as compared to the 1993 10 Year Servicing Plan.

The unit DCC rates used for each service is based on the land uses and staging shown in Appendix H. For example, water DCC rates varied from $1,070/unit for RS lots to $330/unit for RMS-1 units.

It is assumed that the need for arterial roads is principally driven by the larger community needs and therefore those costs have not been included in the table. The projected DCC revenue for arterial roads is $9,667,200.

7. Community Facilities

As part of the rezoning requirements, individual landowners will be required to contribute to financing the police, fire, library and park development amenities of the NCP area. The contribution will be based on the number of dwelling units which the property will yield. The details of the City of Surrey's Amenity Study are included in Appendix F.

The amenity charges related to residential development provided by the City of Surrey Planning and Development department are:

Amenity Item	Cost per Unit	Projected Revenue (Based on 2042 units)
Police	$50	$102,100
Fire	$216	$441,072
Library	$112.5	$229,725
Parks Development	$640	$1,306,880
TOTAL	$1,018.50	$2,079,777

* Note: This total includes the residential institutional use as shown on Figure 1.2.

The amenity contribution from the institutional and commercial development is based on an equivalency factor of 1 hectare of land is equivalent to 10 residential units (as provided by the City of Surrey, Appendix F). The total institutional area is 3.3 hectares and the commercial area is 1.1 hectare. The contribution is only for fire and police.

Amenity Item	Cost per Unit	Projected Revenue
Police	$50	$2,200
Fire	$216	$9,504
TOTAL	$266	$11,704

8. Implications of the Plan

Table 8.1 describes the various land uses proposed in the NCP. Using residential unit densities established in the Rosemary Heights LAP, this table estimates the maximum number of residential units that could potentially develop assuming full build-out within the NCP area. From these unit counts, population estimates have been generated on the basis of the population ratios established in the LAP by the City of Surrey.

8.1 Summary of Land Uses

Table 8.1 provides a summary of the land areas which would be occupied by each of the land uses proposed in the NCP. To identify the land use mix, the percentage of total net plan area (after roads have been netted out) occupied by each land use is calculated in this table. This mix is further summarized as follows:

- 71% - Residential uses;
- 14% - Parks, open space and buffer areas;
- 4.5% - Public facilities (including schools and fire hall);
- 4.7% - Golf course;
- 4.9% - Retreat centre; and,
- .7% - Neighbourhood commercial centre.

Of the 71% which is occupied by residential uses, the following residential land use mix has been calculated as a percentage of the total net plan area:

- 4.2% - Suburban 1 Acre Residential;
- 15.1% - Suburban ½ Acre Residential;
- 8.1% - Single Family Residential;
- 5.4% - Compact Single Family Residential;
- 17.2% - Cluster Housing (at Single Family Density);
- 15.2% - Townhouses;
- 4.7% - Garden Apartments; and,
- .7% - Institutional Residential.

8.2 Residential Unit Estimates

On the basis of the unit densities established in the LAP, the following residential unit estimates were generated:

# of Units	Residential Use
14	Suburban 1 Acre Residential
26	Suburban ½ Acre Residential
168	Single Family Residential
141	Compact Single Family Residential
359	Cluster Housing (at SFD Density)
797	Townhouses
497	Garden Apartments
40	Institutional Residential
2,042	**Total Units**

The above table illustrates that potentially **2,042 residential units** could be developed as per the NCP at full build-out some time in the future.

8.3 Population Estimates

Population ratios established in the LAP were applied to the above-noted density mix in order to generate population estimates for the NCP area. Using this method, it is estimated that just over **5,544 people** would be generated by the land uses and development proposed in the NCP (assuming full build-out of the neighbourhood as per the NCP).

This total population estimate has been used to calculate the fire protection and policing requirments noted in earlier sections of this plan.

Rosemary Heights Central
Neighbourhood Concept Plan

Summary of Land Uses

Residential Uses

Land Use	Net Area (Hectares)	Net Area (Acres)	% of Area	Units/Acre	Est. Units	% of Units	Pop./Unit	Est. Population
Suburban 1 Acre Residential	5.9	14.58	4.2	1.0	14	1%	3.2	45
Suburban 1/2 Acre Residential	21.3	52.63	15.1	0.5	26	1%	3.2	83
Single Family Residential	11.4	28.03	8.1	6.0	168	8%	3.2	538
Compact Single Family Residential	7.6	18.78	5.4	7.5	141	5%	3.2	451
Cluster Housing at SFD Density	24.2	59.80	17.2	6.0	359	21%	3.2	1,149
Townhouses	21.5	53.13	15.2	15.0	797	35%	2.8	2,232
Institutional Residential	1.0	2.47	0.7	15.0	40	4%	1.3	52
Garden Apartments	6.7	16.56	4.7	30.0	497	25%	2.0	994
Sub-Total	99.6	245.98	* 70.6		2042			5544

Non-Residential Uses

Neighbourhood Commercial	1.1	2.72	0.7%
Western Elementary School	2.4	5.93	1.7%
Eastern Elementary School	2.9	7.15	2.0%
Western Neighbourhood Park	2.2	5.43	1.6%
Eastern Neighbourhood Park	2.4	5.85	1.7%
Linear Park & Pedestrian Linkages	5.8	14.25	4.1%
Nicomekl River Open Space	9.3	23.00	6.6%
Buffer Areas	1.3	3.21	0.9%
Golf Course	6.6	16.30	4.7%
Institutional - Firehall	1.1	2.72	0.7%
Institutional - Retreat Centre	6.9	17.05	4.9%
Sub-Total	42.0	103.61	* 29.6%

Total Area:	Hectares	Acres
	141.6	349.6

Table 8.1

* Slight variation due to rounding

CITY OF SURREY

Rosemary Heights Central Neighbourhood Concept Plan

Appendix A

OCP – Rosemary Heights – Central

URBANSYSTEMS

October, 1996
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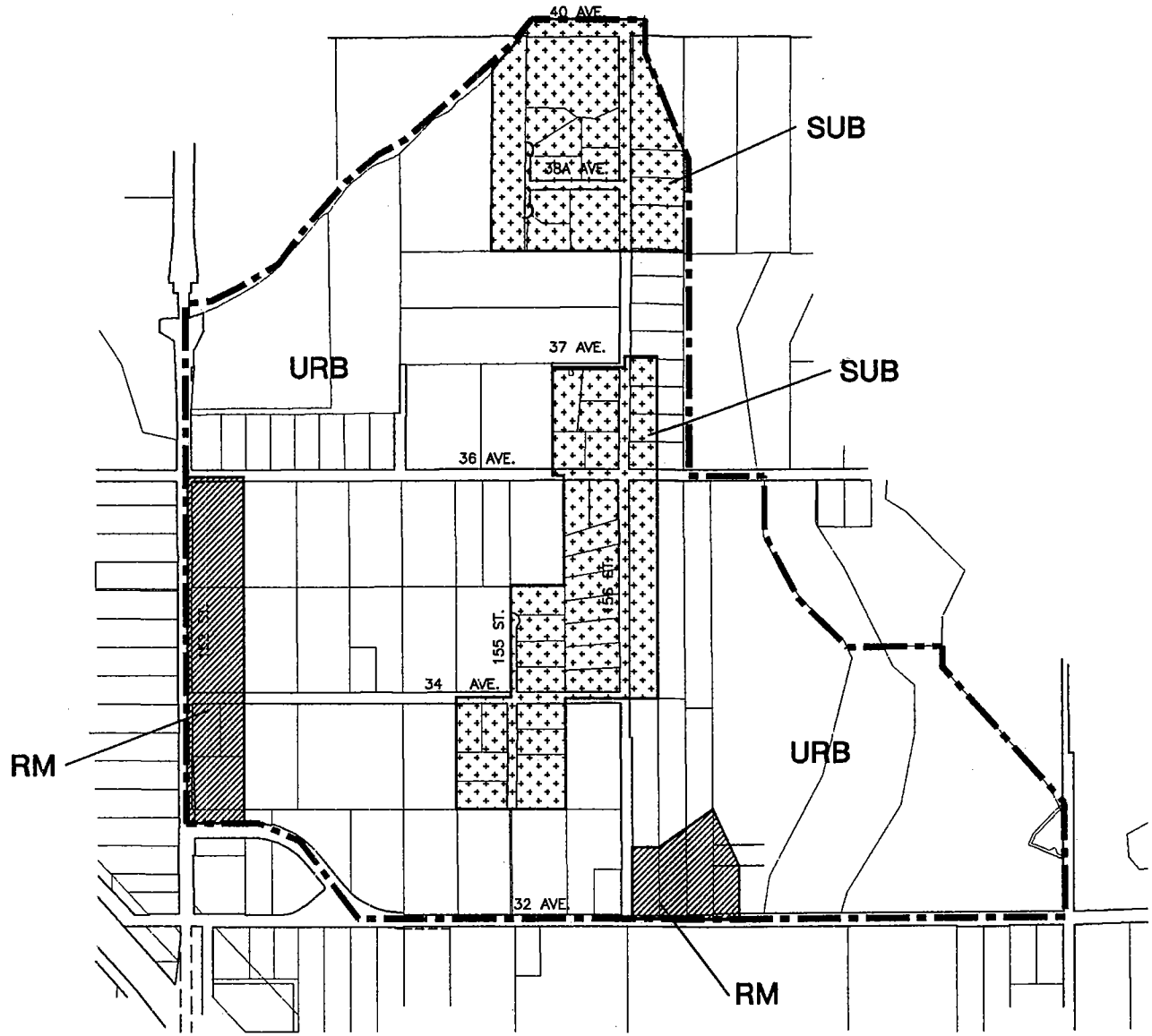

ROSEMARY HEIGHTS

CENTRAL NEIGHBOURHOOD OFFICIAL COMMUNITY PLAN

APPENDIX A

STUDY BOUNDARY

URBAN

RESIDENTIAL MULTI-FAMILY

SUBURBAN

URBAN SYSTEMS
consulting planners and engineers

DATE: MARCH 1996 JOB No. 6107219.1

CITY OF SURREY

Rosemary Heights Central Neighbourhood Concept Plan

Appendix B

Analysis of Potential Affordable Housing Sites

URBANSYSTEMS

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SURREY
CITY OF PARKS

INTER-OFFICE MEMO

TO: **Jet Malong, South Surrey Planner**

FROM: **Barbara Beblo, Senior Planner, Social Planning**

DATE: **January 8, 1996** FILE: **2350-007/2**

RE: **Rosemary Heights - Neighbourhood Concept Plan**

Further to your request for comments on the above noted NCP, I would like to offer the following before the plan progresses to the next stage.

Affordable Housing

There appears to be no reference for the provision of affordable housing in the Rosemary Heights Central Neighbhourhood NCP. Council, however, has requested that suitable sites for affordable housing be identified during the NCP process. To assist in the process, of identifying potential sites, I have briefly reviewed all of the designated townhouse sites based on Surrey's Location Criteria for Affordable Housing. Generally, the standard for affordable housing projects is a 40 unit project on approx. 3.5 acres, with the objective of one project per school catchment area.

The two principal criteria for family affordable housing are that the site be located within walking distance to

(i) an elementary school; and

(ii) a neighbourhood commercial area.

Townhouse designated sites #2, #7 and #9 on the attached map appear to meet these criteria the best, based on the sketch provided in the NCP document. Other sites may also be considered and reviewed on their merits at the time of application.

Seniors affordable housing could be located on the sites identified for garden apartments along 152 Street. These are close to commercial, institutional, public transit and open space facilities.

Community Facilities/ Amenities

The Rosemary Heights Community Plan proposes institutional uses and two neighbourhood parks and schools as community amenities. However there is no indoor space for community functions, meetings, programs or child care services. To create a balanced and vibrant community some type of community indoor space should be provided. This could be achieved in a number of ways, either by:

(i) incorporating two neighbourhood houses, approx. 3,000 sq.ft. in size, in each of the neighbourhood parks, as proposed in the North Cloverdale NCP;

(ii) constructing one community facility of approx. 6,000 sq.ft.;

(iii) expanding the function of the elementary schools as community schools with dedicated space allocated and accessible to the community programs and child care facilities; and

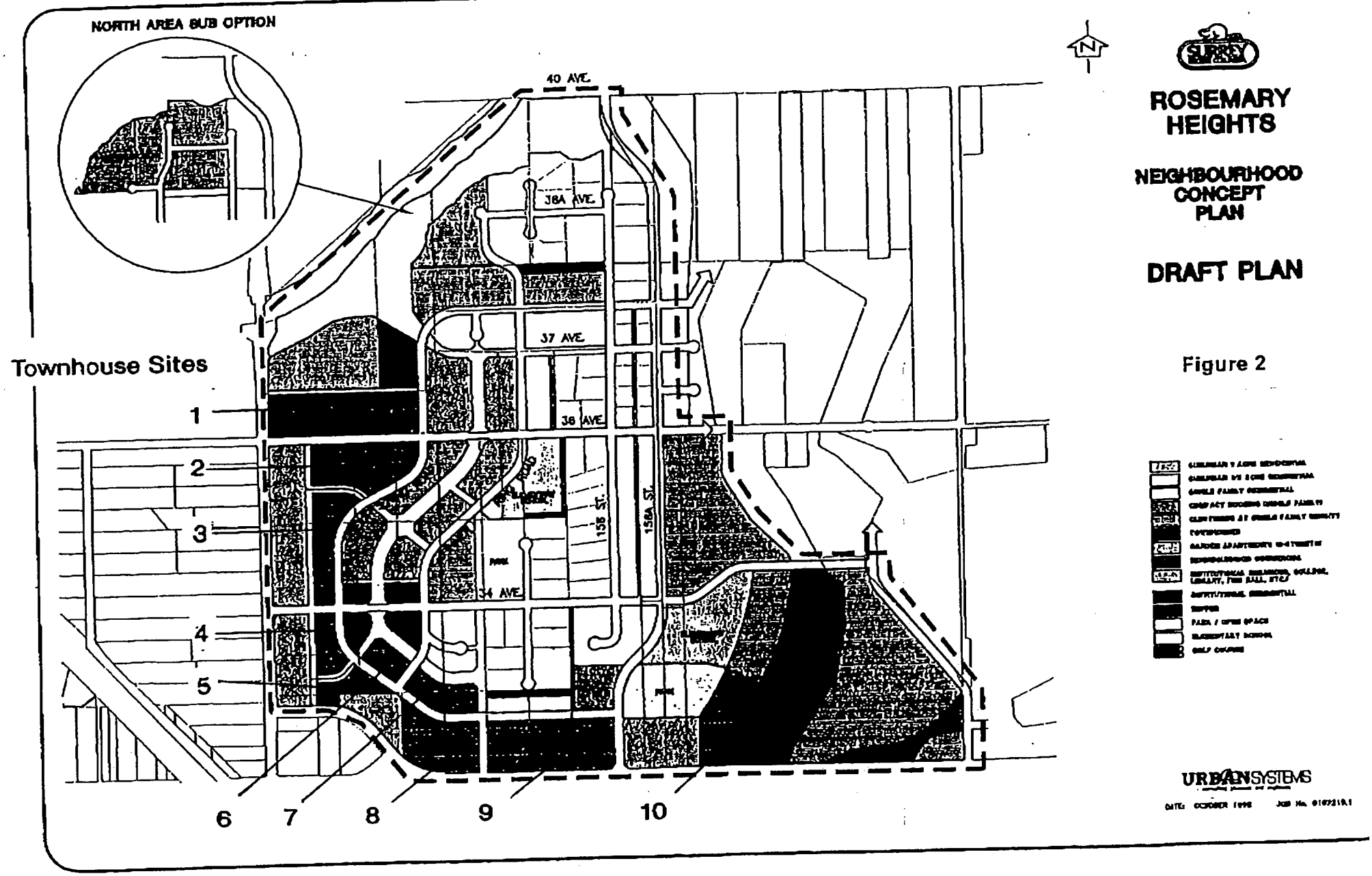
(iv) provided through the amenity provisions of development projects.

I trust this is helpful to you, if you would like to discuss these suggestions further please let me know.

Barbara Beblo
Senior Planner, Social Planning

cc. Wendy Whelen, Senior Planner, NCP Coordinator

Review of Potential Family Oriented Affordable Housing Sites



Rosemary Heights Central Neighbourhood - Neighbourhood Concept Plan

REVIEW OF DESIGNATED TOWNHOUSE SITES FOR FAMILY-ORIENTED AFFORDABLE HOUSING *

SITE	Adequate Site Area? (Approx. 3.5 Acres)	Within Walking Distance to Elem. School/ Park? (1/2 km)	Within Walking Distance to Neighbourhood Commercial Node? (1/2 km)	No. of Sides that Interface with Single Family Development?	No. of Properties Involved?
1	Yes	Yes**	No	none	3
2	Yes	Yes**	Yes	none	2
3	Yes	No	Yes	none	2
4	No	No	Yes	none	1
5	No	No	Yes	none	3
6	No ?	No	Yes	none	1
7	Yes	Yes	Yes	1	3
8	Yes	No	Yes	none	2
9	Yes	Yes**	No	1	2
10	Yes	Yes	No	1	1

* Planning for two affordable housing projects, one per school catchment area, with approx. 40 ground oriented units.

**Yes = if located at the eastern portion of the designated area

CITY OF SURREY

Rosemary Heights Central Neighbourhood Concept Plan

Appendix C

Rosemary Heights Central Neighbourhood Concept Plan

Stormwater Drainage Report

URBANSYSTEMS

October, 1996
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Table of Contents

List of Figures

List of Tables

1. Summary

This report presents the drainage and stormwater management servicing strategies for the Central Rosemary Heights Neighbourhood Concept Plan area. The proposed servicing infrastructure will be comprised of a minor system (storm sewers) designed to convey the 1:5 year level runoff, while the major system (over land drainage) will convey the 1:100 year level runoff. Stormwater quantity control will only be required for those lands discharging to Morgan Creek. It is proposed to employ the existing detention ponds on-line of Morgan Creek at 160th Street to service the Central Rosemary Heights Plan area.

A new storm drain connection will be provided from the intersection of 152nd Street and 36th Avenue to provide base flows to Barbara Creek. This base flow will be equivalent to the peak 1:2 year pre-development runoff level. Flow exceeding this level will be conveyed north directly to the Nicomekl River. Runoff from all other areas within the Plan area will either discharge east to the Morgan Creek Development drainage system or be conveyed north directly to the Nicomekl River.

Stormwater quality control measures (Best Management Practices) are encouraged throughout the plan area. Specific quality control measures are discussed in Section 4.3 of the Plan.

2. Introduction

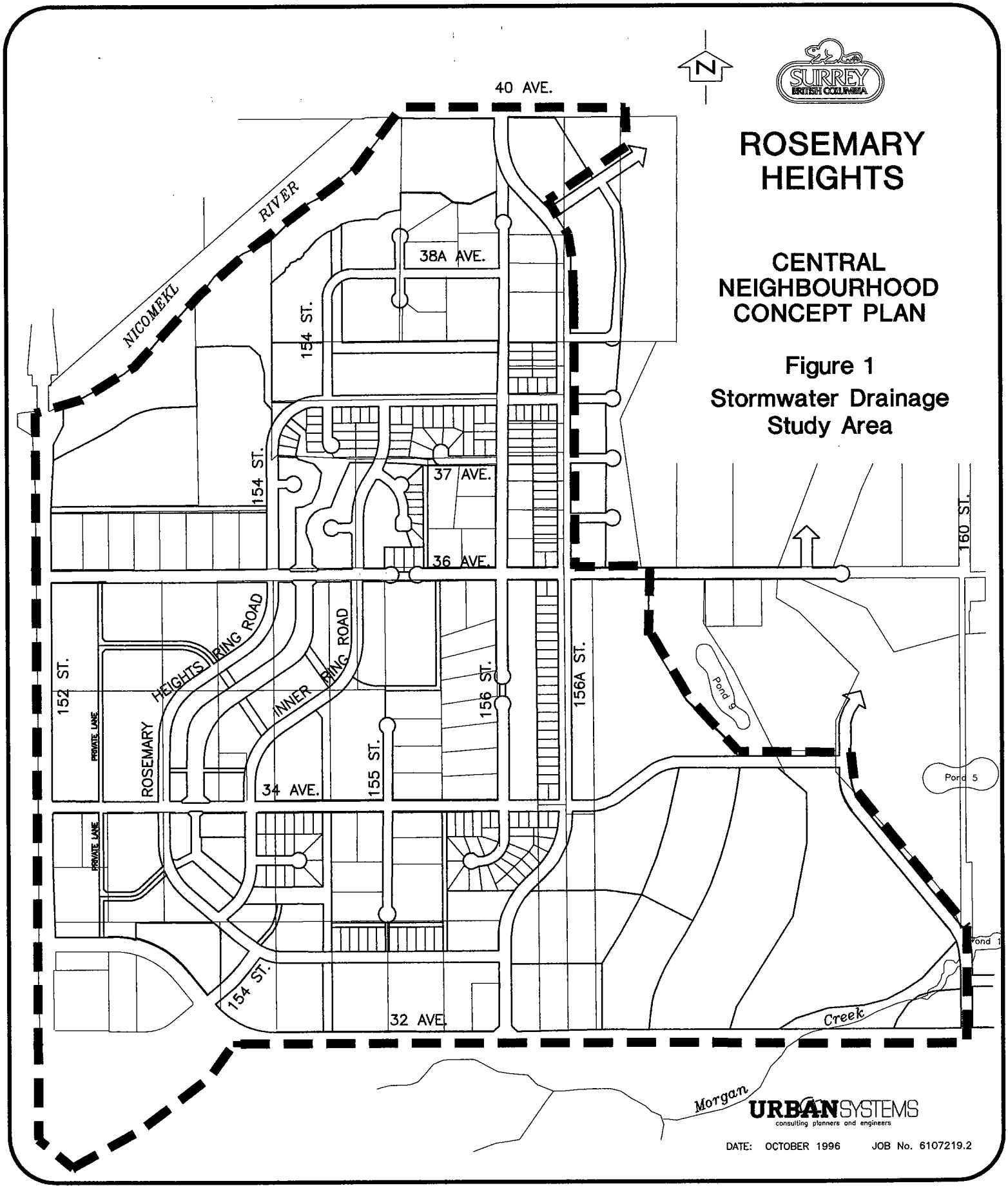
This report has been prepared as part of the Central Neighbourhood Concept Plan, Stage II report for the Rosemary Heights area. The premise of this report is the proposed land use strategy presented in Section 2 of the Plan.

This report expands on the information presented in the Plan and includes all data and discussion used in development of the stormwater servicing strategy. The objective of this study is to determine the effects proposed development may have on existing downstream drainage systems and to present the conceptual design for the required drainage and stormwater management infrastructure.

This Plan was prepared in coordination with the Morgan Creek/Old Logging Ditch Master Drainage Plan (New East Consulting Services Ltd., April 1996) and the Elgin Creek 1995 Master Drainage Plan Update (I.D. Group/Duncan & Associates Engineering Ltd., January 1996). The design engineers (Aplin & Martin Consultants Ltd.) for the neighbouring Morgan Creek Development to the east, were also consulted regarding stormwater discharge east of 156th Street.

2.1 Study Area

The primary boundaries to the study area include 32nd Avenue, 152nd Street, the Morgan Creek Development to the east, and 40th Avenue, as defined in Figure 1. The area encompassed by these boundaries totals 175.5 hectares. Under current conditions, the area is typically characterised by rural residential, agricultural and undeveloped forest land uses. The future land use strategy will see this area transform into a range of residential densities, institutional, commercial and open space uses.



ACAD13 10/25/96 15:08 FIGURE1 PLOT 1=1

3. Methodology

In order to assess the storm drainage infrastructure required to service future development and to assess the potential impacts on existing watercourses, hydrologic modelling was performed using the OTTYHMO_89 (Wisner, 1989) computer package. Expected stormwater runoff rates were determined for both existing and future land use conditions at key locations within the study area. These results are presented later in Section 6 of Appendix A.

The results of the hydrologic models were used to assess the suitability of existing drainage features to manage future flow rates, as well as to develop a servicing strategy for proposed developments. While the results presented in the Plan and this report are sufficient for developing servicing and financing strategies, this information is not sufficient for detailed design. Further computations are required at the pre-design stage to confirm the infrastructure sizing noted in this report.

3.1 Design Rainfall Depths

The study area lies approximately equidistant from the Surrey Municipal Hall and White Rock weather stations. Therefore, rainfall values were computed for the study area by averaging the rainfall depths of the two stations. Information for each weather station was acquired from the Atmospheric Environment Service. The information used in this study is consistent with that used in the Morgan Creek/Old Logging Ditch Master Drainage Plan. A summary of the design rainfall depths is shown in Table 1.

3.2 Design Rainfall Distribution Patterns

Several storm durations were analysed in order to assess the critical storm events for both existing and future development conditions. Design storms were prepared for the 2, 5, and 100 year return periods. For each return period, storm durations of 2, 6, 12 and 24 hours were used.

Table 1
Design Rainfall Parameters

White Rock STP

	Rainfall Depths (mm)		
	1:2 year	1:5 year	1:100 year
2 hour	15.9	23.1	42.8
6 hour	27.8	34.3	52.3
12 hour	36.2	45.0	69.2
24 hour	50.9	63.9	99.5

Surrey Municipal Hall

	Rainfall Depths (mm)		
	1:2 year	1:5 year	1:100 year
2 hour	14.9	18.1	26.9
6 hour	27.4	33.0	48.1
12 hour	39.7	47.9	70.3
24 hour	55.8	67.3	98.9

Design Rainfall

	Rainfall Depths (mm)		
	1:2 year	1:5 year	1:100 year
2 hour	15.40	20.60	34.85
6 hour	27.60	33.65	50.20
12 hour	37.95	46.45	69.75
24 hour	53.35	65.60	99.20

Notes: Design rainfall depth represent the arithmetical mean of the two weather stations.

Rainfall Hyetographs were developed with the AES distribution for the 2 hour event and the SCS Type 1A distribution for the 6, 12 and 24 hour events, as presented in the City of Surrey Interim Storm Drainage Criteria.

Urban Systems Ltd. received Interim Storm Drainage Criteria from the City of Surrey engineering department in a letter dated November 3, 1995. This criteria presented rainfall mass curves to be used in the City of Surrey for various storm durations. Design storms for this study have been prepared in accordance with this criteria, namely the AES distribution for 2 hour events and the SCS Type 1A distribution for the 6, 12 and 24 hour events.

3.3 Rainfall Losses

The SCS curve number (CN) method was used to calculate the rainfall losses. Curve numbers have been selected for each sub-catchment to represent the average land use and soils conditions.

Soils information was obtained from the Soils of the Langley-Vancouver Map Area (RAB Buttetin 18, MOE, 1981). Surface soils in the area are typically classified as Bose soils. These soils are described as gravelly lag or glacial outwash underlain by glacial till. The low permeability in the till layer creates seasonal seepage and perched water tables along the surface of the till layer during winter months. With the winter months also producing the greatest amounts of rainfall, this low permeable condition has been used for all hydrologic modelling in this study.

A summary of curve numbers for both the existing and future catchments are presented in Table 2. Detailed computations of these values are shown in Sections 4 and 5 of this report. All curve numbers represent antecedent moisture condition (AMC) III.[1]

[1]Rather than computing an initial abstraction as a function of the curve number and rainfall depth, the catchment commands used in OTTHYMO employ a default value for the initial abstraction equal to 1.5 mm. Unless adjustments are made to the curve numbers, the stormwater runoff would be over estimated by the model. Therefore, for modelling purposes only, modified curve numbers have been used. A summary of modified curve numbers for both the existing and future sub-catchments are presented in Tables 7,8,9.

Table 2
Summary of Catchment Information

Catchment	Existing Conditions		Proposed Conditions	
	Area (ha)	CN	Area (ha)	CN
100	29.3	89	17.6	91
200	20.1	92	56.7	94
300	38.4	90	19.6	94
400	29.9	90	28.2	94
500	8.4	91	8.4	94
600	49.4	91	44.9	95
Totals	175.5	90	175.5	94

3.4 Time of Concentration

The NASHYD command within OTTHYMO was used to compute runoff hydrographs for the existing development conditions. The time of concentration for the catchment is one of the variables required. Computations of the time of concentration for each sub-catchment are shown in Table 3.

Table 3
Computation of Time of Concentration
Existing Conditions

$$Tc = \frac{Ct\,(L)\,(n)}{12\,s^{0.5}}$$

where: Tc = Time of Concentration (min)
Ct = Concentration Coefficient
L = Length of longest drainage path (m)
n = Mannings coefficient of flow path
s = Basin slope (m/m)

	Overland Flow					Channelled Flow					Total Tc	
Catchment	Ct	L (m)*	n	s	Tc (min)	Ct	L (m)	n	s	Tc (min)	(min)	Tp (hrs)**
101	1.4	250	0.4	0.04	58	0.5	0	0.03	0.04	0	**58**	**0.65**
102	1.4	130	0.4	0.05	27	0.5	150	0.03	0.05	1	**28**	**0.31**
103	1.4	200	0.4	0.05	42	0.5	0	0.03	0.05	0	**42**	**0.47**
201	1.4	250	0.4	0.06	48	0.5	0	0.03	0.06	0	**48**	**0.53**
202	1.4	170	0.4	0.02	56	0.5	300	0.03	0.009	4	**60**	**0.67**
203	1.4	200	0.4	0.025	59	0.5	300	0.03	0.005	5	**64**	**0.72**
301	1.4	250	0.4	0.027	71	0.5	150	0.03	0.002	4	**75**	**0.84**
302	1.4	80	0.4	0.05	17	0.5	150	0.03	0.005	3	**19**	**0.22**
303	1.4	250	0.4	0.02	82	0.5	0	0.03	0.016	0	**82**	**0.92**
304	1.4	200	0.4	0.055	40	0.5	0	0.03	0.055	0	**40**	**0.44**
401	1.4	250	0.4	0.04	58	0.5	0	0.03	0.04	0	**58**	**0.65**
402	1.4	250	0.4	0.02	82	0.5	600	0.03	0.02	5	**88**	**0.98**
501	1.4	250	0.4	0.04	58	0.5	0	0.03	0.04	0	**58**	**0.65**
601	1.4	180	0.4	0.02	59	0.5	300	0.03	0.02	3	**62**	**0.69**
602	1.4	150	0.4	0.013	61	0.5	400	0.03	0.028	3	**64**	**0.72**
603	1.4	200	0.4	0.045	44	0.5	600	0.03	0.016	6	**50**	**0.56**

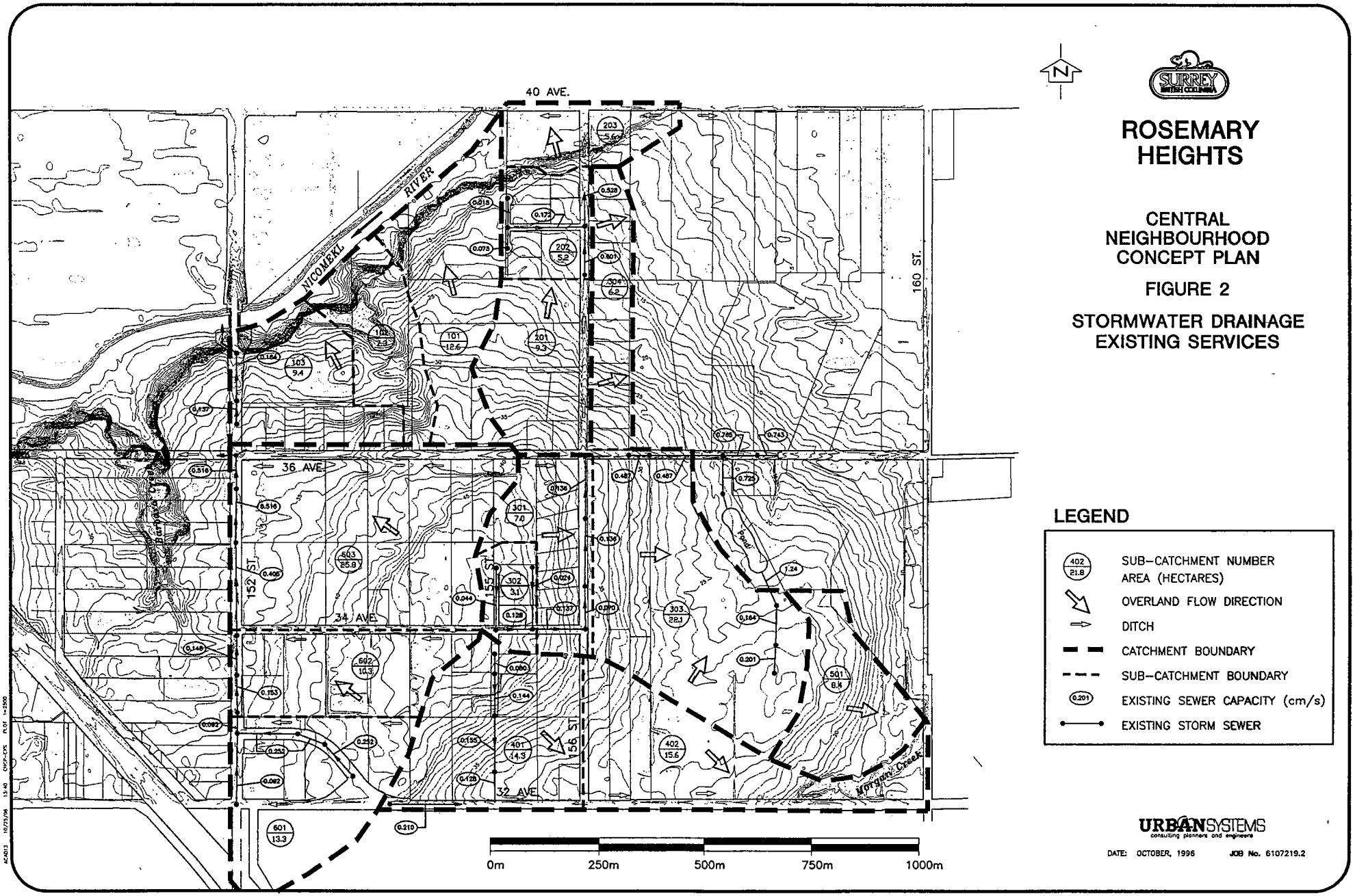
Notes:
1. * - maximum allowable overland flow length is 250 m in accordance with section 2.8.2.1 of Surrey Design Criteria Manual
2. ** - Tp is the Time to Peak, which is defined as 0.67 of the Tc, as per Otthymo_89 manual.
3. - Ct and n values were obtained from the Surrey Design Criteria Manual.

4. Existing Conditions

Aerial photographs, legal plans and site reconnaissance were used to establish the existing conditions of the study area. Predominantly, the area is characterised by a mix of rural residential, agricultural and undeveloped forest. The study area has been divided into 6 primary catchments and further divided into a total of 16 sub-catchments. Table 4 shows the division of land uses for each sub-catchment and presents the detailed computations of the runoff curve numbers used for hydrologic modelling.

Much of the area is serviced by an open ditch drainage system, however storm sewers have been constructed on 152nd Street and throughout much of the rural residential developments. Figure 2 presents the existing sub-catchments and drainage system while Figure 3 presents a modelling schematic.

Under existing conditions 28 percent of the study area discharges directly into the Nicomekl River between 40th Avenue and 152nd Street, while the remaining 72 percent discharges to various locations, including Barbara Creek, Morgan Creek (Titman Creek), the 36th Avenue ditch and east in the 40th Avenue ditch.



ROSEMARY HEIGHTS

CENTRAL NEIGHBOURHOOD CONCEPT PLAN

FIGURE 2

STORMWATER DRAINAGE EXISTING SERVICES

LEGEND

- SUB-CATCHMENT NUMBER / AREA (HECTARES)
- OVERLAND FLOW DIRECTION
- DITCH
- CATCHMENT BOUNDARY
- SUB-CATCHMENT BOUNDARY
- EXISTING SEWER CAPACITY (cm/s)
- EXISTING STORM SEWER

URBANSYSTEMS
consulting planners and engineers

DATE: OCTOBER, 1996 JOB No. 6107219.2

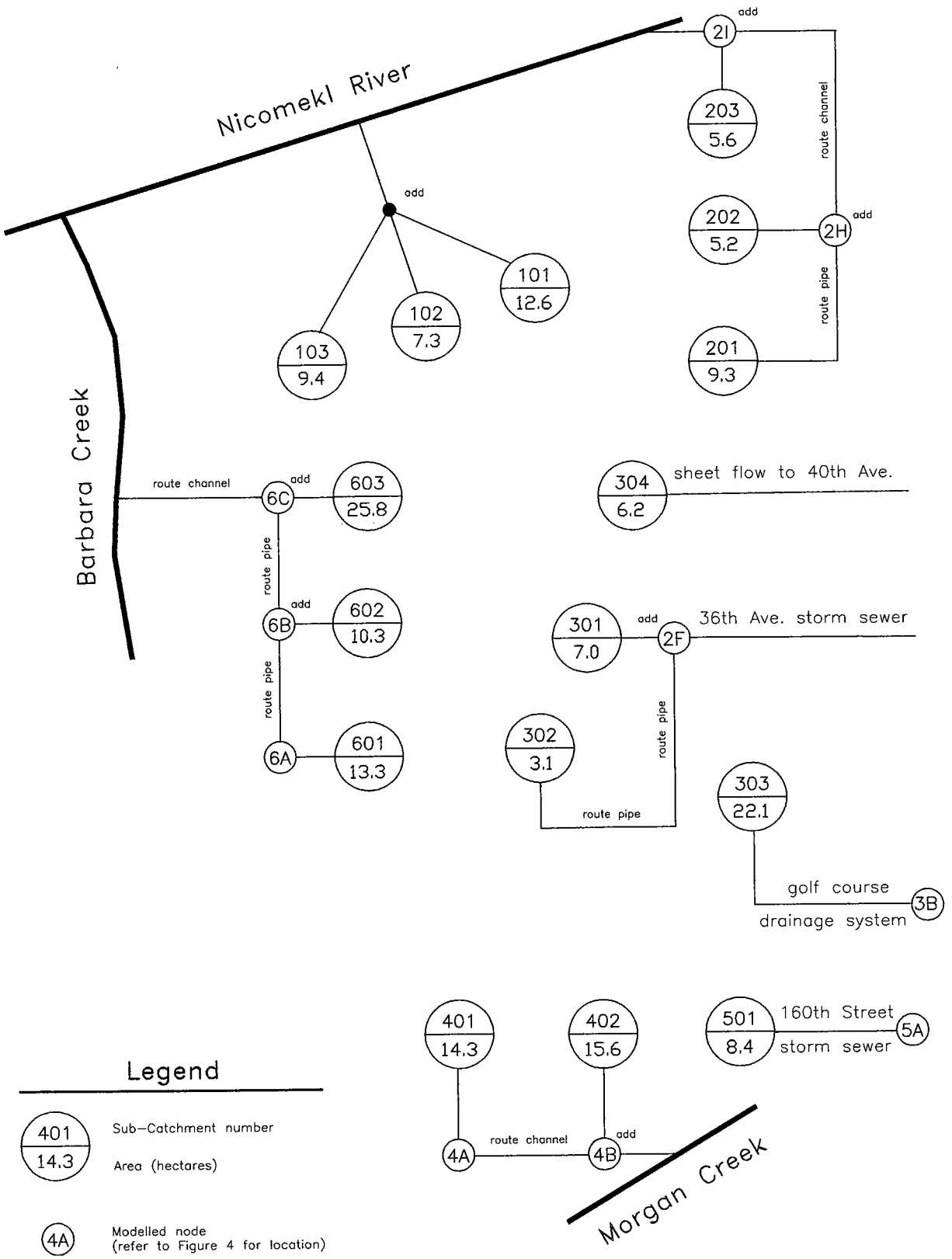
Table 4
Curve Number Estimation
Existing Conditions

	Areas by Land Use (hectares)								
Catchment	***Suburban Residential***	***Institutional***	***Impervious***	***Roads***	***Open Space***	***Treed***	***Golf Course***	***Totals***	***Composite CN Total Area***
101	0.5				4.5	7.6		**12.6**	88
102				0.3	1.0	6.0		**7.2**	87
103	3.8	2.5		0.5		2.6		**9.4**	92
201	4.1			1.0	3.4	0.8		**9.3**	92
202	4.2			1.0				**5.2**	93
203				1.0	4.6			**5.6**	91
301	3.9			1.3	0.5	1.4		**7.0**	92
302	2.1			0.4	0.6			**3.1**	93
303	1.9			0.5	1.0	13.8	5.0	**22.1**	88
304	6.2							**6.2**	93
401	6.7			1.5	4.5	1.6		**14.3**	92
402	1.8			1.9	1.7	7.6	2.6	**15.6**	89
501				0.8	7.7			**8.4**	91
601	3.1			2.3	7.9			**13.3**	92
602	6.2		1.9	1.0	0.9	0.3		**10.3**	94
603	7.3			2.7	2.4	13.4		**25.8**	89
Totals	**51.8**	**2.5**	**1.9**	**16.0**	**40.6**	**55.1**	**7.6**	***175.5***	90
% Imperv.	25	75	100	75	0	0	0		
Total CN*	93	98	100	98	90	86	90		
Perv. CN*	90	90	-	90	90	86	90		

Notes:
1. Land use types and areas are not determined solely from legal/zoning plans, but also through visual inspection (ie. site visit, aerial photos).
2. Curve Numbers are representative of AMC III conditions.

Figure 3

Modelling Schematic
Existing Conditions



Legend

401 / 14.3 — Sub-Catchment number; Area (hectares)

4A — Modelled node (refer to Figure 4 for location)

ACAD13 10/25/96 15:24 FIGURE3 PLOT 1=1

5. Proposed Conditions

The servicing strategy presented in this report has been developed for the land use strategy presented in the Plan. Future developments will contain a wide mix of land uses, ranging from rural residential to high density residential, institutional and commercial. The broad range of development conditions creates a wide range of hydrologic runoff characteristics.

As with the existing conditions, the study area has been divided into six primary catchment areas which have been divided further into a total of 19 sub-catchments. Table 5 shows the division of land uses for each sub-catchment and presents the detailed computations of the runoff curve numbers used for hydrologic modelling.

The study area is located adjacent to the Nicomekl River approximately 6,500 metres upstream of Mud Bay and is subject to tidal fluctuations. Detention in the uplands this close to the river would not restrict flows significantly enough to reduce the flooding problem in the lowlands. The same level of flooding in the lowlands would be expected with or without detention in the Rosemary Heights uplands. As a result, from a flood control perspective, stormwater detention for those lands discharging directly to the Nicomekl River is unwarranted. Discussions with both City and MELP staff have confirmed this approach. The minor (1:5 year) stormwater runoff will be conveyed via storm sewers. Runoff during less frequent events will utilize overland flow routes and the storm sewer system. The future catchment boundaries will increase the area discharging directly to the Nicomekl River to 68 percent, from the current 28 percent. The remaining 32 percent will discharge either to Morgan Creek or to the drainage infrastructure in the neighbouring Morgan Creek Development to the east.

While the majority of runoff from the Plan area will be diverted away from Barbara Creek, a diversion structure at the intersection of 36th Avenue and 152nd Street will be required to provide a 1:2 year pre-development base flow to Barbara Creek. The excess flows will be diverted north on 152nd Street directly to the Nicomekl River. Figure 4 presents the proposed sub-catchments and drainage system while Figure 5 presents a modelling schematic.

Table 5

Curve Number Estimation
Future Conditions

Catchment	Areas by Land Use (hectares)															Composite CN Total Area
	Suburban Residential	Single Family	Compact Single Fam.	Cluster Single Fam.	Town House	Apart.	Nighbour. Comm.	Intitution.	Institution./ Residential	Road	School	O.S./Park/ Buffer	Woodlot	Golf Course	Totals	
101	0.7			3.2				3.6	1.5	0.7		0.2	7.7		**17.6**	91
201				1.1						0.6	2.4	0.6			**4.7**	94
202	7.3	2.2		0.5						2.7		0.7			**13.4**	94
203		0.2	1.3		4.2					0.7		0.2			**6.5**	96
204	2.1	3.5	1.3							2.2		0.9			**10.1**	94
205	0.7	1.6								0.9					**3.2**	95
206	5.2			2.1						1.6		0.8			**9.7**	93
207	2.0	0.8								0.7					**3.5**	94
208										1.0		4.6			**5.6**	92
301		1.3		8.9						2.2	2.9			4.3	**19.6**	93
401	3.5	0.8	1.0		5.3					3.0		0.6			**14.2**	95
402				1.2	2.2	1.8				0.9		2.4		2.4	**11.0**	93
403				0.8						0.8			1.4		**3.0**	91
501				7.5						1.0					**8.4**	94
601	2.9				1.7			1.1		2.8		4.4			**12.9**	94
602	0.4	1.3	0.7	2.4	2.1		0.8		0.5	2.9		3.3			**14.4**	95
603			1.2	1.0	4.2		0.3			2.2		1.5			**10.5**	95
604						1.8				0.8					**2.6**	97
605						3.3				1.2					**4.5**	97
Totals	**24.8**	**11.7**	**5.5**	**28.7**	**19.7**	**6.9**	**1.1**	**4.7**	**2.1**	**28.9**	**5.3**	**20.2**	**9.1**	**6.7**	**175.5**	94
% Imperv.	25	40	50	35	60	65	85	75	75	85	45	0	0	0		
Total CN*	93	94	95	94	96	97	99	98	98	99	95	90	86	90		
Perv. CN*	90	90	90	90	90	90	90	90	90	90	90	90	86	90		

Notes:
1. Land use types and areas represent the land use plan presented in the NCP.
2. Curve numbers are representative of AMC III conditions.

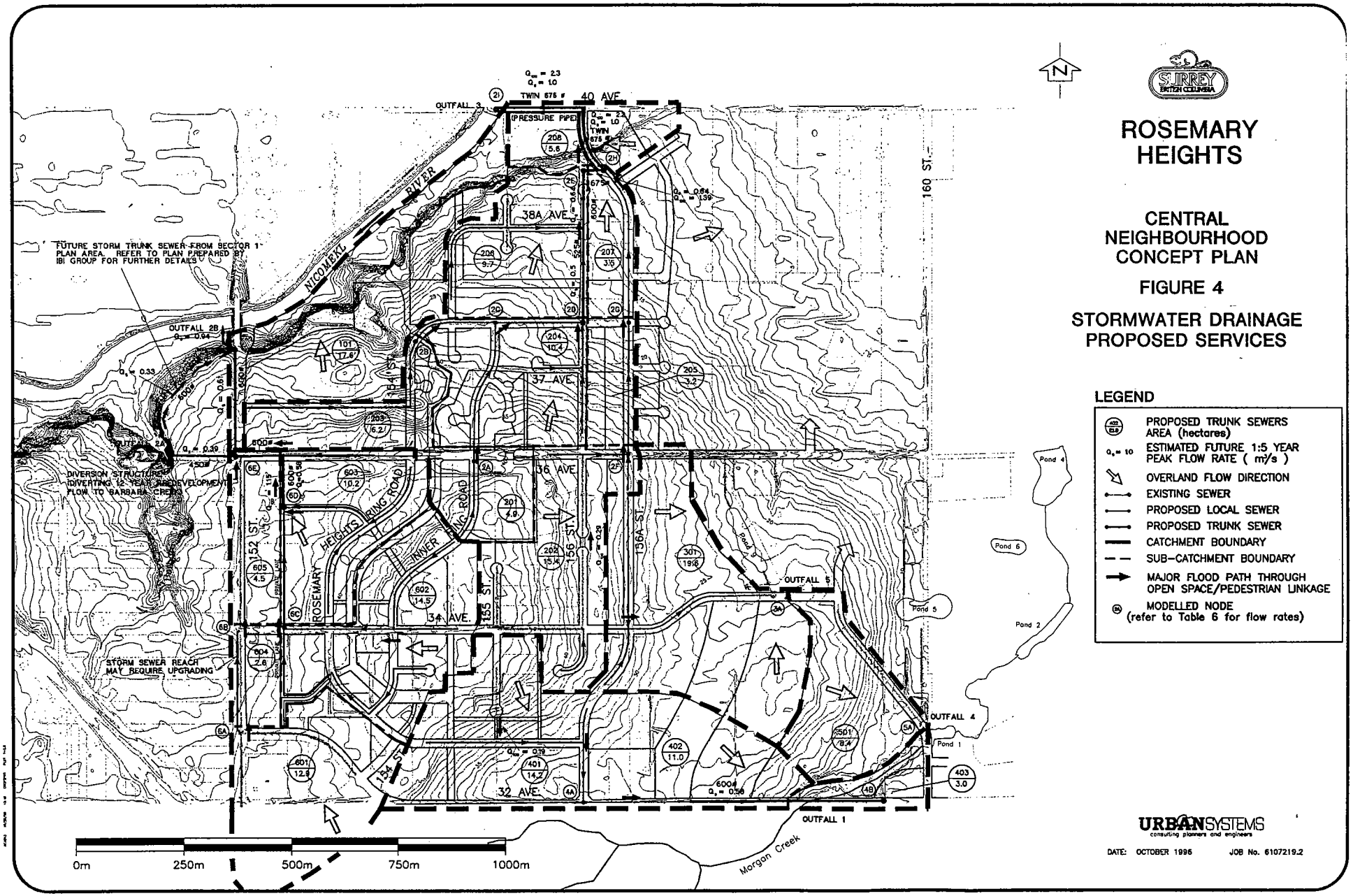
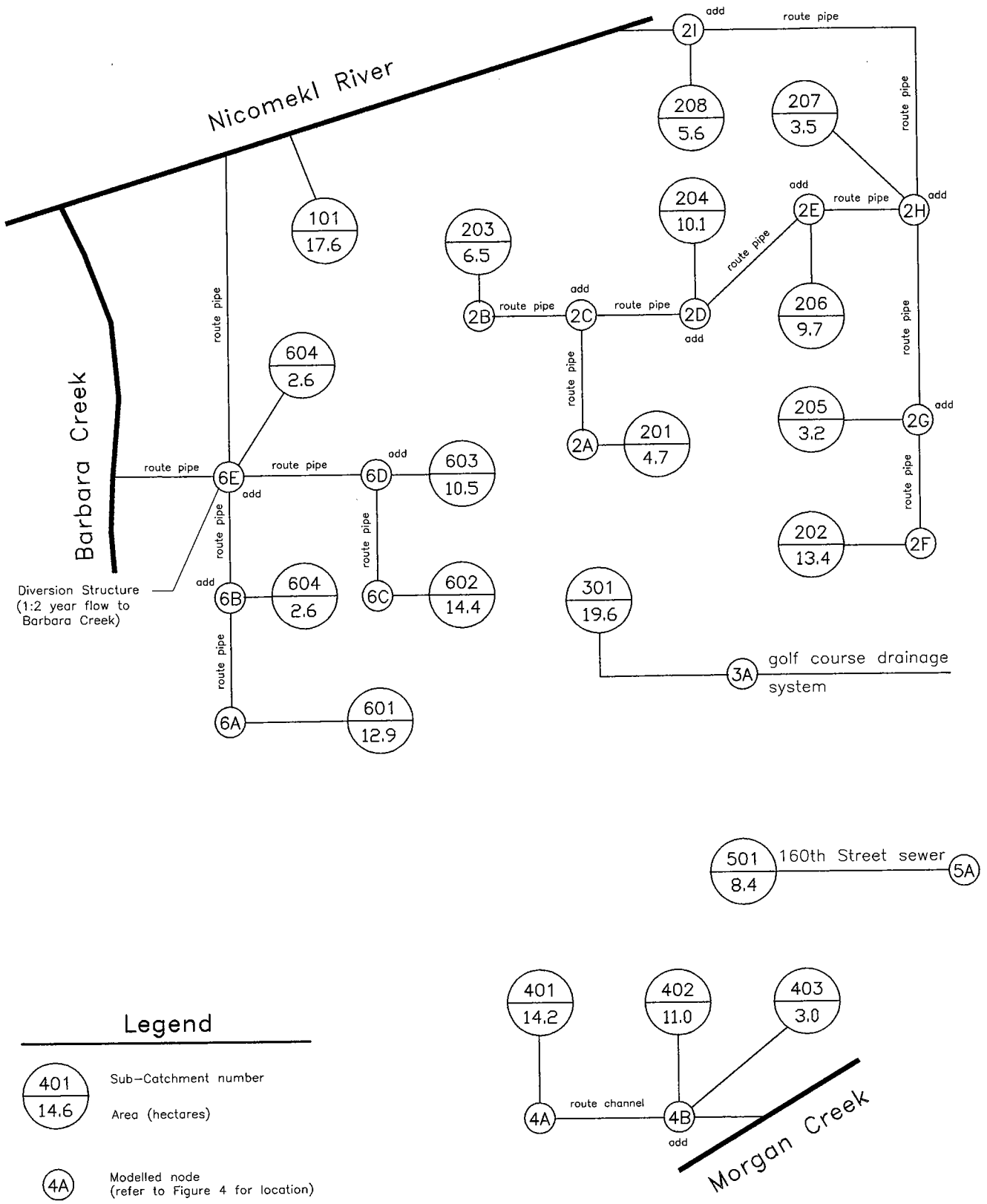

ROSEMARY HEIGHTS
CENTRAL NEIGHBOURHOOD CONCEPT PLAN
FIGURE 4
STORMWATER DRAINAGE PROPOSED SERVICES
LEGEND
PROPOSED TRUNK SEWERS AREA (hectares)
ESTIMATED FUTURE 1:5 YEAR PEAK FLOW RATE (m³/s)
OVERLAND FLOW DIRECTION
EXISTING SEWER
PROPOSED LOCAL SEWER
PROPOSED TRUNK SEWER
CATCHMENT BOUNDARY
SUB-CATCHMENT BOUNDARY
MAJOR FLOOD PATH THROUGH OPEN SPACE/PEDESTRIAN LINKAGE
MODELLED NODE (refer to Table 6 for flow rates)
40 AVE
38A AVE
37 AVE
36 AVE
34 AVE
32 AVE
152 ST.
155 ST.
156 ST.
160 ST.
136A ST.
154 ST.
ROSEMARY HEIGHTS RING ROAD
INNER RING ROAD
NICOMEKL RIVER
OUTFALL 1
OUTFALL 2A
OUTFALL 2B
OUTFALL 3
OUTFALL 4
OUTFALL 5
FUTURE STORM TRUNK SEWER FROM SECTOR 1 PLAN AREA. REFER TO PLAN PREPARED BY IBI GROUP FOR FURTHER DETAILS
DIVERSION STRUCTURE DIVERTING 12 YEAR REDEVELOPMENT FLOW TO BARBARA CREEK
STORM SEWER REACH MAY REQUIRE UPGRADING
PRESSURE PIPE
Pond 1
Pond 2
Pond 3
Pond 4
Pond 5
Pond 6
Morgan Creek
0m
250m
500m
750m
1000m
URBAN SYSTEMS
consulting planners and engineers
DATE: OCTOBER 1996
JOB No. 6107219.2

Figure 5

Modelling Schematic
Proposed Conditions



ACAD13 10/25/96 15:25 FIGURE5 PLOT 1=1

6. Hydrologic Modelling Results

OTTHYMO models were created for both the existing and future development conditions. As discussed earlier, a variety of storm durations were modelled in order to determine the critical storm event for each return period. Based on the fact that little or no peak flow attenuation will be required for the study area, flow rates under existing conditions have been presented at only three primary outfall locations. Peak flow rates under future development conditions were identified for each sub-catchment in order to determined infrastructure sizing.

Table 6 presents a summary of peak flow rates at the various locations throughout the study area. As shown, the longer duration 12 and 24 hour storms produce peak runoff rates under existing conditions, while the short duration 2 hour events produces the peak runoff rates under future conditions.

The impacts on existing drainage systems and the requirement for infrastructure servicing is presented in the following section.

Table 6

SUMMARY OF RUNOFF RATES

EXISTING FLOWS (cms)

	NODE (refer to Figure 4 for location)																	
STORM	2A	2B	2C	2D	2E	2F	2G	2H	2I	3A	4A	4B	5A	6A	6B	6C	6D	6E
2/2	-	-	-	-	-	-	-	-	0.11	-	-	0.11	-	-	-	-	-	0.22
2/6	-	-	-	-	-	-	-	-	0.15	-	-	0.19	-	-	-	-	-	0.34
2/12	-	-	-	-	-	-	-	-	0.17	-	-	0.21	-	-	-	-	-	0.39
2/24	-	-	-	-	-	-	-	-	0.17	-	-	0.22	-	-	-	-	-	0.39
5/2	-	-	-	-	-	-	-	-	0.22	-	-	0.22	-	-	-	-	-	0.45
5/6	-	-	-	-	-	-	-	-	0.21	-	-	0.27	-	-	-	-	-	0.48
5/12	-	-	-	-	-	-	-	-	0.24	-	-	0.30	-	-	-	-	-	0.54
5/24	-	-	-	-	-	-	-	-	0.24	-	-	0.30	-	-	-	-	-	0.54
100/2	-	-	-	-	-	-	-	-	0.59	-	-	0.66	-	-	-	-	-	1.30
100/6	-	-	-	-	-	-	-	-	0.38	-	-	0.51	-	-	-	-	-	0.88
100/12	-	-	-	-	-	-	-	-	0.46	-	-	0.59	-	-	-	-	-	1.06
100/24	-	-	-	-	-	-	-	-	0.43	-	-	0.57	-	-	-	-	-	1.01

FUTURE FLOWS (cms)

	NODE (refer to Figure 4 for location)																	
STORM	2A	2B	2C	2D	2E	2F	2G	2H	2I	3A	4A	4B	5A	6A	6B	6C	6D	6E
2/2	0.07	0.14	0.20	0.34	0.42	0.15	0.20	0.66	0.66	0.25	0.24	0.39	0.13	0.14	0.20	0.22	0.40	0.70
2/6	0.05	0.08	0.12	0.22	0.29	0.12	0.15	0.47	0.51	0.17	0.15	0.26	0.08	0.11	0.14	0.14	0.26	0.46
2/12	0.06	0.10	0.16	0.28	0.38	0.15	0.20	0.61	0.64	0.22	0.19	0.34	0.10	0.13	0.17	0.18	0.33	0.57
2/24	0.06	0.08	0.13	0.24	0.33	0.14	0.18	0.55	0.59	0.20	0.16	0.30	0.09	0.12	0.16	0.15	0.27	0.48
5/2	0.11	0.19	0.29	0.50	0.64	0.24	0.31	1.01	1.02	0.37	0.35	0.58	0.18	0.22	0.29	0.32	0.58	1.00
5/6	0.06	0.10	0.16	0.29	0.39	0.16	0.21	0.63	0.68	0.23	0.20	0.35	0.11	0.15	0.19	0.19	0.34	0.59
5/12	0.08	0.13	0.21	0.38	0.52	0.21	0.27	0.83	0.88	0.30	0.26	0.46	0.14	0.19	0.24	0.24	0.43	0.76
5/24	0.07	0.10	0.17	0.31	0.44	0.19	0.23	0.72	0.77	0.26	0.21	0.39	0.12	0.16	0.21	0.21	0.36	0.64
100/2	0.22	0.36	0.57	1.02	1.39	0.58	0.73	2.26	2.31	0.80	0.71	1.22	0.38	0.61	0.64	0.65	1.15	2.01
100/6	0.11	0.17	0.27	0.50	0.69	0.29	0.36	1.12	1.18	0.41	0.34	0.61	0.19	0.26	0.32	0.33	0.58	1.01
100/12	0.14	0.21	0.35	0.63	0.88	0.37	0.47	1.44	1.53	0.53	0.43	0.79	0.24	0.32	0.41	0.41	0.73	1.28
100/24	0.11	0.17	0.28	0.52	0.75	0.32	0.40	1.23	1.33	0.46	0.35	0.67	0.20	0.30	0.36	0.35	0.61	1.08

Critical storm event

2/6 = Denotes a 1:2 year, 6 hour storm event

7. Proposed Services

7.1 Minor Drainage System

Currently, the study area is serviced by a combination of open ditches and storm sewers. Existing sewers which do not require replacement or upgrading to service future developments have been shown on Figure 4. While the upland ditch system does not support fish directly, the ditches do provide valuable fish nutrients. In some cases, such as one existing ditch, east of 154 Street, this ditch is protected within a park/open space designation and does ultimately provide nutrients into the Nicomekl River. The Plan assumes that the sewer network will be sized for the 1:5 year storm event, in accordance with current City standards. Should developers wish to provide basements, providing a sewer system designed for the 1:100 year event will need to be revisited.

While Figure 4 identifies the routing of both local and trunk sewers, pipe sizes have only been identified for trunk sewers. A trunk sewer has been determined using ht Surrey criteria which states that a trunk storm sewer shall be a system which services an area of 20 hectares or greater.

Although not a trunk sewer, the existing sewer on 152nd Street between the 32nd Avenue diversion and 34th Avenue is under capacity for the existing development conditions. The capacity of this reach ranges from 0.092 m^3/s to 0.153 m^3/s, while the expected 1:5 year peak flow is 0.15 m^3/s. Future development is expected to increase this peak 1:5 year runoff to 0.22 m^3/s. Consideration may be given to upgrading this pipe reach in the interim if more detailed calculations and observed flow conditions necessitate upgrading. The future catchment boundaries will divert a significant catchment area from discharging to the 152nd Street sewer between 34th and 36th Avenue. As a result, the capacity of the 152nd sewer between 34th and 36th Avenue will not be exceeded. Downstream of the proposed 152nd Street diversion structure, the existing sewer on 152nd Street is greatly under capacity and will require replacement to the Nicomekl River.

The local sewer servicing future sub-catchment 203 (refer to Figure 4) has been shown graded eastward, contributing to the future storm sewer on Rosemary Heights Ring Road. Ground contours also indicate the opportunity to grade this sewer westward to 152nd Street. However, it is expected that the surface grading of this future right-of-way will be raised to suit development of the town housing units. Also, as shown on Figure 6.4.1 (Sanitary Sewer) in the Plan, a sanitary trunk sewer is also required in this easement which must be graded to the east. In order to remain consistent with the sanitary trunk sewer the storm sewer and catchment boundaries have been shown accordingly.

Discussion regarding specific outfall locations will be presented later in this section.

7.2 Major Drainage System

Stormwater runoff exceeding the 1:5 year storm event is considered to be major flow. Major flow paths are to be sized for the 1:100 year peak runoff flow rate. In most cases the major flows will be contained within the road right-of-way. Where this can not be achieved the major flow path is contained within buffer or open space dedications. Figure 4 shows the proposed major flow paths. Overland channels or swales within these areas can provide sufficient conveyance. The City must ensure that ownership and maintenance of these areas is retained, or else the sewer may need to be sized for the 1:100 year event.

Due to topography, many of the road intersections may permit surface flow to split in two directions. Specifically, all intersections on 156A Street north of and including 36th Avenue. These must be designed to ensure the major flood path remains north on 156A Street to 40th Avenue and is not permitted to spill into the Morgan Creek catchment. Pavement crossfall adjustments or alternative methods will be necessary to ensure that catchment boundaries are maintained during a major storm event. In this plan sewer trunk sizes have only been determined to convey the 1:5 year runoff.

7.3 Outfall Locations

There are a total of five outfalls servicing the future development (Figure 4):

1. Morgan Creek at 32nd Avenue.
2. Nicomekl River at 152nd Street.
3. Nicomekl River at 40th Avenue.
4. Storm sewer on Morgan Creek Way (160th Street) at Morgan Creek.
5. Storm sewer on 34th Avenue 150 metres west of Morgan Creek Way (160th Street).

The last two outfalls have been adequately addressed by Aplin & Martin in the design of the Morgan Creek Development. The remaining three outfalls are required as part of this Plan.

1. Morgan Creek at 32nd Avenue.

The catchment area contributing to this outfall will decrease slightly from 29.9 hectares to 28.2 hectares following full development. However, the 1:5 year peak flow rate will increase from 0.30 cms to 0.58 cms.

A number of detention ponds have been constructed on-line of Morgan Creek between Morgan Creek Way and 34th Avenue as part of the Morgan Creek Development. The detention ponds were originally sized to detain flow from a large catchment south of 32nd Avenue. The intent was to protect Morgan Creek, north of 32nd Avenue, and the downstream ditches from the impacts of peak flow. The ponds have the capacity to control a much larger area than noted in the New East (April 1996) report for impacts on the drainage system, downstream of 32nd Avenue.

The three downstream ponds have been modelled using the pre-development condition for the lands south of 32nd Avenue and post-development condition for the lands north of 32nd Avenue. This is consistent with the approach used by Surrey in their analysis in the Old Logging Ditch MDP. As expected, the 1:5 year flow increases

prior to the first pond (1.08 cms pre vs. 1.33 cms post). The outfall for the 32nd Avenue trunk is located east of the Morgan Creek/32nd Avenue culvert. This bypasses the fish sensitive area of Morgan Creek between 32nd Avenue and Morgan Creek Way. The Creek can accommodate this modest increase without erosion in the 1:5 year event. At Pond 1 the flow is detained to a 1:5 year release rate of 1.11 cms, a 0.03 cms increase over the pre-development flow.

The flow is then routed into pond #2 and again detained with a new release rate of 1.06 cms in the 1:5 year condition. The discharge is then routed down Morgan Creek into the final pond #4. This pond directly services areas of the Morgan Creek development and is sized accordingly. The release rate from this pond is controlled to meet pre-development 1:5 year condition for the larger catchment including the NCP area.

Morgan Creek is protected by way of restrictive covenants between the private owners and the Ministry of Environment (MELP). The overall Morgan Creek stormwater management approach was approved by MOE during the development of the Morgan Creek residential community. The in-stream ponds and operational features have been accepted by MELP/DFO.

To ensure that there is no downstream impact on Morgan Creek, a trunk sewer on 32nd Avenue is proposed. There are currently two large culvert crossings on 32nd Avenue west of Morgan Creek Way. The proposed 32nd Avenue trunk will bypass the first crossing (Morgan Creek) and continue on to a new outfall to the east. This second outfall by-passes the fisheries sensitive area and discharges close to the first pond. The channel from the outfall to Morgan Creek has already been armoured to protect this tributary from potential erosion. Given the condition of the channel, grade, vegetation and backwater elevation from the pond, discharge at this location will not require additional detention.

It is our understanding that the City of Surrey will require off-line detention to address the potential impacts of peak flow from land south of 32nd Avenue. The trunk bypass proposed for the NCP lands will help to reduce the size of the detention facilities identified in the April 1996 New East report.

2. Nicomekl River at 152nd Street

Currently, 49.4 hectares discharges into a ditch located within the 36th Avenue right-of-way from 152nd Street. Following full development this area will decrease to 44.9 hectares, however the 1:5 year peak flow will increase from 0.54 cms to 1.00 cms. While an outlet structure at Barbara Creek has been constructed to accommodate the 1:100 year runoff, there is concern about the sensitivity of Barbara Creek downstream of 36th Avenue.

While it is proposed to minimize discharge to this outfall to prevent further erosion, the MELP has expressed that base flows must continue to be provided to Barbara Creek. While Barbara Creek does not support resident fish, it does provide valuable nutrients to the Nicomekl River. An agreement in principal was reached with the MELP to provide base flow up to the peak 1:2 year pre-development levels, while the remaining post-development discharge would be conveyed directly north to the Nickomekl River in a new 152nd Street Storm Sewer.

Figure 4 showing the proposed stormwater drainage system indicates a new 450 ø sewer within the 36th Avenue right-of-way between 152nd Street and Barbara Creek. This assumes that the existing open channel in this right-of-way will be infilled and replaced with a storm sewer. The opportunity also exists to maintain this as an open channel to provide added nutrients to Barbara Creek.

The consultant (IBI Group) preparing the development plan for the Sector 1 Plan Area on the west side of 152nd Street has indicated the opportunity to eliminate the base flow requirement at 36th Avenue by providing additional base flows further upstream at 150th Street.

While this opportunity has been recognized, further review by IBI Group and a sign off from the MELP is required prior to being adopted. Therefore, this plan continues to identify a base flow provision at 36th Avenue.

The new trunk sewer on 152nd between 36th Avenue and the Nicomekl River will parallel the west side of the existing 250 ø storm sewer to the Nicomekl River.

The future 600 ø trunk storm sewer from the Sector 1 Plan Area, as shown on Figure 4, will discharge to the 152nd Street trunk at the top of the escarpment. The trunk sewer servicing both Plan Areas and the outfall will continue to parallel the existing 250 ø storm sewer within the 152nd right-of-way. Specific attention will be required during the design of the outfall to ensure the integrity of the bridge abutments and habitat areas are not compromised.

3. Nicomekl River at 40th Avenue

The catchment contributing to this outfall will undergo the most significant change following development. The area contributing to this outfall will increase from 20.1 hectares to 56.7 hectares. As expected, the 1:5 year peak flow rates will increase substantially from 1.02 cms to 2.29 cms.

This section of 40th Avenue is below the 200 year floodline (estimated at 2.5 m in elevation) and is subject to frequent flooding. Drainage along 40th Avenue is currently serviced by open ditches and it is not City policy to enclose ditches within the floodplain. However, various outfall option were reviewed, including.

- construct a dyke tie-in,
- utilize the existing open ditch, and
- install a twin pressure pipe system

There are land ownership and safety concerns with construction a dyke tie-in, and utilizing the existing ditch may pose a liability risk to the City during flooding events. Therefore, the chosen option is to install a twin pressure pipes beginning on 156th Street with an invert elevation above 6 metres and continuing within the 156th Street and 40th Avenue dedication to the bank of the Nicomekl River for direct discharge through a flood gate. A twinned pressure pipe system is proposed to allow continued operation during maintenance periods. At the entrance to the pressure pipes on 156th Street, a storm inlet

capable of handling the 1:100 year peak flow rate will be required. As long as the inlet is sufficiently designed, the pressure pipes will be capable of conveying the major flow, with a maximum surcharge elevation remaining below 6 metres in elevation.

During the design stage of this system a number of issues will need to be addressed:

(i) adequate access must be provided through the length of the system for maintenance purposes;

(ii) review the opportunities to construct the outlet such that the pressure systems discharges at an acute angle with the direction of flow in the Nicomekl River to minimize scour.

(iii) although not required during high flow conditions, dissipation measures will likely be required at the outfall for bank protection during low flow conditions.

Table 7

Computation of Modified CN
Pervious Areas

Storm	Rainfall Depth (mm)	For SCS CN 86				For SCS CN 90			
		S	Q	S*	Modified CN	S	Q	S*	Modified CN
1:2 yr, 2 hr	15.4	41.3	1.05	170.34	**60**	28.2	2.51	63.20	**80**
6hr	27.6	41.3	6.16	84.52	**75**	28.2	9.61	44.81	**85**
12hr	39.95	41.3	13.74	69.13	**79**	28.2	18.82	40.10	**86**
24hr	53.35	41.3	23.51	62.49	**80**	28.2	29.97	37.84	**87**
1:5 yr, 2 hr	20.6	41.3	2.83	109.70	**70**	28.2	5.18	51.32	**83**
6hr	33.65	41.3	9.65	74.92	**77**	28.2	13.95	41.95	**86**
12hr	46.45	41.3	18.33	65.28	**80**	28.2	24.12	38.81	**87**
24hr	65.6	41.3	33.31	59.26	**81**	28.2	40.77	36.69	**87**
1:100 yr, 2 hr	34.85	41.3	10.40	73.59	**78**	28.2	14.85	41.53	**86**
6hr	50.2	41.3	21.11	63.64	**80**	28.2	27.28	38.25	**87**
12hr	69.75	41.3	36.76	58.47	**81**	28.2	44.51	36.40	**87**
24hr	99.2	41.3	62.51	55.01	**82**	28.2	71.87	35.11	**88**

$$Q = \frac{(P-Ia)^2}{(P-Ia+S)} \qquad CN = \frac{25400}{254+S}$$

Notes: This is a computational step required only for modelling purposes in Otthymo. As indicated in the Otthymo manual, the program uses a default value of initial abstraction equal to 1.5 mm, when using the "Design Nashyd and Standhyd" commands. However, the SCS CN is developed for IA=0.2, therefore a Modified CN must be used.

Table 8

Modified Curve Numbers
Existing Conditions

	Storm Event											
	1:2 year				*1:5 year*				*1:100 year*			
Catchment	***2***	***6***	***12***	***24***	***2***	***6***	***12***	***24***	***2***	***6***	***12***	***24***
101	68	79	82	83	75	81	83	84	81	83	84	85
102	64	77	81	82	73	79	82	82	80	82	82	83
103	81	87	89	89	85	88	89	90	89	89	90	90
201	82	87	88	89	85	88	89	89	88	89	89	90
202	87	90	91	91	89	91	91	91	91	91	91	92
203	83	87	88	89	85	88	89	89	88	89	89	90
301	82	87	88	89	85	88	89	89	88	89	89	90
302	85	89	90	90	87	90	90	90	90	90	90	91
303	68	79	82	83	76	81	83	84	82	83	84	85
304	85	89	90	90	87	90	90	90	90	90	90	91
401	82	87	88	89	85	88	89	89	88	89	89	90
402	73	82	84	85	79	83	85	86	84	85	86	87
501	81	86	87	88	84	87	88	88	87	88	88	89
601	84	88	89	89	86	89	89	89	89	89	89	90
602	87	91	91	92	89	91	92	92	91	92	92	93
603	73	82	84	85	79	83	85	86	84	85	86	87
Totals	77	84	86	87	82	85	87	87	86	87	87	88

Note: These numbers represent composite CN's. (ie. weighted average of pervious and impervious areas together.)

Table 9
Modified Curve Numbers
Future Conditions

	Storm Event											
	1:2 year				*1:5 year*				*1:100 year*			
Catchment	***2***	***6***	***12***	***24***	***2***	***6***	***12***	***24***	***2***	***6***	***12***	***24***
101	78	85	87	88	83	87	88	89	87	88	89	89
201	88	91	92	92	90	92	92	92	92	92	92	93
202	88	91	91	92	90	91	92	92	91	92	92	93
203	92	94	94	95	93	94	95	95	94	95	95	95
204	89	92	92	93	91	92	93	93	92	93	93	93
205	90	92	93	93	91	93	93	93	93	93	93	94
206	87	90	91	92	89	91	92	92	91	92	92	92
207	88	91	92	92	90	92	92	92	92	92	92	93
208	83	87	88	89	86	88	89	89	88	89	89	90
301	87	90	91	92	89	91	92	92	91	92	92	92
401	90	93	93	94	92	93	94	94	93	94	94	94
402	87	90	91	91	89	91	91	91	91	91	91	92
403	77	85	87	88	82	86	88	88	87	88	88	89
501	88	91	92	92	90	92	92	92	92	92	92	93
601	88	91	91	92	90	91	92	92	91	92	92	93
602	89	92	92	93	91	92	93	93	92	93	93	93
603	91	93	94	94	92	94	94	94	94	94	94	94
604	94	96	96	96	95	96	96	96	96	96	96	97
605	94	96	96	96	95	96	96	96	96	96	96	96
Totals	87	91	91	92	89	91	92	92	91	92	92	93

Notes: These numbers represent composite CN's. (ie. weighted average of pervious and impervious areas together.)

CITY OF SURREY

Rosemary Heights Central Neighbourhood Concept Plan

Appendix D

Detailed Cost Estimates of DCC Infrastructure

URBANSYSTEMS

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CITY OF SURREY UNIT COSTS FOR CONSTRUCTION ESTIMATES IN NCP

Road Works (including Engineering, Administration, GST, etc., equalling a 50% factor)

Sidewalk	$75/m
Concrete Curbing	$37.5/m
Boulevard Strip	$21/m
Pavement Widening	$45/sq.m.
Streetlights and Conduit	$150/m
Asphalt Overlay	$9/sq.m.

***Sanitary and Storm Works** (including Engineering, Administration, GST, etc., equalling a 50% factor)

Pipe (mm)	Cost
250	$360/m
300	$375/m
375	$435/m
450	$480/m
525	$510/m
600	$570/m
675	$630/m
750	$765/m
900	$930/m
1050	$1080/m
1200	$1260/m
1350	$1455/m
1500	$1665/m

Major Collector Construction Costs

Interim Standard (8.5m)

Including - detail enclosure, gravel swale, streetlights, pavement widening, overlay, sidewalk one side, catch basins at ultimate and 50% factor for engineering, contingency, administration, GST, etc.
$1,014/m**

***Water Works** (including Engineering, Administration, GST, etc., equalling a 50% factor)

Pipe (mm)	Cost
200	$375/m
250	$390/m
300	$420/m
350	$465/m
400	$480/m
450	$525/m

*Unit costs include catch basins, manholes, tees, hydrants, valves, house services, restoration, rehabilitation, etc. Diversion structures and PRVs have been estimated in the specific item costs shown in Tables 4.1.a through 4.1.d.

** In locations where a trunk storm sewer and major collector widenings are proposed as DCC elements, Surrey will only fund the storm sewer in the storm DCC rebate or credit. This means that the unit cost for major collector rebate will be lower than $1,014/m as the storm sewer cost will not be included. Storm sewers costs will be in the trunk cost in this situation. Note that Surrey rebates or credits only on actual costs not estimates in any case.

Rosemary Heights
Detailed Cost Estimate of
DCC Infrastructure

Location	Size	Length (m)	Cost (/m)	Total	Subtotals	Required
Water						
152 St.: KGH - 32 Ave.	400	1000	$ 480.00	$ 480,000.00	(2)	Stage 2
Hwy. 1 Crossing				$ 80,000.00	(2)	Stage 2
152 St.; 32 Ave. - 36 Ave.	300	800	$ 420.00	$ 336,000.00	(2)	Stage 2
36 Ave.: 152 St. - 156A St.(1)	300	800	$ 420.00	$ 336,000.00	(1) $134,400	Stage 2
34 Ave.: 152 St. - 156A St.(1)	300	900	$ 420.00	$ 378,000.00	(1) $151,200	Stage 2 & 3
PRV on 152 St.				$ 125,000.00		Stage 2
Total Water					$ 1,306,600.00	
Sanitary						
2nd Pump and Generator				$ 150,000.00		Stage 1
37A Ave.: A to B	375	450	$ 435.00	$ 195,750.00		Stage 2
154 St.: B to MH 2-3	375	150	$ 435.00	$ 65,250.00		Stage 3
3650 Blk.: MH 2-3 to 2-4	375	400	$ 435.00	$ 174,000.00		
Total Sanitary					$ 585,000.00	
Stormwater						
32nd Avenue						Stage 1
Storm Sewer	600	450	$ 570.00	$ 256,500.00		
Erosion Protection				$ 10,000.00	$ 266,500.00	
Easement SE of 36 Ave. & 152 St.						Required for Stage 3
Storm Sewer	600	120	$ 570.00	$ 68,400.00		
36th Avenue						
Storm Sewer	600	100	$ 570.00	$ 57,000.00		
36th Avenue R.O.W. (Base Flow Pipe)						
Storm Sewer	450	170	$ 480.00	$ 81,600.00		
152nd Street						
Storm Sewer	600	300	$ 570.00	$ 171,000.00		
Outfall Structure				$ 50,000.00	$ 428,000.00	
156th Street						Required for Stage 2
Storm Sewer	525	220	$ 510.00	$ 112,200.00		
Storm Sewer	600	130	$ 570.00	$ 74,100.00		
Gravity Sewer	675	120	$ 630.00	$ 75,600.00		
Pressure Sewer (Twinned)	675	170	$ 690.00	$ 117,300.00		
Pressure Sewer Inlets				$ 15,000.00		
40th Avenue						
Pressure Sewer (Twinned)	675	400	$ 690.00	$ 276,000.00		
Outfall Structure				$ 30,000.00	$ 700,200.00	
Total Stormwater					$ 1,394,700.00	
Roads						
36 Ave./152 St. Signal				$ 85,000.00		Stage 2
34 Ave./152 St. Signal				$ 85,000.00		Stage 3
156A St./32Ave. Signal				$ 85,000.00		Stage 2
32 Ave./154 Signal				$ 85,000.00		Stage 3
Total Roadworks					$ 340,000.00	

ALL UNIT PRICES PROVIDED BY SURREY

(1) Only 40% of this cost is eligible for the DCC program.

(2) Part of this cost is to be shared with the Sector 1 neighbourhood. Full cost is shown in this calculation as no agreement has been reached with Sector 1 for cost sharing at this time.

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Rosemary Heights Central Neighbourhood Concept Plan

Appendix E

Definitions of Current Funding Methods

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DEFINITIONS OF CURRENT FUNDING METHODS

(As provided by the City of Surrey)

1. DCC Rebates

Where a developer constructs specific works and services which may be outside the boundaries of the land being serviced or developed that are included in Surrey's "10 Year Servicing Plan" as a "growth" item. The cost of the specific works and services shall be reimbursed from only the applicable development cost charges (DCC) element only after being initially paid by the developer.

2. Development Coordinated Works (DCW)

Where the City asks the developer to construct and agrees to pay for additional works typically outside of the boundaries of the land being serviced or developed. Funds are usually directed to:

- safety related items;
- works that will mitigate the impact of development;
- works which will provide continuity of existing standards; and,
- works which will facilitate the future upgrading of City services;
- works that will logically complete a road or service or condition where redevelopment will not occur and local improvements will not be planned for small works.

This method can be initiated by the developer or the City at the time of development and is subject to approval by Surrey at the time of Development, and subject to available funds.

3. Upsizing (Water, Sanitary)

This method is used when the City requests oversizing and agrees to pay for the difference in cost to upsize and construct a new sanitary sewer or water main from the developments needs to the City's needs. Upsizing is dependent upon available funds at the time of development, and is initiated by Surrey. The City will only pay upsizing from the confirmed level of supply under the design criteria for the subject zone; not just from the minimum pipe size.

4. Frontage Latecomer

Where the City has required a developer to provide a highway or water, sewer, or drainage facilities that serve land other than the land being serviced or developed, the developer may submit a latecomers application to the City; where a specific unit charge will be levied against the benefitting lands for a 10-year term. The City shall collect a unit charge on applicants who obtain physical access to, connect to or benefit from the extension. Such a unit charge shall be paid to the City who will, in turn, pay the front-ender on an annual basis.

This method may be initiated by the developer only if front-ending a utility that will benefit his development, and benefit others as per the Latecomers procedure manual. The developer can then present a latecomer application to the City along with the required fees. The latecomer will require those deemed to be benefitting from the utility to pay a unit charge as per the Latecomers procedure manual prior to obtaining physical access. The use of this method is dependent on the development scenario and on the financial benefit to the developer at the time of development.

5. Area (Sanitary Pump Station and Force Main) Latecomer

Where a sanitary pump station and/or gravity lines and/or force main that can serve lands other than those being serviced or developed, the developer may submit an area latecomers application to the City, where a specific unit charge will be levied against the benefitting lands for a 10-year term. The City shall collect a unit charge from applicants who obtain physical access to, connect to or benefit from the works. Such a unit charge shall be paid to the City, who will in turn, pay the front-ender on an annual basis (as per the Latecomer Procedure Manual).

This method may be initiated by the developer only if front-ending a utility that will benefit his development, but will benefit a larger catchment as well. The developer can then present a latecomer application to the City along with the required fees. The latecomer will require those deemed to be benefitting from the utility to pay a unit charge as per the Latecomer Procedure Manual prior to obtaining physical access. The use of this method is dependent on the development scenario and on the financial benefit to the developer at the time of development.

Note: Consultants must refer to and follow the current Latecomer Procedure Manual.

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Rosemary Heights Central Neighbourhood Concept Plan

Appendix F

City of Surrey Amenity Study Summary

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Rosemary Heights Central Neighbourhood Concept Plan

CITY OF SURREY AMENITY STUDY
NEIGHBOURHOOD CONCEPT PLAN (NCP) PROGRAM
PROPOSED AMENITY/FACILITY CONTRIBUTION FORMULAS

SUMMARY OF PROPOSED AMENITY CONTRIBUTIONS

Amenity Category	Recommended Contribution
Police Protection *This contribution is based upon a projected growth rate of 5% of paying for 5% of the average annual capital expenditure for the next 10 years.*	$50.00 per unit
Fire Protection *This contribution is based upon a projected growth rate of 5% of paying for 5% of the average annual capital expenditure for the next 10 years.*	$216.00 per unit
Library Materials *This contribution is based upon 1.5 resource materials (at $25 each) per capita (3 people per household).*	$112.50 per unit
Park Development *The contribution toward park development within NCPs will be determined by the Parks and Recreation Department and will be based upon the actual estimated costs of park/facility development in each NCP area.*	Based on actual costs of construction *Could range from approximately $300 to $600 per unit depending on the type of development and the number of units in the NCP area.*
TOTAL AMENITY CONTRIBUTION	**$378.50 per unit plus parks development costs**

The formulas for police and fire protection are based on a projected population growth of 5% per year which translates to 14,250 people per year. 5% of the average annual capital expenditure is $23,250 for the RCMP, and $145,000 for the Fire Department. These are both derived from the respective 10 year capital plans.

Contributions from institutional, industrial and commercial development would be based upon an equivalency factor of *1 hectare of land is equivalent to 10 residential units (4/acre)*. These uses will be required to contribute toward fire and police protection only.

Rosemary Heights Central NCP

Park Amenity Contribution

Description	Quantities	Total
School Park site I	3.5 acres	
Soccer Field		$70,000.00
Softball Diamond		$250,000.00
Benches and tables		$175,000.00
Bike rack		$9,000.00
Landscaping		$1,000.00
Signage		$35,000.00
		$5,000.00
School Park site II	3 acres	
Soccer Field		$60,000.00
Softball Diamond		$250,000.00
Benches and tables		$175,000.00
Bike rack		$9,000.00
Landscaping		$1,000.00
Signage		$35,000.00
		$5,000.00
Linear Park	12.35 acres	
Arborist Services		$123,500.00
		$3,500.00
Public Consultations		$9,000.00
Total:		**$1,216,000.00**

CITY OF SURREY

Rosemary Heights Central Neighbourhood Concept Plan

Appendix G

City of Surrey Corporate Report re: NCP Infrastructure Financing

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October, 1996
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SURREY
CITY OF P

Corporate Report

NO: _____

COUNCIL DATE: _____

Post-it™ Fax Note 7671E	Date	# of pages ▸
To Fraser Smith	From Paul Ham	
Co./Dept. Urban Systems	Co.	
Phone #	Phone # 591-4243	
Fax # 273-8752	Fax #	

REGULAR

TO:	Mayor & Council	DATE:	June 19, 1996
FROM:	General Manager, Engineering	FILE:	2350-000 5503-001
SUBJECT:	NCP Infrastructure Financing		

RECOMMENDATION

That Council approve the following principles to help with the financing of infrastructure in NCP areas.

1. Each NCP must be self-financing.
2. Allow frontenders of trunk servicing (i.e., 10 year plan items) to recover costs via DCCs collected in the catchment, or other benefiting, area.
3. Allow NCPs to use special levies to generate additional funds for specific infrastructure needs.
4. Allow the use of interim detention to delay the need for detention ponds serving the larger catchment area.
5. That the City's financial contribution remain at the 10% level.

INTENT

To confirm the direction provided by Council at the "workshop" session of May 23 and to establish principles for assisting with the funding of engineering infrastructure in NCP areas.

DISCUSSION

Over the past two months, the Engineering Department has refined the costs of the engineering infrastructure required to open up the 12 NCPs. The total infrastructure requirements to open up the 12 NCPs if they all proceed in 1996 and 1997 has been reduced to $60 million compared with the $80 million originally, estimated in earlier discussions with Council, not including arterial roads. Arterial roads have not been included in our analysis to date since they are not an issue with respect to the opening up of any of the NCPs.

The annual estimated cost to open up all the NCPs in 1996-97 based upon the refined information is $9 million down from earlier estimates of $14 million. The DCC revenues generated from the NCPs is estimated to be $4 million annually and increasing each year as more development shifts from the infill areas to the NCPs. The cash flow shortfall is estimated to be $5 million in the short-term if all NCPs proceed within a short period of time. It will be less if fewer NCPs open up as the revenue will not go down but the infrastructure costs will. It is important to note that the Development Cost Charges at buildout of all the NCPs will pay for all the identified infrastructure needs.

The main cost issue in the start-up costs of the NCPs is drainage works. Of the 12 NCPs, 10 NCPs have major drainage costs associated with their early development. Seven of these NCPs have community detention pond requirements, three have pump station requirements and four have storm sewer trunk requirements.

Financing of Infrastructure

In view of the number of NCPs, many of which do not have a major developer to facilitate front-ending of services, there is a need for a set of principles to be developed so that all NCP areas can be treated on an equal basis and with consistency.

Based on staff review, consultation with the Development Advisory Committee and the "workshop" session with Council on May 23, the following principles are proposed:

1. Each NCP must be self-financing.

   Comment: Each NCP needs to develop a financing plan such that the NCP can fund the engineering infrastructure required for its development.

2. Allow frontenders of trunk servicing (i.e., 10 year plan items) to recover costs via DCCs collected in the catchment, or other benefiting, area.

   Comment: This proposal expands on the present DCC rebate approach for works constructed by developers. It will permit greater cost recovery and, hence, the ability of developers to front-end more major elements of needed start-up infrastructure.

3. Allow NCPs to use special levies to generate additional funds for specific infrastructure needs.

   Comment: Some NCP areas are proposing special NCP levies to cover DCC cash flow shortfalls for needed start-up infrastructure. Without such additional levies, the DCC revenue flow will be insufficient to fund needed works in the short term.

4. Allow the use of interim detention to delay the need for detention ponds serving the larger catchment area.

Comment: *Where an NCP is unable to fund a required community detention facility, the City will allow the use of a limited number of interim detention ponds within the NCP. These interim ponds must be identified in the NCP Stage 2 Report and fully funded by the developer(s). The Drainage Development Cost Charges will still be paid by the developers and when adequate funds are available, the City will construct the detention pond for the overall catchment area. Interim detention will provide a sound level of control for storm water flows. The ultimate catchment-wide pond will provide a similar, if somewhat enhanced, level of flow control together with the additional benefit of water quality improvements.*

5. That the City's financial contribution remain at the 10%.

Comment: *The City is not in a financial position to front-end services for NCP areas. The City can, however, continue to contribute at the 10% level for growth related works initiated by developers in the NCP areas. By requiring each NCP to be self-financing, the City has removed itself from the sequencing of capital infrastructure required for the NCPs to develop. In place of City sequencing market economics determines the timing for when the various areas develop.*

CONCLUSION

The above principles reflect the direction provided by Council at the May 23 "workshop" session. They will provide a consistent and fair approach to dealing with the infrastructure needed for the NCP areas. The City will work to facilitate the development of these areas by helping coordinate the efforts of the various stake holders in each NCP. Where more major works are required to service a number of NCPs, it is proposed that the City reserve the option to include such works in its DCC capital programs or utility revenue funded programs.

Umendra Mital

Umendra Mital, P.Eng.
General Manager, Engineering

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CITY OF SURREY

Rosemary Heights Central Neighbourhood Concept Plan

Appendix H

Detailed Cash Flow Analysis

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October 1996
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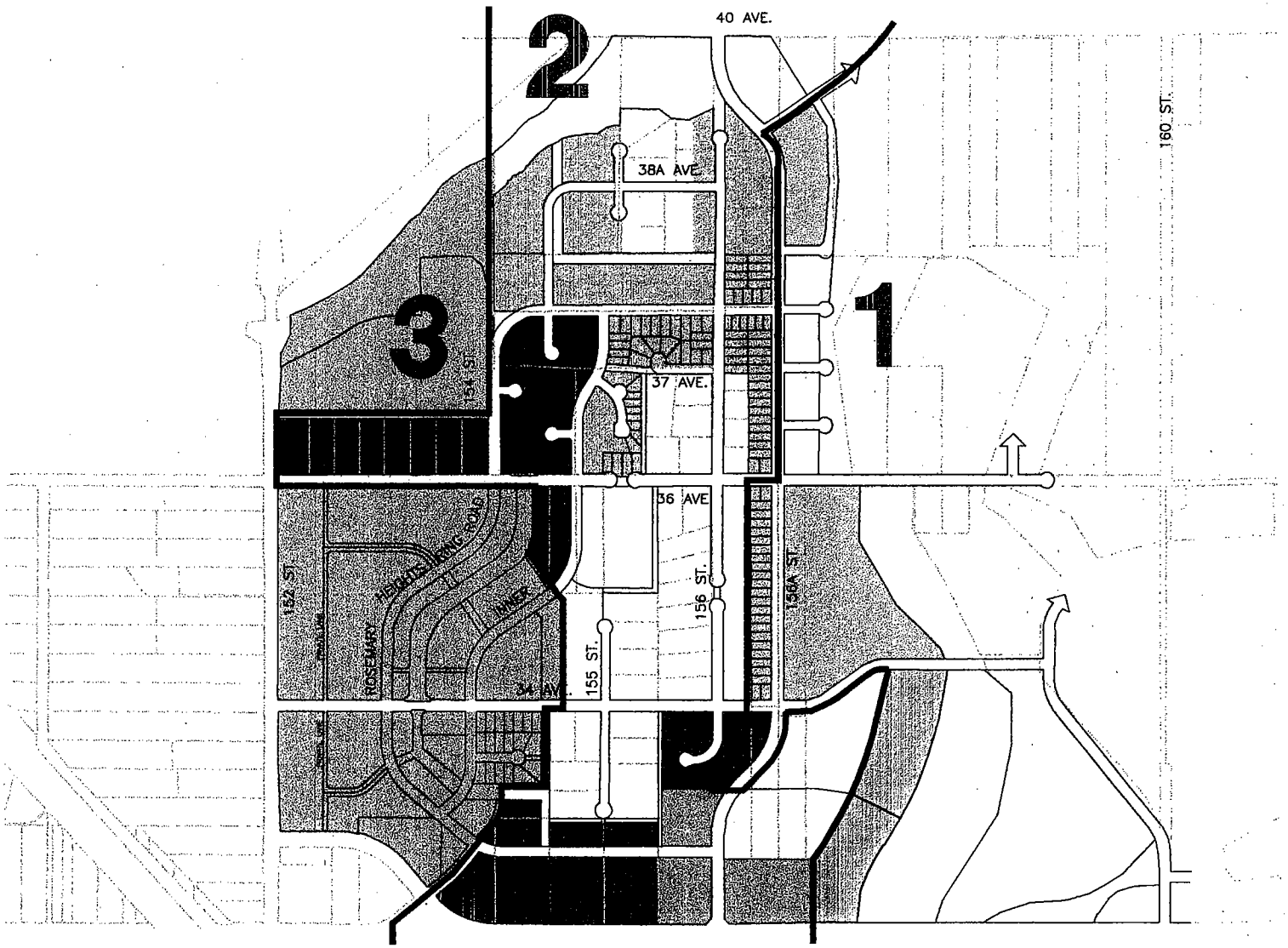
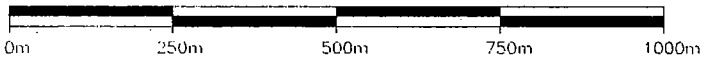
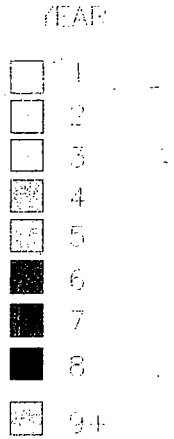




ROSEMARY HEIGHTS

CENTRAL NEIGHBOURHOOD CONCEPT PLAN

DETAILED STAGING PLAN



URBANSYSTEMS

DATE: OCTOBER 1996 JOB No. 6197219.2

Water									
Stage	Year	# of Units	Location	Length (m)	Unit Cost/ m	Main Costs	Other Costs	Total Cost	Comments
1	1	150							No DCC elements
1	2	152							No DCC elements
1	3	91							No DCC elements
2	4	178							No DCC elements
2	5	165	36 Ave.	250	$ 420	$ 105,000		$ 42,000	Upsizing only (40% of total cost)
									Current DCC program
2	6	140	152 St.	1000	$ 480	$ 480,000		$ 480,000	Current DCC program
							$ 80,000	$ 80,000	New DCC element
							$ 125,000	$ 125,000	New DCC element
							sub total	$ 685,000	
			34 Ave.	200	$ 420	$ 84,000		$ 33,600	Upsizing only (40% of total cost)
									Addition to DCC program
2	7	153	36 Ave.	150	$ 420	$ 63,000		$ 25,200	Upsizing only (40% of total cost)
									Current DCC program
2	8	139	152 St.	800	$ 420	$ 336,000		$ 336,000	Current DCC element
			36 Ave.	400	$ 420	$ 168,000		$ 67,200	Upsizing only (40% of total cost) current prog.
							sub total	$ 403,200	
3	9		34 Ave.	350	$ 420	$ 147,000		$ 58,800	Upsizing only (40% of total cost)
									Addition to DCC program
3	10		34 Ave.	350	$ 420	$ 147,000		$ 58,800	Upsizing only (40% of total cost)
									Addition to DCC program
3	11								No DCC elements
							Total	$ 1,306,600	

Drainage									
Stage	Year	# of Units	Outfall	Length (m)	Unit Cost/ m	Trunk Cost	Other Costs	Total Cost	Comments
1	1	150	32 Ave.	325	$ 570	$ 185,250	$ 10,000	$ 195,250	New DCC element
1	2	88	34 Ave.						No DCC elements
		30	34 Ave.						No DCC elements
		34	39 Ave.						No DCC elements
1	3	91	32 Ave.	125	$ 570	$ 71,250		$ 71,250	New DCC element
2	4	122	32 Ave.						No DCC elements
		16	156A St.						No DCC elements
		40	32 Ave.						No DCC elements
2	5	165	156 St.	220	$ 510	$ 112,200		$ 112,200	
				130	$ 570	$ 74,100		$ 74,100	
				120	$ 630	$ 75,600		$ 75,600	
				170	$ 690	$ 117,300		$ 117,300	
							$ 15,000	$ 15,000	
			40 Ave.	400	$ 690	$ 276,000		$ 276,000	
							$ 30,000	$ 30,000	
							sub total	$ 700,200	Partly in current DCC program
2	6	140							No DCC elements
2	7	153							No DCC elements
2	8	139							No DCC elements

3	9		152 St.	120	$ 570	$ 68,400		$ 68,400			
				100	$ 570	$ 57,000		$ 57,000			
				170	$ 480	$ 81,600		$ 81,600			
				300	$ 570	$ 171,000		$ 171,000			
							$ 50,000	$ 50,000			
							sub total	$ 428,000	New DCC elements		
3	10 +								No DCC elements		
							Total	$ 1,394,700			

Sanitary									
Stage	Year	# of Units	Location	Length (m)	Unit Cost/ m	Trunk Cost	Other Costs	Total Cost	Comments
1	1	150					$ 150,000	$ 150,000	Current DCC program
1	2	152							No DCC elements
1	3	91							No DCC elements
2	4	178							No DCC elements
2	5	165	37A Ave.	450	$ 435	$ 195,750		$ 195,750	New DCC trunk
2	6	140							No DCC elements
2	7	153	154 St.	150	$ 435	$ 65,250		$ 65,250	New DCC trunk
2	8	139	3650 Blk	400	$ 435	$ 174,000		$ 174,000	New DCC trunk
3	9 +								No DCC elements
							Total	$ 585,000	

Rosemary Heights

May 1, 1997

Projected DCC Revenues and Expenditure

Water

Year	# of units	DCC Revenue (annual)	DCC Expenditure	Annual Balance
1	150	$ 141,000	$ -	$ 141,000
2	131	$ 128,730	$ -	$ 269,730
3	91	$ 85,540	$ -	$ 355,270
4	182	$ 173,680	$ -	$ 528,950
5	138	$ 147,660	$ 42,000	$ 634,610
6	140	$ 136,800	$ 718,600	$ 52,810
7	218	$ 222,600	$ 25,200	$ 250,210
8	157	$ 149,920	$ 403,200	$ (3,070)
9	162	$ 164,890	$ 58,800	$ 103,020
10	180	$ 178,300	$ 58,800	$ 222,520
11	189	$ 187,020		$ 409,540
12	152	$ 118,740		$ 528,280
13 +	152	$ 152,240		$ 680,520
Total	2042	$ 1,987,120	$ 1,306,600	$ 680,520

Sanitary

Year	# of units	DCC Revenue (annual)	DCC Expenditure	Annual Balance
1	150	$ 121,500	$ 150,000	$ (28,500)
2	131	$ 111,270	$ -	$ 82,770
3	91	$ 73,710	$ -	$ 156,480
4	182	$ 149,820	$ -	$ 306,300
5	138	$ 128,340	$ 195,750	$ 238,890
6	140	$ 118,200	$ -	$ 357,090
7	218	$ 192,900	$ 65,250	$ 484,740
8	157	$ 129,330	$ 174,000	$ 440,070
9	162	$ 142,860	$ -	$ 582,930
10	180	$ 154,200	$ -	$ 737,130
11	189	$ 161,730	$ -	$ 898,860
12	152	$ 102,560	$ -	$ 1,001,420
13 +	152	$ 131,760	$ -	$ 1,133,180
Total	2042	$ 1,718,180	$ 585,000	$ 1,133,180

Rosemary Heights
Projected DCC Revenues and Expenditure

May 1, 1997

Major Collector Roads

Year	# of units	DCC Revenue (annual)	DCC Expenditure	Annual Balance
1	150	$ 183,000	$ -	$ 183,000
2	131	$ 159,820	$ -	$ 342,820
3	91	$ 111,020	$ -	$ 453,840
4	182	$ 222,040	$ -	$ 675,880
5	138	$ 168,360	$ -	$ 844,240
6	140	$ 170,800	$ -	$ 1,015,040
7	218	$ 265,960	$ 85,000	$ 1,196,000
8	157	$ 191,540	$ 85,000	$ 1,302,540
9	162	$ 197,640	$ -	$ 1,500,180
10	180	$ 219,600	$ -	$ 1,719,780
11	189	$ 230,580	$ 85,000	$ 1,865,360
12	152	$ 151,440	$ -	$ 2,016,800
13 +	152	$ 185,440	$ 85,000	$ 2,117,240
Total	2042	$ 2,457,240	$ 340,000	$ 2,117,240

Drainage

Year	# of units	DCC Revenue (annual)	DCC Expenditure	Annual Balance
1	150	$ 171,000	$ 195,250	$ (24,250)
2	131	$ 207,990	$ -	$ 183,740
3	91	$ 103,740	$ 71,250	$ 216,230
4	182	$ 227,080	$ -	$ 443,310
5	138	$ 319,230	$ 700,200	$ 62,340
6	140	$ 198,800	$ -	$ 261,140
7	218	$ 381,800		$ 642,940
8	157	$ 196,620	$ -	$ 839,560
9	162	$ 279,740	$ 428,000	$ 691,300
10	180	$ 273,800	$ -	$ 965,100
11	189	$ 288,560	$ 5,000	$ 1,248,660
12	152	$ 165,380	$ -	$ 1,414,040
13 +	152	$ 246,380	$ -	$ 1,660,420
Total	2042	$ 3,060,120	$ 1,399,700	$ 1,660,420

Rosemary Heights

May 1, 1997

Projected DCC Revenues and Expenditure

Cummulative DCCs by Year

Year	# of units	DCC Revenue (annual)	DCC Expenditure	Annual Balance
1	150	$ 616,500	$ 345,250	$ 271,250
2	152	$ 607,810	$ -	$ 607,810
3	91	$ 374,010	$ 71,250	$ 302,760
4	178	$ 772,620	$ -	$ 772,620
5	165	$ 763,590	$ 937,950	$ (174,360)
6	140	$ 624,600	$ 718,600	$ (94,000)
7	153	$ 1,063,260	$ 175,450	$ 887,810
8	139	$ 667,410	$ 662,200	$ 5,210
9	150	$ 785,130	$ 486,800	$ 298,330
10	150	$ 825,900	$ 58,800	$ 767,100
11	150	$ 867,890	$ 90,000	$ 777,890
12	150	$ 538,120	$ -	$ 538,120
13 +	274	$ 715,820	$ 85,000	$ 630,820
Total	2042	$ 9,222,660	$ 3,631,300	$ 5,591,360

rose3.xls

DCC Revenues Based on Various Land Uses Over 13+ Years

Using 2024 Total Units

May 2, 1997

Water Revenue

DCC/unit	RS-SF $1,070		RA 1AC $1,070		RH-G $1,070		RF-G $1,070		RF-CLUS. $1,070		RM-15 TH $940		RM-30 APT $940		RMS-1 $330		Total Revenue	Total Units
	# of units	Revenue	# of units	Revenue	# of units	Revenue	# of units	Revenue	# of units	Revenue	# of units	Revenue	# of units	Revenue	# of units	Revenue		
1		$ -		$ -		$ -		$ -		$ -	150	$ 141,000		$ -		$ -	$ 141,000	150
2	30	$ 32,100		$ -	13	$ 13,910		$ -		$ -	88	$ 82,720		$ -		$ -	$ 128,730	131
3		$ -		$ -		$ -		$ -		$ -	91	$ 85,540		$ -		$ -	$ 85,540	91
4		$ -		$ -		$ -	20	$ 21,400		$ -	40	$ 37,600	122	$ 114,680		$ -	$ 173,680	182
5	77	$ 82,390	8	$ 8,560	13	$ 13,910	40	$ 42,800		$ -		$ -		$ -		$ -	$ 147,660	138
6	40	$ 42,800		$ -		$ -		$ -		$ -	100	$ 94,000		$ -		$ -	$ 136,800	140
7	21	$ 22,470		$ -		$ -	45	$ 48,150	70	$ 74,900	82	$ 77,080		$ -		$ -	$ 222,600	218
8		$ -		$ -		$ -	18	$ 19,260		$ -	139	$ 130,660		$ -		$ -	$ 149,920	157
9		$ -		$ -		$ -	18	$ 19,260	79	$ 84,530		$ -	65	$ 61,100		$ -	$ 164,890	162
10		$ -		$ -		$ -		$ -	70	$ 74,900	50	$ 47,000	60	$ 56,400		$ -	$ 178,300	180
11		$ -	2	$ 2,140		$ -		$ -	70	$ 74,900	57	$ 53,580	60	$ 56,400		$ -	$ 187,020	189
12		$ -	2	$ 2,140		$ -		$ -		$ -		$ -	110	$ 103,400	40	$ 13,200	$ 118,740	152
13+		$ -	2	$ 2,140		$ -		$ -	70	$ 74,900		$ -	80	$ 75,200		$ -	$ 152,240	152
Total	168	$ 179,760	14	$ 14,980	26	$ 27,820	141	$ 150,870	359	$ 384,130	797	$ 749,180	497	$ 467,180	40	$ 13,200	$ 1,987,120	2042

Sanitary Revenue

DCC/unit	RS-SF $930		RA 1AC $930		RH-G $930		RF-G $930		RF-CLUS. $930		RM-15 TH $810		RM-30 APT $810		RMS-1 $290		Total Revenue	Total Units
	# of units	Revenue	# of units	Revenue	# of units	Revenue	# of units	Revenue	# of units	Revenue	# of units	Revenue	# of units	Revenue	# of units	Revenue		
1		$ -		$ -		$ -		$ -		$ -	150	$ 121,500		$ -		$ -	$ 121,500	150
2	30	$ 27,900		$ -	13	$ 12,090		$ -		$ -	88	$ 71,280		$ -		$ -	$ 111,270	131
3		$ -		$ -		$ -		$ -		$ -	91	$ 73,710		$ -		$ -	$ 73,710	91
4		$ -		$ -		$ -	20	$ 18,600		$ -	40	$ 32,400	122	$ 98,820		$ -	$ 149,820	182
5	77	$ 71,610	8	$ 7,440	13	$ 12,090	40	$ 37,200		$ -		$ -		$ -		$ -	$ 128,340	138
6	40	$ 37,200		$ -		$ -		$ -		$ -	100	$ 81,000		$ -		$ -	$ 118,200	140
7	21	$ 19,530		$ -		$ -	45	$ 41,850	70	$ 65,100	82	$ 66,420		$ -		$ -	$ 192,900	218
8		$ -		$ -		$ -	18	$ 16,740		$ -	139	$ 112,590		$ -		$ -	$ 129,330	157
9		$ -		$ -		$ -	18	$ 16,740	79	$ 73,470		$ -	65	$ 52,650		$ -	$ 142,860	162
10		$ -		$ -		$ -		$ -	70	$ 65,100	50	$ 40,500	60	$ 48,600		$ -	$ 154,200	180
11		$ -	2	$ 1,860		$ -		$ -	70	$ 65,100	57	$ 46,170	60	$ 48,600		$ -	$ 161,730	189
12		$ -	2	$ 1,860		$ -		$ -		$ -		$ -	110	$ 89,100	40	$ 11,600	$ 102,560	152
13+		$ -	2	$ 1,860		$ -		$ -	70	$ 65,100		$ -	80	$ 64,800		$ -	$ 131,760	152
Total	168	$ 156,240	14	$ 13,020	26	$ 24,180	141	$ 131,130	359	$ 333,870	797	$ 645,570	497	$ 402,570	40	$ 11,600	$ 1,718,180	2042

DCC Revenues Based on Various Land Uses Over 13+ Years

Using 2024 Total Units

May 2, 1997

Major Collector

DCC/unit	RS-SF $1,220		RA 1AC $1,220		RH-G $1,220		RF-G $1,220		RF-CLUS. $1,220		RM-15 TH $1,220		RM-30 APT $1,220		RMS-1 $370		Total Revenue	Total Units
	# of units	Revenue	# of units	Revenue	# of units	Revenue	# of units	Revenue	# of units	Revenue	# of units	Revenue	# of units	Revenue	# of units	Revenue		
1		$ -		$ -		$ -		$ -		$ -	150	$ 183,000		$ -		$ -	$ 183,000	150
2	30	$ 36,600		$ -	13	$ 15,860		$ -		$ -	88	$ 107,360		$ -		$ -	$ 159,820	131
3		$ -		$ -		$ -		$ -		$ -	91	$ 111,020		$ -		$ -	$ 111,020	91
4		$ -		$ -		$ -	20	$ 24,400		$ -	40	$ 48,800	122	$ 148,840		$ -	$ 222,040	182
5	77	$ 93,940	8	$ 9,760	13	$ 15,860	40	$ 48,800		$ -		$ -		$ -		$ -	$ 168,360	138
6	40	$ 48,800		$ -		$ -		$ -		$ -	100	$ 122,000		$ -		$ -	$ 170,800	140
7	21	$ 25,620		$ -		$ -	45	$ 54,900	70	$ 85,400	82	$ 100,040		$ -		$ -	$ 265,960	218
8		$ -		$ -		$ -	18	$ 21,960		$ -	139	$ 169,580		$ -		$ -	$ 191,540	157
9		$ -		$ -		$ -	18	$ 21,960	79	$ 96,380		$ -	65	$ 79,300		$ -	$ 197,640	162
10		$ -		$ -		$ -		$ -	70	$ 85,400	50	$ 61,000	60	$ 73,200		$ -	$ 219,600	180
11		$ -	2	$ 2,440		$ -		$ -	70	$ 85,400	57	$ 69,540	60	$ 73,200		$ -	$ 230,580	189
12		$ -	2	$ 2,440		$ -		$ -		$ -		$ -	110	$ 134,200	40	$ 14,800	$ 151,440	152
13+		$ -	2	$ 2,440		$ -		$ -	70	$ 85,400		$ -	80	$ 97,600		$ -	$ 185,440	152
Total	168	$ 204,960	14	$ 17,080	26	$ 31,720	141	$ 172,020	359	$ 437,980	797	$ 972,340	497	$ 606,340	40	$ 14,800	$ 2,457,240	2042

Drainage Revenue

DCC/unit	RS-SF $2,120		RA 1AC $3,390		RH-G $3,390		RF-G $2,120		RF-CLUS. $2,120		RM-15 TH $1,140		RM-30 APT $1,140		RMS-1 $830		Total Revenue	Total Units
	# of units	Revenue	# of units	Revenue	# of units	Revenue	# of units	Revenue	# of units	Revenue	# of units	Revenue	# of units	Revenue	# of units	Revenue		
1		$ -		$ -		$ -		$ -		$ -	150	$ 171,000		$ -		$ -	$ 171,000	150
2	30	$ 63,600		$ -	13	$ 44,070		$ -		$ -	88	$ 100,320		$ -		$ -	$ 207,990	131
3		$ -		$ -		$ -		$ -		$ -	91	$ 103,740		$ -		$ -	$ 103,740	91
4		$ -		$ -		$ -	20	$ 42,400		$ -	40	$ 45,600	122	$ 139,080		$ -	$ 227,080	182
5	77	$ 163,240	8	$ 27,120	13	$ 44,070	40	$ 84,800		$ -		$ -		$ -		$ -	$ 319,230	138
6	40	$ 84,800		$ -		$ -		$ -		$ -	100	$ 114,000		$ -		$ -	$ 198,800	140
7	21	$ 44,520		$ -		$ -	45	$ 95,400	70	$ 148,400	82	$ 93,480		$ -		$ -	$ 381,800	218
8		$ -		$ -		$ -	18	$ 38,160		$ -	139	$ 158,460		$ -		$ -	$ 196,620	157
9		$ -		$ -		$ -	18	$ 38,160	79	$ 167,480		$ -	65	$ 74,100		$ -	$ 279,740	162
10		$ -		$ -		$ -		$ -	70	$ 148,400	50	$ 57,000	60	$ 68,400		$ -	$ 273,800	180
11		$ -	2	$ 6,780		$ -		$ -	70	$ 148,400	57	$ 64,980	60	$ 68,400		$ -	$ 288,560	189
12		$ -	2	$ 6,780		$ -		$ -		$ -		$ -	110	$ 125,400	40	$ 33,200	$ 165,380	152
13+		$ -	2	$ 6,780		$ -		$ -	70	$ 148,400		$ -	80	$ 91,200		$ -	$ 246,380	152
Total	168	$ 356,160	14	$ 47,460	26	$ 88,140	141	$ 298,920	359	$ 761,080	797	$ 908,580	497	$ 566,580	40	$ 33,200	$ 3,060,120	2042

DCC Revenues Based on Various Land Uses Over 13+ Years

Using 2024 Total Units

May 2, 1997

Arterial

DCC/unit	RS-SF $4,800		RA 1AC $4,800		RH-G $4,800		RF-G $4,800		RF-CLUS. $4,800		RM-15 TH $4,800		RM-30 APT $4,800		RMS-1 $1,440		Total Revenue	Total Units
	# of units	Revenue	# of units	Revenue	# of units	Revenue	# of units	Revenue	# of units	Revenue	# of units	Revenue	# of units	Revenue	# of units	Revenue		
1		$ -		$ -		$ -		$ -		$ -	150	$ 720,000		$ -		$ -	$ 720,000	150
2	30	$ 144,000		$ -	13	$ 62,400		$ -		$ -	88	$ 422,400		$ -		$ -	$ 628,800	131
3		$ -		$ -		$ -		$ -		$ -	91	$ 436,800		$ -		$ -	$ 436,800	91
4		$ -		$ -		$ -	20	$ 96,000		$ -	40	$ 192,000	122	$ 585,600		$ -	$ 873,600	182
5	77	$ 369,600	8	$ 38,400	13	$ 62,400	40	$ 192,000		$ -		$ -		$ -		$ -	$ 662,400	138
6	40	$ 192,000		$ -		$ -		$ -		$ -	100	$ 480,000		$ -		$ -	$ 672,000	140
7	21	$ 100,800		$ -		$ -	45	$ 216,000	70	$ 336,000	82	$ 393,600		$ -		$ -	$ 1,046,400	218
8		$ -		$ -		$ -	18	$ 86,400		$ -	139	$ 667,200		$ -		$ -	$ 753,600	157
9		$ -		$ -		$ -	18	$ 86,400	79	$ 379,200		$ -	65	$ 312,000		$ -	$ 777,600	162
10		$ -		$ -		$ -		$ -	70	$ 336,000	50	$ 240,000	60	$ 288,000		$ -	$ 864,000	180
11		$ -	2	$ 9,600		$ -		$ -	70	$ 336,000	57	$ 273,600	60	$ 288,000		$ -	$ 907,200	189
12		$ -	2	$ 9,600		$ -		$ -		$ -		$ -	110	$ 528,000	40	$ 57,600	$ 595,200	152
13+		$ -	2	$ 9,600		$ -		$ -	70	$ 336,000		$ -	80	$ 384,000		$ -	$ 729,600	152
Total	168	$ 806,400	14	$ 67,200	26	$ 124,800	141	$ 676,800	359	$ 1,723,200	797	$ 3,825,600	497	$ 2,385,600	40	$ 57,600	$ 9,667,200	2042

DCC Revenues Based on Various Land Uses Over 13+ Years

May 2, 1997

Using 2024 Total Units

Summary

	Water	Expenditures	Annual Balance	Sanitary	Expenditures	Annual Balance	Mj. Collector	Expenditures	Annual Balance	Drainage	Expen.	Annual Balance
1	$ 141,000	$ -	$ 141,000	$ 121,500	$ 150,000	$ (28,500)	$ 183,000	$ -	$ 183,000	$ 171,000	$ 195,250	$ (24,250)
2	$ 128,730	$ -	$ 269,730	$ 111,270	$ -	$ 82,770	$ 159,820	$ -	$ 342,820	$ 207,990	$ -	$ 183,740
3	$ 85,540	$ -	$ 355,270	$ 73,710	$ -	$ 156,480	$ 111,020	$ -	$ 453,840	$ 103,740	$ 71,250	$ 216,230
4	$ 173,680	$ -	$ 528,950	$ 149,820	$ -	$ 306,300	$ 222,040	$ -	$ 675,880	$ 227,080	$ -	$ 443,310
5	$ 147,660	$ 42,000	$ 634,610	$ 128,340	$ 195,750	$ 238,890	$ 168,360	$ -	$ 844,240	$ 319,230	$ 700,200	$ 62,340
6	$ 136,800	$ 718,600	$ 52,810	$ 118,200	$ -	$ 357,090	$ 170,800	$ -	$ 1,015,040	$ 198,800	$ -	$ 261,140
7	$ 222,600	$ 25,200	$ 250,210	$ 192,900	$ 65,250	$ 484,740	$ 265,960	$ 85,000	$ 1,196,000	$ 381,800	$ -	$ 642,940
8	$ 149,920	$ 403,200	$ (3,070)	$ 129,330	$ 174,000	$ 440,070	$ 191,540	$ 85,000	$ 1,302,540	$ 196,620	$ -	$ 839,560
9	$ 164,890	$ 58,800	$ 103,020	$ 142,860	$ -	$ 582,930	$ 197,640	$ -	$ 1,500,180	$ 279,740	$ 428,000	$ 691,300
10	$ 178,300	$ 58,800	$ 222,520	$ 154,200	$ -	$ 737,130	$ 219,600	$ -	$ 1,719,780	$ 273,800	$ -	$ 965,100
11	$ 187,020	$ -	$ 409,540	$ 161,730	$ -	$ 898,860	$ 230,580	$ 85,000	$ 1,865,360	$ 288,560	$ 5,000	$ 1,248,660
12	$ 118,740	$ -	$ 528,280	$ 102,560	$ -	$ 1,001,420	$ 151,440	$ -	$ 2,016,800	$ 165,380	$ -	$ 1,414,040
13+	$ 152,240	$ -	$ 680,520	$ 131,760	$ -	$ 1,133,180	$ 185,440	$ 85,000	$ 2,117,240	$ 246,380	$ -	$ 1,660,420
Total	**$ 1,987,120**	**$ 1,306,600**	**$ 680,520**	**$ 1,718,180**	**$ 585,000**	**$ 1,133,180**	**$ 2,457,240**	**$ 340,000**	**$ 2,117,240**	**$ 3,060,120**	**$ 1,399,700**	**$ 1,660,420**

Total Surplus $5,591,360