

***ROSEMARY HEIGHTS BUSINESS
PARK & LIVE / WORK AREA
NEIGHBOURHOOD CONCEPT PLAN***

PLEASE NOTE:

The City of Surrey does not warrant the accuracy or completeness of the information contained in this document or any use of this document by the user. The information contained in this document is relevant only to the date of first printing and may not incorporate subsequent amendments. It is the responsibility of the user of this document to contact the Planning & Development Department regarding any amendments pertaining to this document.



Corporate Report

CITY MANAGER'S
DEPARTMENT

NO: CO04

COUNCIL DATE: Feb. 14, 2000

COUNCIL-IN-COMMITTEE

TO: Mayor & Council DATE: February 10, 2000
FROM: General Manager, Planning & Development FILE: 2350-007/3
SUBJECT: Rosemary Heights Business Park & Live/Work Area
Complete Neighbourhood Concept Plan (Development Concept Component)

RECOMMENDATION

The Planning & Development Department recommends that City Council:

1. Approve the final and complete Neighbourhood Concept Plan (Development Concept Component in Appendix B) for the Rosemary Heights Business Park and Live/Work Area;
2. Approve the arrangements, conditions and design guidelines specified in the Neighbourhood Concept Plan as a means of managing the development and the general provision of services, amenities and facilities for the Rosemary Heights Business Park and Live/Work Area;
3. Authorize staff to draft a by-law to amend the provisions of Surrey's Official Community Plan By-law, 1996, No. 12900, as amended, to re-designate three properties (2900, 2920 & 2950 Croydon Drive) from SUBURBAN to INDUSTRIAL, to accommodate Business Park development (Appendix D);
4. Authorize staff to draft an amendment to Zoning By-law, 1993, No. 12000, as amended, to include an amenity contribution provision for the Rosemary Heights Business Park and Live/Work Area;
5. Authorize staff to draft an amendment to Surrey Sign By-law, 1999, No. 13656, to include specific sign regulations for the Rosemary Heights Business Park as denoted in the Neighbourhood Concept Plan (Design Guidelines); and

6. Authorize Economic Development staff to incorporate the approved Rosemary Heights Business Park and Live/Work Area Neighbourhood Concept Plan into the City's promotional and marketing initiatives toward attracting business park users to locate in Surrey, and to package the approved Neighbourhood Concept Plan in a format to support this objective.

INTENT

The intent of this report is to provide an overview of the Neighbourhood Concept Plan for the Rosemary Heights Business Park and Live/Work Area (Appendix A), including a summary of:

- (a) the planning process;
- (b) the major components of the plan;
- (c) implementation measures; and,
- (d) analyses of the amenity requirements for this Neighbourhood Concept Plan area.

A report under separate cover from the Engineering Department describes the servicing and infrastructure funding arrangements associated with the Development Concept contained in this report.

BACKGROUND

General

The Rosemary Heights Business Park is bounded by 32 Avenue (Diversion) on the north, a creek (and North Grandview Heights) on the south, 156 Street on the east and Highway No. 99 on the west. The approved Rosemary Heights Central Neighbourhood Concept Plan area is located to the north and a cemetery is located immediately east.

The area consists of about 25 lots of various sizes, comprising a total area of approximately 31 hectares (77 acres). Currently the area is characterized by small rural acreages and hobby farms. Three creeks traverse the area, and there is abundant vegetation. The South Surrey Interchange is currently under construction to the west of the future Business Park. B.C. Hydro will be constructing a new sub-station in the north west area. A hydro right-of-way runs along west side of the Business Park, which substantially limits the utilization of about 10 properties along Croydon Drive. Currently, the area is mostly zoned RA - One Acre Residential.

Policy Framework - Surrey's Official Community Plan and the Rosemary Heights Local Area Plan

The approved Local Area Plan for Rosemary Heights (approved in 1994 - Land Use Plan attached in Appendix B) directs that the area east of 152 Street and south of 32 Avenue be developed as an employment area (i.e. a business park), to provide employment opportunities in close proximity to the Rosemary Heights/Morgan Creek residential areas and to Highway No. 99. The Local Area Plan further indicates that a high standard of development and design control should be applied to new development in this employment area.

The majority of these lands are designated Industrial in Surrey's Official Community Plan with the intention to create a clean, high quality business park to provide jobs for Surrey residents.

Council has directed that a Neighbourhood Concept Plan be prepared for the future Business Park by involving the property owners and the public. The Official Community Plan provides guidelines and requirements for the preparation and content of Neighbourhood Concept Plans. It also contains a number of directives related to the provision of serviced industrial lands and the creation of jobs for Surrey residents. The Rosemary Heights Business Park and Live/Work Area Neighbourhood Concept Plan was prepared within this policy framework.

Neighbourhood Concept Plan Process

Overview

In August, 1997, a majority of the property owners agreed to participate in the preparation of a Neighbourhood Concept Plan for the area. A Citizen Advisory Committee was established and a number of Committee and public meetings were held to review development options and to allow the owners to voice their concerns and have their comments addressed in the plan.

Rosemary Heights Business Park Citizen Advisory Committee (CAC)

To bring local knowledge to the planning process and to facilitate local discussion and communication, a Citizen Advisory Committee was established to assist City staff in preparing the preferred development concept. The Committee consisted of 8 property owners representing the majority of the land area in the Business Park. The Committee met on eight occasions, and served as an invaluable resource for reviewing the proposed development concepts, disseminating information and assisting with the selection of a preferred concept.

Public Meetings, Open Houses and Other Communications

A public open house was first held in June, 1998 (about 30 people in attendance) to introduce the planning process and present a first draft of a proposed development concept to the public. A public meeting was also held in October, 1998 (about 75 people in attendance) at which the public could view and comment on a preferred development concept.

The public and property owners generally supported the preferred development concept presented at the meeting, which contained a ring-road design for the new South Surrey Interchange. However, in February, 1999, a new design was released which eliminated the ring-road aspects of the Interchange. This design change had major impacts on the original preferred development concept especially in terms of access and road layout. Consequently, City staff and the Citizen Advisory Committee had to re-visit the preferred development concept to incorporate the new Interchange design. Two new development concepts were prepared and presented at a public open house in March, 1999 (about 50 people attended). Of the two new concepts, the one presented in this report was preferred by the Citizen Advisory Committee, a majority of the land owners, the public and other stakeholders and is considered to be more efficient than the previous concept.

Staff have met on an ongoing basis with individual property owners and potential business park developers to facilitate land assembly and interest in the future Business Park.

Input and Review by City Departments, Government and Other Agencies

The City's project team involved in preparing the development concept and servicing/funding strategy included staff from Planning & Development, Engineering, Parks, Recreation & Culture, and Engineering and Environmental consultants. This team-oriented approach has resulted in the optimal development concept which addresses the public, municipal and technical objectives of all stakeholders. It is noted that relevant government agencies were also consulted and that their concerns have been incorporated into the final Neighbourhood Concept Plan.

Work Place (Business Park & Live/Work) Opportunity Study for Rosemary Heights

To ensure that the development concept for the Business Park meets market needs, and to confirm the potential viability of the lands for both business park and live/work developments, the City engaged an economic/marketing consultant to evaluate this Business Park location along with proposed business parks in East Newton and East Clayton.

The results of this study pertinent to the Rosemary Heights Business Park and Live/Work Area are:

- the site has excellent accessibility and exposure characteristics because of its location adjacent to Highway No. 99 and the South Surrey Interchange;
- there is a shortage of business park land in Surrey, especially in South Surrey where there is virtually none;
- the eastern portion of the NCP area is somewhat isolated due to the presence of streams, and therefore is conducive to live/work activities to complement the Business Park; and
- the opportunity exists to establish a high-quality business park and live/work development on this site to service the needs of local business and to provide employment for local residents.

DISCUSSION

Overview of the Development Concept

The development concept component of the Rosemary Heights Business Park and Live/Work Area Neighbourhood Concept Plan is contained in Appendix A. A full report of the Neighbourhood Concept Plan is attached in Appendix B. This preferred development concept envisages a Business Park which will accommodate low-impact businesses such as high-tech industries, research and development companies, light manufacturing and corporate head offices.

The lands in the eastern portion of the NCP area are proposed to accommodate either business park uses or live/work developments. In order to ensure land use compatibility, and viable sizes of development sites, and to avoid scattered uncoordinated developments, development of the properties north and south of Titman Creek must be comprehensively designed and carefully coordinated.

To accommodate stormwater run-off for this NCP area and some lands upstream, a municipal stormwater detention facility will be located on City-owned lands near Croydon Drive at an entrance to the Business Park. Two small stormwater facilities will be located on private lands which can be constructed at the surface as an amenity for the Business Park development, or sub-surface below a parking lot.

The Business Park will also have a landscaped gateway feature (e.g., an identification sign) at the main entrance off of 32 Avenue (Diversion), and a landscaped water feature (detention pond) at the secondary entrance off Croydon Drive. There will also be enhanced landscaping, vegetated watercourse areas and buffers to ensure that the Business Park attains the highest aesthetic standards.

If the entire NCP area is developed as a Business Park it is expected to accommodate about 134,834 sq.m. (1,451,388 sq.ft.) of business park floor space and provide about 4,840 jobs. If the easterly portion of the NCP area is developed as a live/work area and the remainder as Business Park, the NCP area is expected to accommodate about 97,500 sq. m. (1,050,000 sq.ft.) of business floor area, along with about 98 live/work units and

3,647 jobs. The table presented in Appendix III of the attached Neighbourhood Concept Plan illustrates the basic land use statistics of the development concept.

Environmental Issues

A Bio-Inventory Study and a Top of Bank Survey were undertaken for this area. The Bio-Inventory Study makes the following recommendations:

- protect riparian corridors and establish leavestrips (adjacent to creeks); in some locations relaxation of the 30 metre setback requirement to 15 metres "may" be appropriate;
- retain at least some of the present forest blocks;
- consider the relocation of headwater reaches only;
- maintain water quality and quantity; and
- preserve some old field habitat.

A prevailing concern throughout the planning process was that the presence of three watercourses within the plan area substantially impacts the amount of land able to be developed. In particular, the existence of vegetated riparian areas and the Ministry of Environment's 30 metre setback requirement for non-residential development severely limits development on some properties.

In recognition of this, the City and the Citizen Advisory Committee engaged the services of an environmental consultant to undertake a detailed analysis of the area including top-of-bank surveys and valuations of the existing riparian areas. The consultant made recommendations on an area-wide basis regarding opportunities for environmental enhancement and riparian protection in exchange for some setback reductions based upon the actual value and extent of riparian areas and existing fisheries habitat in the Business Park.

City staff met on numerous occasions with the environmental agencies to work out an acceptable setback strategy with a view to settling these issues in advance of receiving a development application from a major Business Park user. However, the agencies were reluctant to commit to such a strategy for fear of setting a precedent, although they encourage such comprehensive environmental planning. Therefore, the development concept indicates 30 metre setbacks for Business Park uses and 15 metres for live/work residential densities under 6 units per acre. As such, the environmental agencies generally concurred with the proposals in the NCP.

In any event, the information assembled and the scientific knowledge and data related to the area is made available to potential developers and land owners as background information in the Neighbourhood Concept Plan. This information will be valuable in the evaluation of development proposals which may require slight deviations from the Ministry of Environment's Land Development Guidelines. It may also eliminate the need for applicants to undertake exhaustive environmental impact studies at the time of rezoning.

Design Guidelines

The Neighbourhood Concept Plan contains a set of Design Guidelines (Appendix VI of the attached Neighbourhood Concept Plan) which will ensure that a high quality, well landscaped Business Park is achieved. The Design Guidelines address such issues as:

- overall compatibility of building design;
- the streetscape along 32 Avenue and Croydon Drive;
- buffer landscaping;
- the interface between the Business Park and the optional Live/Work area; and
- gateways, open space development and tree preservation.

In addition, the Design Guidelines briefly address the development limitations on some properties along Croydon Drive due to the existence of a 100 metre hydro right-of-way. The Guidelines depict a possible development scenario with several smaller buildings on either side and parking under the right-of-way. This scenario may be possible depending on the specific site-conditions.

Engineering Services, Phasing and Funding

A general servicing plan, overall road pattern, storm water management strategy, and phasing and funding strategy have been developed as a critical component of the Neighbourhood Concept Plan. These issues are addressed in a consultant's report and accompanying recommendations from the Engineering Department (to be considered by Council concurrently with this report).

The Rosemary Heights Business Park is under consideration for potential pre-servicing arrangements. Pre-zoning the lands would therefore also be considered to assist in attracting new business to the area quickly.

To enhance the quality of the Business Park and create its unique identity, several aesthetic features should be considered. In particular, specially lit and landscaped identification signs, ponds, fountains, decorative pavers and enhanced landscaped cul-de-sac islands are encouraged to be provided on private property by developers. Where they are located on public land, funding for the features will be derived in part from amenity contributions associated with landscaping open spaces and also through cost sharing arrangements determined at the time of development through servicing agreements.

Amenity Requirements

To address the amenity needs of the proposed new development in this area, at the time of rezoning, development proposals will be required to make a monetary contribution toward the provision of new police and fire protection services, improvements to the municipal detention pond to make it a Business Park amenity and general landscaping on public lands (i.e., at the gateway off of 32 Avenue). Live/work developments will also be

required to contribute toward the provision of library materials for the residents of the live/work area.

The monetary contributions toward police, fire and library materials will offset the capital costs of providing these services to the new development and are applied on a standardized basis in all of the Surrey's Neighbourhood Concept Plan areas. The monetary contributions toward the development of other amenities are based upon an estimate of the capital costs of these improvements for this particular Neighbourhood Concept Plan area. The total cost is divided among the anticipated acreage and number of dwelling units to ensure an equitable contribution arrangement.

The estimated cost of developing the amenities associated with general landscaping and improvements to the pond area is approximately \$101,500, which consists of the following:

Road fronting pond	\$15,000
Site furniture and signs	\$11,500
Pathways and trails	\$40,000
Landscaping	\$20,000
Consulting fees/public meetings	\$15,000

A summary of the applicable amenity contributions (per acre or unit) and the estimated revenue the City can expect to receive from this Neighbourhood Concept Plan area are presented in the following table:

ROSEMARY HEIGHTS BUSINESS PARK AND LIVE/WORK AREA AMENITY CONTRIBUTIONS¹			
	Per Acre Contribution Business Park <i>Approx. 32 acres</i>	Per Acre Contribution Live/Work Area <i>Approx. 12 acres</i>	Anticipated Revenue
Police Protection	\$201.60 per acre	\$201.60 per acre	\$8,870
Fire Protection	\$870.92 per acre	\$870.92 per acre	\$8,820
Park/Pathways Development	\$ 2,306.82 per acre	\$2,306.82 per acre	\$101,500
Library Materials	N/A	\$113.40 per unit @ 8 units per acre	\$10,886
Total Contribution (per acre)	\$3,379.34 per acre	\$3,379.34 per acre plus \$113.40 per unit for libraries	
Total Anticipated Revenue			\$159,576

¹ Contributions as of January, 2000

Implementation of the Neighbourhood Concept Plan

Official Community Plan Amendment (Re-designation of Three Properties)

The original boundaries of the Rosemary Heights Business Park are proposed to be changed as a result of public/property owner input and on-site characteristics. In particular, the original southern boundary of the Business Park was a watercourse, believed at the time to be a natural boundary separating Rosemary Heights from the Suburban area of North Grandview Heights. Upon closer inspection, the more southerly watercourse consists of a larger natural barrier and therefore it is proposed that three additional properties within (north) of this more southerly creek boundary be included in the Business Park. The three affected properties are identified on a map contained in Appendix C. An amendment to Surrey's Official Community Plan is required to re-designate these properties from Suburban to Industrial.

The Optional Live/Work Area

Due to the optional live/work or business park designation on the eastern portion of the NCP area (north and south of Titman Creek), developments must be designed comprehensively to avoid land use conflicts and must be carefully coordinated with potential business park uses.

Design Guidelines

To achieve a comprehensively designed Business Park in an open space/campus-like setting, all development proposals in the Business Park will be required to comply with the Design Guidelines forming part of the Neighbourhood Concept Plan.

Sign By-law Amendment

To maintain a high quality and visually attractive streetscape in the Business Park, sign guidelines are proposed (see the Design Guidelines in Appendix VI of the attached Neighbourhood Concept Plan). It is proposed that no free-standing signs be permitted along 32 Avenue and 152 Street and that low, architecturally coordinated signs be maintained throughout the Business Park. Accordingly, Surrey's Sign By-law will need to be amended to contain specific sign regulations for the Rosemary Heights Business Park.

Zoning By-law Amendments

To enact the amenity contribution requirement, Surrey's Zoning By-law will need to be amended to add the Rosemary Heights Business Park and Live/Work Area to the list of Neighbourhood Concept Plans within which monetary contributions are required.

Special Aesthetic Features

Developers will be encouraged to provide specially lit and landscaped identification signs, ponds, fountains, decorative pavers and an enhanced landscaped cul-de-sac island on private property. Where similar features are located on public land, funding for the features will be derived in part from amenity contributions associated with landscaping open spaces and also through cost sharing arrangements determined at the time of development through servicing agreements.

Live/Work Developments Study

The concept of designing and building new live/work developments, particularly in the Surrey context, is untried, although market research suggests that there is a demand for this unique and innovative housing/business accommodation. The benefits of this type of development are that it would provide more choice and affordability in the housing/business market and could serve as an incubator for small businesses in Surrey.

The City is currently undertaking research and is developing policies and regulations for the applicability and implementation of live/work developments in Surrey. This study places particular emphasis on proposed live/work developments in Rosemary Heights, East Newton and East Clayton. A report and recommendations arising from this study will be forwarded to City Council for consideration, and consequent policies and zoning mechanisms will be implemented in conjunction with live/work development proposals.

Economic Development - Pre-zoning and Pre-servicing

Surrey's Official Community Plan indicates as a key future direction, that the City should provide an adequate supply of accessible and serviced land for commerce and industry, because job creation is a critical element of the City's Economic Development Strategic Plan. The approval of the Rosemary Heights Business Park and subsequent rezoning and servicing would meet the following policy directives contained in the Official Community Plan:

- co-ordinate planning and economic development,
- create jobs close to home,
- pre-service sufficient industrial land for new business,
- encourage clean industries,
- improve City infrastructure for economic development, and,
- establish industrial and business parks.

CONCLUSION

A City project team, in consultation with the property owners and the public, have prepared a development concept and engineering/funding/phasing strategy for the Rosemary Heights Business Park and Live/Work area.

The Neighbourhood Concept Plan addresses the objectives identified by the property owners and the community, and is consistent with the policy framework identified in Surrey's Official Community Plan and the Rosemary Heights Local Area Plan. Strategies have been identified for funding various amenities required for the Business Park and for ensuring that the Business Park will be a high quality, comprehensively designed development within a campus-like setting.

To ensure the successful and early development of the Business Park, programs for promoting development and marketing are proposed to be undertaken. An impending study of live/work developments in the Surrey context will assist in ensuring the viability and successful implementation of this new innovative land use.

Subject to Council's concurrence with the related report from the Engineering Department, it is recommended that the Neighbourhood Concept Plan for the Rosemary Heights Business Park and Live/Work area and the issues discussed in this report, be endorsed.



Murray D. Dinwoodie
General Manager
Planning & Development Department

WW/kms

Appendices

- Appendix A: Rosemary Heights Business Park Proposal Land Use Map
- Appendix B: Rosemary Heights Business Park and Live/Work Area Neighbourhood Concept Plan
- Appendix C: Rosemary Heights Local Area Plan (Land Use Plan)
- Appendix D: Proposed OCP Amendment



**ROSEMARY HEIGHTS BUSINESS PARK
AND LIVE/WORK AREA**

NEIGHBOURHOOD CONCEPT PLAN
(Development Concept Component)

February, 2000

**ROSEMARY HEIGHTS BUSINESS PARK
AND LIVE/WORK AREA NEIGHBOURHOOD CONCEPT PLAN**
(Development Concept Component)

TABLE OF CONTENTS

1. Introduction	1
2. Study Area Characteristics	2
3. Policy Framework - Surrey's Official Community Plan (OCP) and the Rosemary Heights Local Area Plan (LAP)	3
4. Overview of the Neighbourhood Concept Plan	3
5. Environmental Protection	4
6. Engineering Services, Phasing and Funding	5
7. Design Guidelines	6
8. Live/Work Developments Study	7
9. Zoning	8
10. Amenity Requirements	8
Appendices	
Appendix I: Rosemary Heights Local Area Plan - Land Use Plan	
Appendix II: Development Concept (Land Use) Map	
Appendix III: Land Use Statistics	
Appendix IV: Environmental Background Information	
Appendix V: Synopsis of the Engineering Consultant's Report	
Appendix VI: Design Guidelines	



ROSEMARY HEIGHTS BUSINESS PARK AND LIVE/WORK AREA NEIGHBOURHOOD CONCEPT PLAN

(Development Concept Component)

1. Introduction

General

A City project team, in consultation with the Rosemary Heights Business Park Citizen Advisory Committee, property owners and the public, have prepared this Neighbourhood Concept Plan (development concept and engineering/funding/phasing strategy) for the Rosemary Heights Business Park and Live/Work area in South Surrey.

The Neighbourhood Concept Plan addresses the objectives identified by the property owners and the community, and is consistent with the policy framework identified in Surrey's Official Community Plan and the Rosemary Heights Local Area Plan.

The Neighbourhood Concept Plan identifies specific land use, design, servicing and funding strategies to ensure that the Business Park and Live/Work area will be a high quality, comprehensively designed co-ordinated development within a campus-like setting and pastoral.

To ensure the successful and timely development of the Business Park, programs for promoting development and marketing will be implemented. A study of live/work developments in the Surrey context is being undertaken (January, 2000) to ensure the viability and successful implementation of this new innovative land use.

Engineering

A report under separate cover prepared by Urban Systems Ltd. and kept in the Engineering Department identifies the engineering requirements needed to support the development concept (see also Corporate Report dated January 19, 2000 from the Manager of Utilities, Engineering Department and a synopsis of the consultant's report in Appendix V).

Flexibility

This Neighbourhood Concept Plan is intended to be conceptual in nature and the components of the development concept may vary in size but not in general location. Some flexibility has been built in to the Plan to allow alternative local road patterns to accommodate the acreage requirements of potential Business Park users.

Any proposed amendments to this Neighbourhood Concept Plan must be undertaken in accordance with Council's approved Neighbourhood Concept Plan amendment policy.

2. Study Area Characteristics

The Rosemary Heights Business Park is bounded by 32 Avenue (Diversion) on the north, a creek (and North Grandview Heights) on the south, 156 Street on the east and Highway No. 99 on the west. The approved Rosemary Heights Central Neighbourhood Concept Plan area (predominantly residential) is located to the north and a cemetery is located immediately east.

The area consists of about 25 lots of various sizes, comprising a total area of approximately 31 hectares (77 acres). The area is characterized by small rural acreages and hobby farms. Three creeks traverse the area, and there is abundant vegetation. The South Surrey Interchange is located to the west of the Business Park. B.C. Hydro will be constructing a new sub-station in the north west area in 20002/3. A hydro right-of-way runs along west side of the Business Park, which substantially limits the utilization of about 10 properties along Croydon Drive. The area is mostly zoned RA - One Acre Residential.

The lands are considered suitable for business park and live/work development due to the following characteristics:

- the site has excellent accessibility and exposure characteristics because of its location adjacent to Highway No. 99 and the South Surrey Interchange;
- there is a shortage of business park land in Surrey, especially in South Surrey where there is virtually none;
- the eastern portion of the NCP area is somewhat isolated due to the presence of streams, and therefore is conducive to live/work activities to complement the Business Park; and
- the opportunity exists to establish a high-quality business park and live/work development on this site to service the needs of local business and to provide employment for local residents.

In addition, the area is well located in terms of its close proximity to the United States and Vancouver, golf courses and housing.

3. **Policy Framework - Surrey's Official Community Plan (OCP) and the Rosemary Heights Local Area Plan (LAP)**

The approved Local Area Plan for Rosemary Heights (approved in 1994 - Land Use Plan attached in Appendix I) directs that the area east of 152 Street and south of 32 Avenue be developed as an employment area (i.e., a business park) to provide employment opportunities in close proximity to the Rosemary Heights/Morgan Creek residential areas and to Highway No. 99. The Local Area Plan further indicates that a high standard of development and design control should be applied to new development in this employment area.

The majority of these lands are designated Industrial in Surrey's Official Community Plan with the intention to create a clean, high quality business park to provide jobs for Surrey residents.

City Council has directed that a Neighbourhood Concept Plan be prepared for the future Business Park by involving the property owners and the public. The Official Community Plan provides guidelines and requirements for the preparation and content of Neighbourhood Concept Plans. It also contains a number of directives related to the provision of serviced industrial lands and the creation of jobs for Surrey residents. The Rosemary Heights Business Park and Live/Work Area Neighbourhood Concept Plan was prepared within this policy framework.

4. **Overview of the Neighbourhood Concept Plan (NCP) (Appendix II)**

Rosemary Heights Business Park

The development concept map of the Rosemary Heights Business Park and Live/Work Area Neighbourhood Concept Plan is contained in Appendix II. This preferred development concept envisages a Business Park which will accommodate low-impact businesses such as high-tech industries, research and development companies, light manufacturing and corporate head offices. The Business Park will be comprehensively designed to accommodate an abundance of open space due to the presence of three watercourses, landscaped stormwater ponds, trees and landscaped buffers.

The Live/Work Option

The lands in the eastern portion of the NCP area are proposed to accommodate either business park uses or live/work developments. In order to ensure land use compatibility and viable sizes of development sites, and to avoid scattered uncoordinated developments, projects proposed for the properties north of Titman Creek and south of Titman Creek must be comprehensively designed and carefully coordinated in terms of land use (business park or live/work) and design.

While the precise nature of live/work development is largely undefined (as of January, 2000), the market appeal and affordability potential prompted the inclusion of this innovative housing/business type in the Neighbourhood Concept Plan. The details of density, form and design of this type of development along with regulatory/building code issues will be refined through the completion of a live/work development study (in mid-2000). If live/work concept is determined not to be feasible, the Neighbourhood Concept Plan contemplates the option of business park uses for the lands in the eastern section of the NCP area.

Image and Amenities

To attain a pastoral and executive image, the Business Park will have a landscaped gateway feature (e.g., an identification sign) at the main entrance off 32 Avenue (Diversion), and a landscaped water feature (stormwater detention pond) at the secondary entrance off Croydon Drive. There will also be enhanced landscaping, special street/pathway treatments, vegetated watercourse areas and buffers throughout to ensure that the Business Park attains the highest aesthetic standards.

Projected Floor Areas and Employment (Appendix III)

If the entire NCP area is developed as a Business Park it is expected to accommodate about 134,834 sq.m. (1,451,388 sq.ft.) of business park floor space and provide about 4,840 jobs. If the easterly portion of the NCP area is developed as a live/work area and the remainder as Business Park, the NCP area is expected to accommodate about 97,500 sq. m. (1,050,000 sq.ft.) of business floor area, along with about 98 live/work units and 3,647 jobs. The table presented in Appendix III illustrates the basic land use statistics of the development concept.

5. Environmental Protection

Riparian Areas

A Bio-Inventory Study and a Top of Bank Survey were undertaken for this area. The Bio-Inventory Study makes the following recommendations:

- protect riparian corridors and establish leavestrips (adjacent to creeks); in some locations relaxation of the 30 metre setback requirement to 15 metres "may" be appropriate;
- retain at least some of the present forest blocks;
- consider the relocation of headwater reaches only;
- maintain water quality and quantity; and
- preserve some old field habitat.

A prevailing concern throughout the planning process was that the presence of three watercourses within the plan area substantially impacts the amount of land able to be developed. In particular, the existence of vegetated riparian areas and the Ministry of

Environment's 30 metre setback requirement for non-residential development severely limits development on some properties.

In recognition of this, the City and the Citizen Advisory Committee engaged the services of an environmental consultant to undertake a detailed analysis of the area including top-of-bank surveys and valuations of the existing riparian areas. The consultant made recommendations on an area-wide basis regarding opportunities for environmental enhancement and riparian protection in exchange for some setback reductions based upon the actual value and extent of riparian areas and existing fisheries habitat in the Business Park.

City staff met on numerous occasions with the environmental agencies to work out an acceptable setback strategy with a view to settling these issues in advance of receiving a development application from a major Business Park user. However, the agencies were reluctant to commit to such a strategy for fear of setting a precedent, although they encourage such comprehensive environmental planning. Therefore, the development concept indicates 30 metre setbacks for Business Park uses and 15 metres for live/work residential densities under 6 units per acre.

Environmental Background Information (Appendix IV)

A synopsis of the information assembled and recommendations of the environmental consultant are contained within Appendix IV. This information is being made available to potential developers and land owners as a resource that may be used in preparing and evaluating development proposals. It may reduce the need for applicants to undertake exhaustive environmental impact studies at the time of rezoning.

Trees

In addition to riparian area and fish habitat protection/enhancement, all significant trees and/or groups of trees should be retained on the sites and incorporated into the design of developments in the business park and live/work area.

6. Engineering Services, Phasing and Funding (Appendix V)

General

A general servicing plan, overall road pattern, stormwater management strategy, and phasing and funding strategy have been developed as a critical component of the Neighbourhood Concept Plan. These issues are addressed in a consultant's report and accompanying recommendations from the Engineering Department. This engineering strategy must be considered in conjunction with the development concept in preparing and reviewing development proposals, and may affect the timing of development and availability of servicing. A synopsis of the engineering consultant's report is contained in Appendix V. More detailed servicing information is available from the Engineering Department where copies of the consultant's report are also available.

Timing

The Rosemary Heights Business Park is under consideration for potential pre-servicing and pre-zoning to assist in attracting new business to the area in a timely fashion. Development proponents should contact the Engineering Department to determine the current status of the servicing and financing arrangements.

Infrastructure Cost Responsibilities

In addition to providing normal works and services, developers will be encouraged to provide amenities such as ponds, fountains, pathways and outdoor furniture on their respective development sites. They will also be encouraged and in some cases required, to provide special treatments (e.g., pavers) and lighting on the local streets/laneways. Certain aspects of the landscaping, road design and public space elements (see Design Guidelines below) are to be funded by the developer through cost-sharing arrangements as part of the servicing agreement process. Some funding for these features is to be obtained through amenity contributions collected by the City at the time of rezoning.

Stormwater Ponds

A municipal stormwater detention facility will be located on City-owned lands near Croydon Drive at the secondary entrance to the Business Park which is also the entrance into the optional live/work area. This pond is necessary to service a large catchment outside the boundaries of this business park. The timing of this pond is dependent on the servicing needs of an area south of the business park, outside the NCP. Two smaller size stormwater facilities will be located on private lands which can be constructed at the surface as an amenity for the Business Park development, or sub-surface (e.g., below a parking lot).

The hydro right-of-way stormwater pond will be financed and constructed by the City. The two smaller stormwater ponds are expected to be financed and constructed by the developers in the NCP at the time of development in either stormwater catchment area. Coordination among land owners and/or developers in the two respective catchment areas is required, and cost sharing arrangements among the landowners may be needed to facilitate construction of the private ponds. The developer funded detention ponds are considered local servicing requirements and do not qualify for Development Cost Charge rebates.

7. Design Guidelines (Appendix VI)

All development proposals within the Rosemary Heights Business Park and Live/Work area must adhere to the general Design Guidelines contained in Appendix VI. These Design Guidelines will be used by development proponents and the City to assist

in ensuring that a high quality, well landscaped Business Park is achieved. The Design Guidelines address such issues as:

- overall compatibility of building design;
- the streetscape along 32 Avenue and Croydon Drive;
- buffer landscaping;
- the interface between the Business Park and the optional live/work area; and
- gateways, open space development and tree preservation.

In addition, the Design Guidelines briefly address the development limitations on some properties along Croydon Drive due to the existence of a 100 metre hydro right-of-way. The Guidelines depict a possible development scenario with several smaller buildings on either side and parking under the right-of-way. This scenario may be possible depending on the specific site-conditions.

For illustrative purposes, the Design Guidelines address some preliminary development guidelines for the live/work area (see Live/Work Developments Study below).

To enhance the quality of the Business Park and create its unique identity, several aesthetic features should be considered. In particular, specially lit and landscaped identification signs, ponds, fountains, decorative pavers and enhanced landscaped cul de sac islands are encouraged to be provided on private property by developers. Where they are located on public land, funding for the features will be derived in part from amenity contributions associated with landscaping open spaces and also through cost sharing arrangements determined at the time of development through servicing agreements.

8. Live/Work Developments Study

The concept of designing and building new live/work developments, particularly in the Surrey context, is untried, although market research suggests that there is a pent up demand for this unique and innovative housing/business accommodation. The benefits of this type of development are that it would provide more choice and affordability in the housing/business market, more employment opportunities and could serve as an incubator for small businesses in Surrey.

The City is undertaking research with the intent to develop policies and regulations on the applicability and implementation of live/work developments in Surrey. This study will place particular emphasis on proposed live/work developments in Rosemary Heights, East Newton and East Clayton. A report and recommendations arising from this study will be forwarded to City Council for consideration, and consequent amendments to the Rosemary Heights Business Park Neighbourhood Concept Plan may be required. Development proponents should contact the Planning & Development Department to determine the status of this study and the associated recommendations.

9. Zoning

Developments for business park uses in the Rosemary Heights Business Park will generally be designed and built under the IB - Business Park Zone. Zoning mechanisms to accommodate the live/work area will be investigated within the context of the Live/Work Developments Study underway to examine the applicability and implementation aspects of live/work developments. A CD - Comprehensive Development Zone may be used to accommodate mixed-use, integrated and comprehensively designed developments.

10. Amenity Requirements

To address the amenity needs of the proposed new development in this area, at the time of rezoning, development proposals will be required to make a monetary contribution toward the provision of new police and fire protection services, improvements to the municipal detention pond to make it a Business Park amenity and general landscaping on public lands (i.e., at the gateway off of 32 Avenue). Live/work developments will also be required to contribute toward the provision of library materials for the residents of the live/work area.

The monetary contributions toward police, fire and library materials will offset the capital costs of providing these services to the new development and are applied on a standardized basis in all of the Surrey's Neighbourhood Concept Plan areas. The monetary contributions toward the development of other amenities are based upon an estimate of the capital costs of these improvements for this particular Neighbourhood Concept Plan area. The total cost is divided among the anticipated acreage and number of dwelling units to ensure an equitable contribution arrangement.

The estimated cost of developing the amenities associated with general landscaping and improvements to the pond area and gateways is approximately \$101,500, which consists of the following:

Road fronting pond	\$15,000
Site furniture and signs	\$11,500
Pathways, trails & gateways	\$40,000
Landscaping	\$20,000
Consulting fees/public meetings	\$15,000

A summary of the applicable amenity contributions (per acre or unit) and the estimated revenue the City can expect to receive from this Neighbourhood Concept Plan area are presented in the following table:

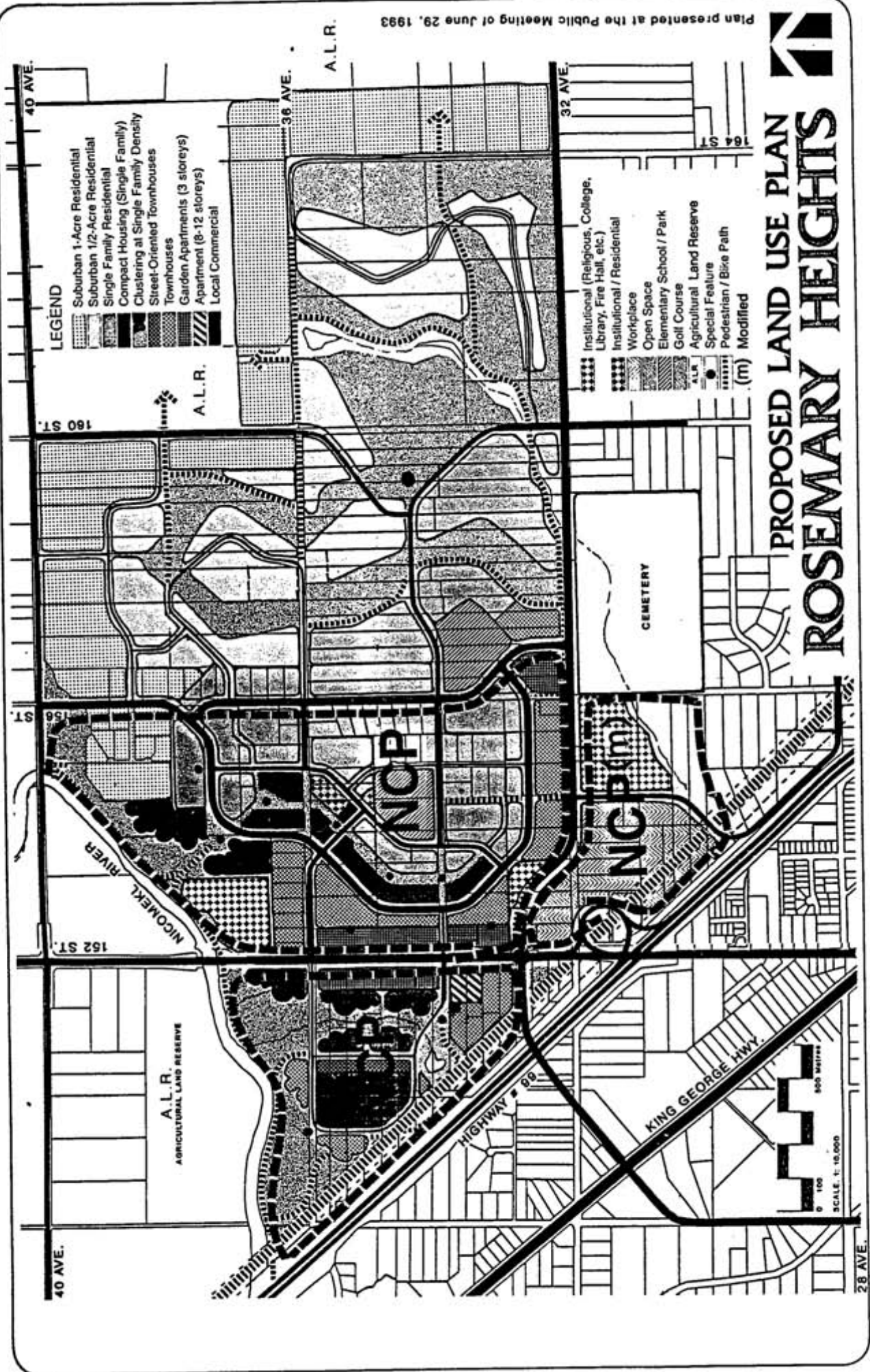
ROSEMARY HEIGHTS BUSINESS PARK AND LIVE/WORK AREA AMENITY CONTRIBUTIONS ¹			
	Per Acre Contribution Business Park <i>Approx. 32 acres</i>	Per Acre Contribution Live/Work Area <i>Approx. 12 acres</i>	Anticipated Revenue
Police Protection	\$201.60 per acre	\$201.60 per acre	\$8,870
Fire Protection	\$870.92 per acre	\$870.92 per acre	\$38,320
Park/Pathways Development	\$ 2,306.82 per acre	\$2,306.82 per acre	\$101,500
Library Materials	N/A	\$113.40 per unit @ 8 units per acre	\$10,886
Total Contribution	\$3,379.34 per acre	\$3,379.34 per acre plus \$113.40 per unit for libraries	
Total Anticipated Revenue			\$159,576

¹ Contribution as of January, 2000

APPENDIX I

Rosemary Heights Local Area Plan - Land Use Plan (Approved 1994)





LEGEND

- Suburban 1-Acre Residential
- Suburban 1/2-Acre Residential
- Single Family Residential
- Compact Housing (Single Family)
- Clustering at Single Family Density
- Street-Oriented Townhouses
- Townhouses
- Garden Apartments (3 storeys)
- Apartment (8-12 storeys)
- Local Commercial

- Institutional (Religious, College, Library, Fire Hall, etc.)
- Institutional / Residential
- Workplace
- Open Space
- Elementary School / Park
- Golf Course
- Agricultural Land Reserve
- Special Feature
- Pedestrian / Bike Path
- (m) Modified

PROPOSED LAND USE PLAN
ROSEMARY HEIGHTS



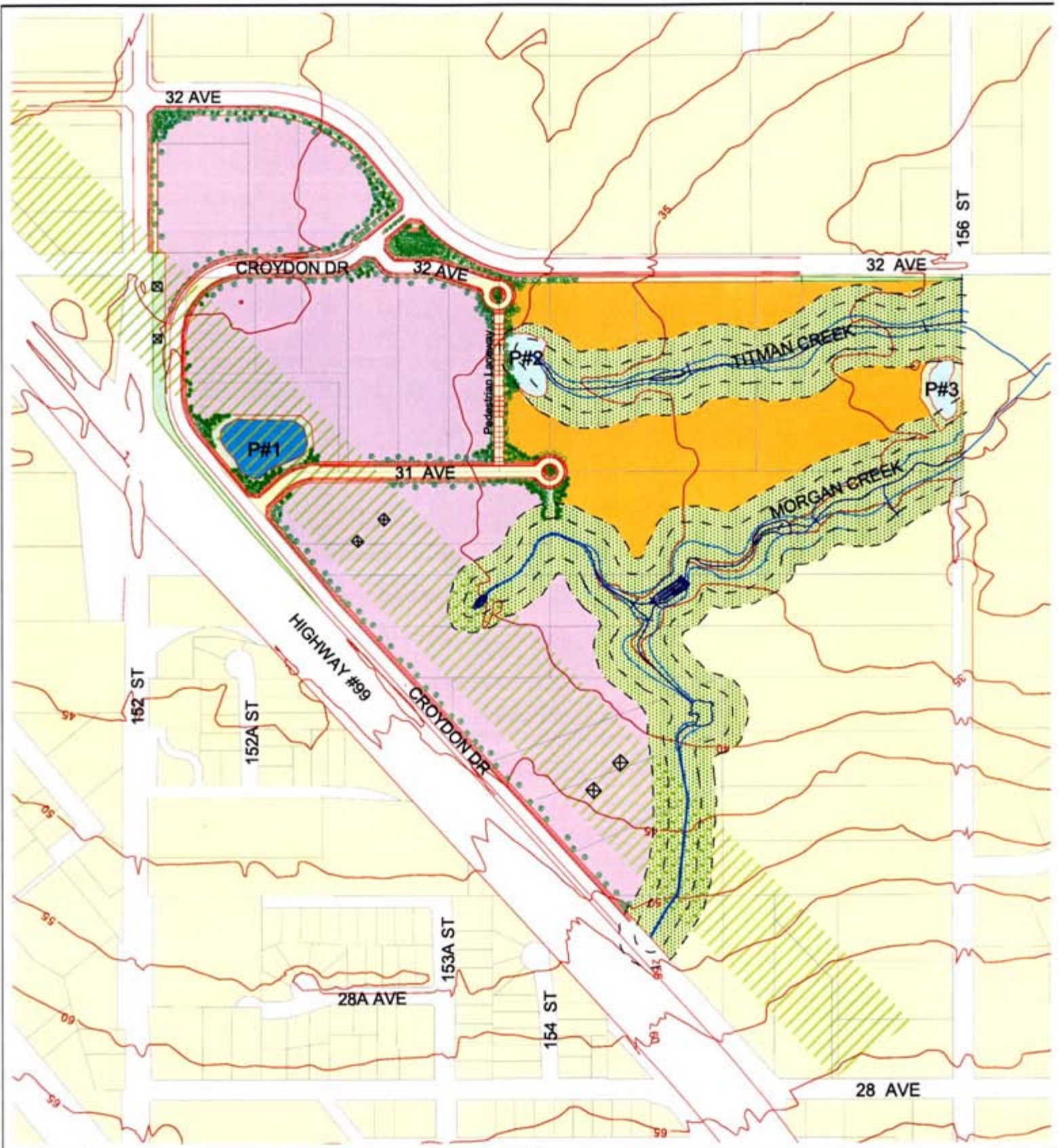
NOTE: ——— THE BOUNDARIES ARE SUBJECT TO CHANGE AND ADJUSTMENTS

SCALE: 1:10,000
 0 100 500 METERS

APPENDIX II

Rosemary Heights Business Park and Live/Work Area Development Concept (Land Use)





Rosemary Heights Business Park Proposed Land Use Plan

City of Surrey Planning & Development Department

NOTE: This plan is conceptual in nature and is only intended to reflect a general pattern of land use.

90 0 90 180 Meters DATE Feb 4, 2000

LEGEND

- Business Park
- Live & Work or Business Park Areas
- Buffers
- Storm Water Detention Pond (amenity feature City-owned)
- Storm Water Detention Pond (amenity feature privately-owned)
- Creek Preservation Areas

- 15m & 30m Riparian Set Backs
- Road Concept
- Hydro Towers
- Creeks
- Contours 5m
- Hydro Right of Way



CITY OF SURREY

APPENDIX III

Rosemary Heights Business Park and Live/Work Area Neighbourhood Concept Plan Land Use Statistics

ROSEMARY HEIGHTS BUSINESS PARK AND LIVE/WORK AREA LAND USE STATISTICS				
Land Use	Area (approx.)	Projected Floor Area (Business Park)¹	Projected No. of Dwelling Units	Projected No. of Jobs²
Business Park	13 ha. 34.5 acres	97,500 sq. m. 1,050,000 sq.ft.	N/A	3,500
Live/Work (optional)	5 ha. 12.3 acres	37,334 sq.m. 402,000 sq.ft.	98 ³	147 (live/work option) 1,340 (Business Park option)
Storm Water Detention Ponds (amenity feature - privately owned)	0.3 ha. 0.8 acres	N/A	N/A	N/A
Storm Water Detention Ponds (amenity features - City-owned)	0.35 ha. 0.9 acres	N/A	N/A	N/A
B.C. Hydro Sub-Station Site	1.0 ha. 2.5 acres	N/A	N/A	N/A
Creek Preservation Areas	10.4 ha. 25.8 acres	N/A	N/A	N/A
Buffers ⁴ (typically landscaped areas on private property)	0.23 ha. 0.6 acres	N/A	N/A	N/A
New Roads	1.05 ha. 2.6 acres	N/A	N/A	N/A
TOTALS	31.3 ha. 77 acres	134,834 sq.m. 1,451,388 sq.ft. (Business Park option) 97,500 sq. m. 1,050,000 sq.ft. (Live/Work option)	98	4,840 (Business Park option) 3,647 (Live/Work option)

¹ Projected floor area is based upon an estimated 0.75 FAR.

² Projected number of jobs is based upon one employee per 300 square feet. Live/work employment is based upon 1.5 jobs per unit.

³ This assumes an average build-out of 8 dwelling units per acre

⁴ Buffers are typically landscaped areas on private property used to ameliorate compatibility among different land uses

APPENDIX IV

Environmental Background Information

A Bio-Inventory Study and a Top of Bank Survey were undertaken by environmental consultants during the planning process for the Rosemary Heights Business Park and Live/Work Neighbourhood Concept Plan area. A copy of the associated reports, along with a copy of a letter from the Department of Fisheries & Oceans are contained within this Appendix.

The results of the Rosemary Heights Business Park Bio-Inventory Report (Dillon Consulting Ltd./Strix Environmental Consulting, May 5, 1998) were incorporated into the development concept. The information and recommendations contained in the Rosemary Heights Top-of-Bank Investigation (Dillon Consulting Ltd., February 15, 1999), relate to proposed areas for setback relaxation and expansion. These reports may assist development proponents with designing development projects and seeking any necessary environmental approvals.

Attached

- 1) Rosemary Heights Business Park Bio-Inventory Report (Dillon Consulting Ltd./Strix Environmental Consulting, May 5, 1998)
- 2) Rosemary Heights Top-of-Bank Investigation (Dillon Consulting Ltd., February 15, 1999)
- 3) Copy of Letter from Department of Fisheries and Oceans, March 15, 1999)

**ROSEMARY HEIGHTS
BUSINESS PARK**

Bio-Inventory Report

May 5, 1998

Submitted to

**City of Surrey, Planning
and Development Department
Surrey, British Columbia**

97-4800-01

Submitted by

**Dillon Consulting Limited
and
Strix Environmental Consulting**

1.0 INTRODUCTION

1.1 Project Background

The City of Surrey is presently undertaking a Neighbourhood Concept Plan (NCP) in the Rosemary Heights area of the City to consider the future development pattern for a business park. The purpose of the Rosemary Heights NCP is to develop a comprehensive land use, servicing and financial plan. The approved plan can then be used as the basis to review and approve rezoning and subdivision applications received by the City.

Dillon Consulting Limited and Strix Environmental Consulting were retained to complete a biophysical inventory of the Rosemary Heights Business Park property. The specific focus of the study was to investigate the intermittent headwater tributaries of Titman Creek, and Morgan Creeks, both of which flow to the Nicomekl River.

The primary objective of the project was to describe and document the natural environmental characteristics of the proposed block of land designated for development as a business park. The work included the assessment of both aquatic and terrestrial features present on the site, as well as the evaluation of the significance of those features.

1.2 Rosemary Heights Business Park Study Area

The Rosemary Heights area is located in the southern region of the City of Surrey. The proposed Rosemary Heights business park is roughly bounded by Highway 99 to the south, 152 Street to the west, 32 Avenue to the north, and 156 Street to the east (Figure 1).

1.3 Purpose of the Environmental Report

As a component of the planning studies being undertaken in the area, an assessment of ecological features and systems of the proposed Rosemary Heights Business Park has been conducted. This overview assessment is important to help guide the planning process in Rosemary Heights. The purpose of this report is to outline the environmental attributes of the area and identify their ecological significance and need, where applicable, for protection, enhancement, or both. In effect, this report is not intended to make planning decisions, but rather to provide information to assist the decision-making process related to future development in Rosemary Heights, and to help determine the environmental consequences of these decisions.

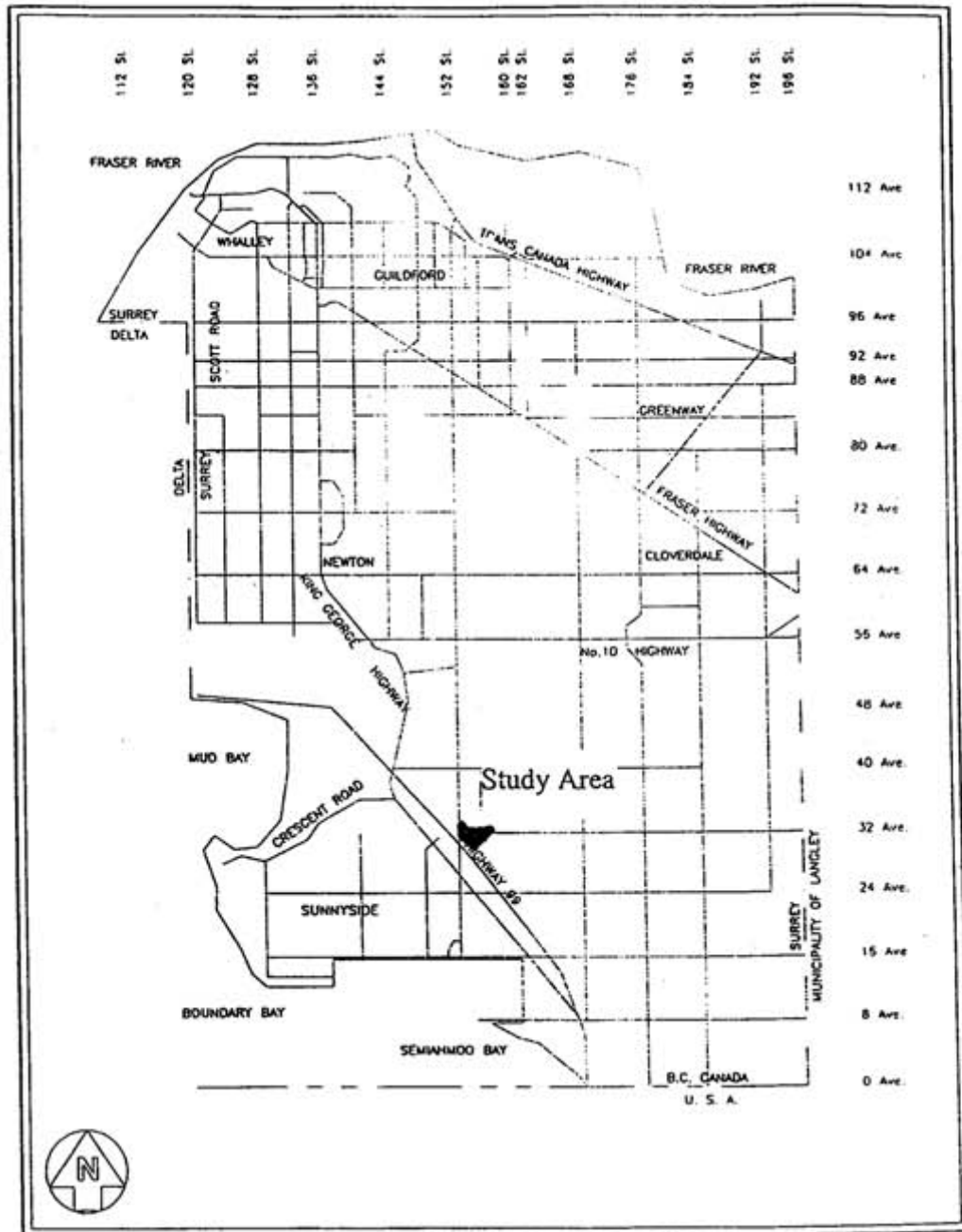


Figure 1. Location of the Rosemary Heights Study Area within the City of Surrey

2.0 PROJECT APPROACH

The approach to the assessment of terrestrial and aquatic components of the Rosemary Heights study area involved:

1. Compilation and review of background information, where available; and
2. Field investigations conducted in the Rosemary Heights study area.

A description of the approaches undertaken for the terrestrial and aquatic components are provided in Sections 2.1 and 2.2, respectively.

2.1 Terrestrial Studies

The main focus of the terrestrial (*i.e.*, wildlife and vegetation) component of this study was on the forest blocks of the study area as vegetation is a primary determinant of animal species' presence, abundance and distribution.

The study area was inspected from the ground. All signs of wildlife were recorded during field investigations conducted November 6 and 7, 1997. Searches for the nests and signs of birds of prey were conducted during this period. Vegetation characteristics were determined by general observation while walking through the site and by information provided by vegetation plots for the three main forest blocks.

2.2 Aquatic Studies

Background fisheries and fish habitat-related information was obtained from reports prepared for the City of Surrey for stream reaches within or adjacent to the Rosemary Heights study area (e.g., ECL 1995, Williamson and Scott 1995, NECS 1995, Urban Systems 1997).

Prior to field investigations, available mapping (1:2,500 contour maps) and aerial photographs (1:2,500 ortho-photos) were reviewed to identify areas to be evaluated in the field. Potential obstructions to fish passage were also located from mapping and photographs for verification in the field.

Field investigations of the drainage network were conducted in November 1997. Habitat elements evaluated during field assessment of individual reaches included:

- creek channel and floodplain characteristics;
- watercourse length, width, depth, gradient and banks;
- barriers to fish passage such as debris jams, culverts and weirs;
- substrate characteristics; and
- creek morphology including pools, runs and riffles.

Channel and riparian conditions were assessed by both visual observation and direct measurement. Measurements of channel characteristics were made at points along the tributary where significant

changes in habitat types occurred (i.e., large pools, confluences).

Following the acquisition of a fish collection permit (# FC97-118) from the Ministry of Environment, Lands and Parks, baited Gee-type minnow traps were set at several locations on Morgan Creek. Fish collections were primarily intended to assist in the valuation of study area streams. Sites were located upstream and downstream of the culvert discharging into the creek off of the 156 Street right-of-way. Visual observation of all in-stream habitat was conducted throughout the bioinventory assessment to augment minnow trap catch data.

Water quality parameters of both Titman and Morgan Creek were measured during the course of the assessment. Water quality was measured at two locations on the property: one site was on the Titman property (15572-32nd Avenue) just downstream of the driveway crossing (photo 4, Appendix A); the other was located on Morgan Creek near the 156 St right-of-way. All measurements were done in the field using accepted analytical metres and probes.

The following parameters and equipment were used to characterize water quality on the property:

Water temperature	Hand held glass stem thermometer
Dissolved Oxygen	YSI Model 55 oxygen meter
Specific Conductance	YSI Model 30 conductivity meter
pH	HANNA Instruments HI-9024 probe

All equipment was calibrated on site according to the manufacturers specifications.

3.0 DESCRIPTION OF THE ROSEMARY HEIGHTS STUDY AREA

3.1 Biogeoclimatic Zone

Standard habitat classification in British Columbia follows the Biogeoclimatic Zone system pioneered by Vladimir Krajina. This classification system is based primarily on climate and vegetation but more detailed site descriptions are accommodated by including other factors such as soil, terrain, aspect, moisture and temperature. The Rosemary Heights study area lies within the Coastal Western Hemlock (CWH) biogeoclimatic zone which covers much of the lower Fraser Valley, coastal B.C., and Queen Charlotte and Vancouver Islands. The CWH biogeoclimatic zone is further divided into subzones to include specific features of this large area. The Rosemary Heights study area is considered part of the Very Dry Maritime Coastal Western Hemlock Subzone, or CWHxm (Pojar *et al.* 1991).

3.2 Physiography and Soils

The study area is located in the Fraser Lowland physiographic region of the province which incorporates the Fraser River delta and floodplain (Holland, 1976 reported in Williamson and Scott, 1995). Surficial geology within the study area is characterised as Capilano sediments consisting of marine, deltaic and fluvial deposits.

3.3 Current Land Use

The proposed Rosemary Heights Business Park Area addresses a small area (64 ha) with a moderately diverse land use. Over the past 20 - 30 years development has occurred in Rosemary Heights reducing the amount of historical rural lands in the study area. At present, within the study area, only two parcels of land are given a rural zoning classification. One parcel situated in the northwest corner of the study area above 32nd Avenue is zoned A-1 (General Agriculture). The other parcel is located on the northeast corner of the study area and is zoned A-2 (Intensive Agriculture). This latter parcel corresponds to the Titman property whose family has lived in the study area for over fifty years. Suburban development comprises the remaining portion of the study area.

The mixed artificial and natural landscape contained within the study area is constantly changing. Some Rosemary Heights area residents have removed undergrowth and large trees to accommodate hobby farms, tree plantations, or to make the property more attractive to buyers or themselves. Given the study area's proximity to the urban centre of Surrey and other municipalities of the Greater Vancouver area there is pressure to develop the remaining forested areas. Many properties in the study area are rented or owned by individuals intending to develop their holdings in Rosemary Heights, while other landowners have made it clear to the study team, through personal communication or through comments at meetings, that they value the natural features of their properties and wish to preserve it for their continued enjoyment.

3.3 Vegetation

The study area is a patchwork of small forest blocks (*i.e.*, FB1, FB2, and FB3) and small clearings in various stages of disturbance. Areas to the north and east of the study area were identified as being of "Medium" and "High" significance respectively in the Surrey Environmentally Sensitive Area (ESA) study (Abs *et al.* 1990). Based on aerial photographs, reconnaissance and reports (ECL 1997, Scott Resource Services 1997, Urban Systems 1997, NECS 1995) the study area and its surrounding environs are similar and contain small remnant forest blocks, some of which are connected between properties. Within the study area, the remnant forest blocks are the most significant environmental features. The two largest blocks of the study area are part of a larger forest unit which extends beyond the south and east boundaries of the study area. This large forest is partly fragmented by residences, small clearings and roadways.

The two large forests in the study area (FB1 and FB2) are connected within the study area by a narrow band of vegetation running along Morgan Creek at the southern boundary of the study area. The eastern-most forest block (FB1) is the largest, contiguous forest in the study area and is located on the property of a long time resident at 15572 32nd Avenue (photos 1 and 2, Appendix A). The south-central block (FB2) is located at the rear of a number of private properties (2960, 3010, 3032 on Croyden Drive, and 3009, 3033 156th Street). A smaller forest block (FB3) is located near the headwaters of the small tributary at the north end of the study area. It is on the properties labelled 15416 and 15412 32nd Avenue on the city of Surrey map. These are the three most significant forest blocks. Other small forest blocks are present along the hydro corridor in the northwest portion of the study area, near the corner of 32nd Avenue and Croyden Drive (photo 5, Appendix A).

The majority of non-forested area consists of old field, shrub, young alder stands and, in one location, a derelict plantation of small spruce (*Picea sp.*) and hedging cedar (*Thuja sp.*). The locations of major vegetation communities are presented in Figure 2.

Although the three main forest blocks considered have many plants in common, the overall assemblage of plants in each is quite different. It is for this reason that they are considered separately and are not lumped into a specific category such as mixed deciduous forest. They each fall into the general category of upland forest. Riparian vegetation is again different from the upland vegetation and is therefore discussed in more detail in another section, *Riparian Forests*. Old field and other disturbed sites are also discussed separately (*Disturbed Areas*) and more generally since many of the species, mostly introduced and weedy, were common to each and of lesser ecological significance.

3.3.1 FB1

The largest, eastern-most forest block is the least disturbed except for the narrow frontage along 32nd Avenue, and a house with its associated livestock buildings and a small horse paddock. The remaining, large forested portion consists of paper birch (*Betula papyrifera* var. *commutata*) and red alder (*Alnus rubra*). Paper birch is more abundant than red alder. Estimated tree size is similar for the two species: approximately 0.3 m dbh and 25-30 m height. Trees are smaller towards the west

edge of the forest and red alder is more abundant there, so the two tree species are of approximately equal abundance. Four large black cottonwood (*Populus balsamifera* ssp. *trichocarpa*) are present near the west forest edge. A few small, sub-canopy western hemlock (*Tsuga heterophylla*) are present throughout the forest. Two common horse chestnuts (*Aesculus hippocastanum*) saplings are present 8 m in from the west edge. Old western red cedar (*Thuja plicata*) stumps indicate past logging, and serve as nurse stumps for paper birch and red huckleberry (*Vaccinium parvifolium*).

The riparian areas of the two tributaries (i.e., Titman Creek and Morgan Creek) running through this forest block support more conifers. Some small western hemlock and two Sitka spruce (*Picea sitchensis*) are present along Titman Creek. A few large western red cedar are present along the south tributary, at the edge of the study area.

The most abundant shrub, excluding trailing blackberry (*Rubus ursinus*), which is considered among herb-layer plants, is salmonberry (*Rubus spectabilis*). Salmonberry (again, along with trailing blackberry) was present in all samples sites. Vine maple (*Acer circinatum*) and coastal red elderberry (*Sambucus racemosa* ssp. *pubens* var. *arborescens*) are also quite abundant. Less abundant shrubs include Indian-plum (*Oemleria cerasiformis*), cascara (*Rhamnus purshiana*), thimbleberry (*Rubus parviflorus*), red huckleberry and beaked hazelnut (*Corylus cornuta*).

Trailing blackberry is the most abundant and widespread plant in the herb layer. Spiny wood fern (*Dryopteris expansa*) is the next most abundant, followed by sword fern (*Polystichum munitum*), false lily-of-the-valley (*Maianthemum dilatatum*), and bracken fern (*Pteridium aquilinum*). False lily-of-the-valley may be under-represented because all specimens (except some in another forest block) are without leaves and are evident only by their lingering fruit or dried stalk (peduncle).

The western forest edge, adjoining a small field next to the spruce plantation, is comprised of hardhack (*Spiraea douglasii*), thimbleberry, salmonberry, bracken fern and trailing blackberry.

3.3.2 FB2

The second largest contiguous forest is located southwest of the first. The two are connected by a narrow band of young red alder along Morgan creek within the study area and by a larger upland forest south of the study boundary.

The type of trees comprising this forest is quite different than FB1. Red alder is the most abundant tree and no paper birch was observed. Bigleaf maple (*Acer macrophyllum*) are fairly common in scattered groups amongst the alder. Both species are approximately 25 to 30 m tall. A few specimens of black cottonwood rise above these major species.

Salmonberry is only slightly more abundant than coastal red elderberry, and both are very abundant, creating a very dense layer of shrubs. A few specimens of vine maple and thimbleberry are present.

The number and type of plants growing in the herb-layer is low, presumably because of the extensive shrub cover. Spiny wood fern is common throughout the forest and trailing blackberry is common

in some locations. Lily-of-the-valley which was in leaf, which is rare for this time of the year, is present in one location.

Some plants noted in the forest along trails include bracken fern, Pacific bleeding heart (*Dicentra formosa*), and black gooseberry (*Ribes lacustre*). Plants growing on the trail include youth-on-age (*Tolmiea menziesii*), large-leaved avens (*Geum macrophyllum* ssp. *macrophyllum*), few-seeded bitter-cress (*Cardamine oligosperma*) and sweet-scented bedstraw (*Galium triflorum*).

3.3.3 FB3

FB3 is a small forest block located at the back of two properties off 32nd Avenue. It extends southward from the headwater channel of Titman Creek which flows into FB1.

One very large Douglas-fir (*Pseudotsuga menziesii*), measuring approximately 0.8 m dbh, and a few smaller Douglas-firs help characterize this forest and distinguish it from the preceding two. However, paper birch is the dominant tree species and red alder is approximately equal in abundance with Douglas-fir. A couple of specimens of bitter cherry (*Prunus emarginata*) are present as well as sapling grand fir (*Abies grandis*).

The shrub layer is quite diverse with no species obviously dominant. Shrubs are more scattered in distribution than the other two forests, probably because of the presence of the large Douglas-firs which affect the amount of sunlight reaching the lower strata, and the soil chemistry. Salmonberry, vine maple, Indian-plum, beaked hazelnut, cascara and English holly are all fairly common. Common snowberry (*Symphoricarpos albus*) and red huckleberry are less common.

Trailing blackberry is the most abundant herb-layer plant. Sword fern, spiny wood fern and star-flowered false Solomon's-seal (*Smilacina stellata*) are fairly abundant. Wall lettuce (*Lactuca muralis*) and sweet-scented bedstraw are least abundant.

3.3.4 Riparian Forests

Vegetation communities along Titman and Morgan Creeks differ somewhat from those of the upland forests. The difference can be subtle and sometimes insignificant where both stream-side and adjacent upland habitat is disturbed.

Red alder and paper birch are the most abundant tree species along the northern tributary. Himalayan blackberry occurs along the north bank of this tributary in FB3. The narrow strip of vegetation along this tributary between FB3 and FB1 consists of a row of well-spaced old, many-branched red alders. English ivy (*Hedera helix*) blankets a couple of red alder. Salmonberry and hardhack are very dense along the creek. A small pond has been created by reduced water flow beneath a roadway providing access to the tree farm at 15460 32nd Avenue. A large weeping willow (*Salix babylonica*) is present there.

Despite past disturbance along the top of the bank within FB1, stream-side vegetation cover is well developed. Paper birch and red alder are the major tree species with some small western hemlock and a couple of Sitka spruce. A large western red cedar is present near the top of the bank. Salmonberry is the most abundant shrub. Vine maple and coastal red elderberry are abundant in some locations. Spiny wood fern, sword fern and lady fern (*Athyrium filix-femina*) are present. A few skunk cabbage (*Lysichiton americanum*) are present in the wider, water-pooling sites where large leaved avens were also observed. Outside the study area, near the confluence of the two tributaries, are some large bigleaf maples. Dull Oregon-grape (*Mahonia nervosa*) is abundant on the upper banks. The predominantly deciduous forest yields to a mature conifer forest of large Douglas-fir and western red cedar downstream of the confluence and out of the study site.

Reaches of Morgan Creek, which supported the greatest water flows, has good instream cover afforded by several large western red cedar at the southeastern corner of the study area. Devil's club (*Oplopanax horridus*) is present beneath the cedar. Upstream from that point is a forest of young red alder, approximately 15 m tall and 5 to 15 cm dbh. The understory consists mainly of salmonberry, coastal red elderberry, thimbleberry, Indian-plum, trailing blackberry and spiny wood fern.

Upstream, within FB2, stream-side trees consisted mainly of red alder, with some bigleaf maple. Salmonberry and coastal red elderberry are abundant. One specimen of deer fern was observed on the stream bank in FB2.

3.3.5 Snags

Snags are nowhere very abundant but do occur as large and small standing dead trees, and as dead limbs of living trees. Small excavation holes were noted in some snags and indicate either use by downy woodpeckers (*Picoides pubescens*), hairy woodpeckers (*Picoides villosus*), or both.

3.3.6 Other Forests

The remaining forested areas are considerably affected by previous agricultural, horticultural and residential developments. They are fragmented, disturbed, isolated and therefore, of reduced ecological value. A forest of large Douglas-fir stretches southwest from near 32nd Avenue towards the hydro corridor along Croyden Drive. On closer inspection this forest is a narrow strip (30-40 m wide) influenced by houses, yards and adjacent fields. Another group of Douglas-firs, just southeast along the hydro corridor, is isolated and fragmented by residential land use. Several large black cottonwood are present with red alders in a heavily disturbed area between residences at the corner of 32nd Avenue and Croyden Drive. While these sites may support a number of indigenous organisms, their contribution to the ecology of the area, and their potential to ensure breeding success to the greatest number of organisms, is probably small compared to the other sites discussed.

The small parcel of land located north of 32nd Avenue and south of the 32nd Avenue Diversion is heavily disturbed. The forest area between the two residences consist of a group of small black cottonwood, paper birch and red alder. Himalayan blackberry (*Rubus discolor*) is the dominant

shrub. Other shrubs include evergreen blackberry (*Rubus laciniatus*), hardhack and cascara. Trailing blackberry and creeping buttercup (*Ranunculus repens*) are common herb-layer plants. A group of Douglas-fir, about 25 m tall, are present around a house in the extreme northwest corner of the study site.

3.3.7 Disturbed Area

Most of the study area has been disturbed recently. Some of the disturbed areas have been discussed already, including the spruce plantation, fragmented and isolated forests or groups of trees in *Other Forests*, and young seral red alder forests. This section is therefore restricted to open areas, that is, areas of derelict grass (old fields) and shrubs. The two main occurrences of disturbed open areas are within the hydro corridor (photos 5 and 6, Appendix A) and within the small agricultural fields (photo 1, Appendix A) near the centre of the study area.

Land use within the hydro corridor is variable because of the number of private residences located along it. Much of it has been left to re-grow, some is strewn with rubbish, and some is used for livestock. Hardhack is the dominant and almost sole shrub in the northwest portion of the hydro corridor at 32nd Avenue and Croyden Drive. Among and around this very dense growth of hardhack are small black cottonwood and red alder, Himalayan blackberry and evergreen blackberry, common tansy (*Tanacetum vulgare*), reed canary grass (*Phalaris arundinacea*), Canada goldenrod (*Solidago canadensis*), Canada thistle (*Cirsium arvense*), and bracken fern. The hardhack thicket extends southeast along the hydro corridor to the driveway accessing 3080 Croyden Drive. Southeast of this, the ground is compacted and scarified. Common plants there include reed canarygrass, common tansy, Canada goldenrod, ribwort (*Plantago lanceolata*), and some Scots broom (*Cytisus scoparius*).

Farther southeast along the hydro corridor the ground is very wet and drains eastward into the south tributary. Reed canarygrass is very abundant in these wet fields. Other plants found in these fields and near the houses include Sitka willow (*Salix sitchensis*), red alder, hardhack, Scots broom, Himalayan blackberry, common St. John's-wort (*Hypericum perforatum*), Canada thistle, common rush (*Juncus effusus*), dovefoot geranium (*Geranium molle*), and broad-leaved peavine (*Lathyrus latifolius*).

Grass species dominated the plants found in the fields near the centre of the study area. Other plants common there include: Himalayan blackberry along edges, ribwort, Canada thistle, Canada goldenrod, creeping buttercup (*Ranunculus repens*), common tansy, and vetch (probably *Vicia americana*).

The following species grew around the buildings, among the fields and grasses of the residence within FB1: western red cedar, paper birch, red alder, bigleaf maple, English oak (*Quercus robur*), Indian-plum, coastal red elderberry, English ivy, English holly, miner's lettuce (*Claytonia perfoliata*) or Siberian miner's lettuce (*Claytonia sibirica*), Pacific bleeding heart, creeping buttercup, self-heal (*Prunella vulgaris*), stinging nettle (*Urtica dioica*), common periwinkle (*Vinca minor*), common dandelion (*Taraxacum officinale*), common foxglove (*Digitalis purpurea*), field chickweed (*Cerastium arvense*) and Japanese knotweed (*Polygonum cuspidatum*).

3.4 Wildlife

The following animals were observed during field work, November 6 and 7, 1997. Previous environmental reports on Rosemary Heights (ECL 1995, Williamson and Scott 1995, Urban Systems 1997) list additional species which may occur in the study area. Long distance migratory songbirds are an example of one group of animals that were not present during the current survey.

3.4.1 Mammals

A male black-tailed deer (*Odocoileus hemionus columbianus*) was observed during both field days, once at the southeast edge of the study area along Morgan Creek in FB1, and again near the headwaters of Titman Creek near FB3. A doe was seen in FB3.

A rabbit, probably the introduced Eastern cottontail (*Sylvilagus floridanus*), was flushed from the field adjacent to FB3.

Coyote (*Canis latrans*) scat is present along the hydro corridor and was noted in a field near the centre of the study area.

Tunnels among the base of grass and herbs in the fields indicate the presence of Townsend's vole (*Microtus townsendii*).

One Douglas' squirrel (*Tamiasciurus douglasii*) was heard in FB3.

3.4.2 Birds

3.4.2.1 *Of Forests*

Downy woodpecker (*Picoides pubescens*), black-capped chickadee (*Parus atricapillus*), golden-crowned kinglet (*Regulus satrapa*), winter wren (*Troglodytes troglodytes*), Bewick's wren (*Thryomanes bewickii*), bushtit (*Psaltriparus minimus*) were observed during the two field days.

3.4.2.2 *Of edges, hedgerows, fields*

Spotted towhee (*Pipilo maculatus*), dark-eyes junco (*Junco hyemalis*), song sparrow (*Melospiza melodia*), northwestern crow (*Corvus caurinus*) were observed in these habitats.

3.4.2.3 *Of passing interest*

Three swans, probably trumpeter swans (*Cygnus buccinator*) but possibly tundra swans (*C. columbianus*), flew over the study area November 7, 1997.

3.4.2.4 *Birds of Prey*

Two nests, believed to be those of Cooper's hawk (*Accipiter cooperii*), are present in FB1. Both are located in the crotches of the trunks of paper birch, about 6 m below the top of the crowns.

No red-tailed hawks (*Buteo jamaicensis*) or their nests were observed. This species probably uses the fields within the study area for hunting. In general, there are few good perching trees adjacent to the fields.

3.4.3 **Amphibians**

Two Pacific treefrogs (*Hyla regilla*) were heard in separate locations within the study area.

3.5 **Fish and Fish Habitat**

The proposed Rosemary Heights Business Park study area represents the headwaters of the Morgan Creek system. Morgan Creek is a tributary to Old Logging Ditch (also known as Kensington Creek) which flows to the Nicomekl River. Flow in the Morgan Creek/Old Logging Ditch system is generally in a northerly direction.

Two main watercourses are found within the Business Park study area. The larger of the two channels, Morgan Creek, flows from west to east along the southern border of the study area. Headwaters of Morgan Creek originate within the hydro right-of-way and roadside ditches, both of which parallel Croyden Drive (photo 5, Appendix A). The other watercourse is Titman Creek, an ephemeral creek that bisects a number of lots fronting on to 32 Avenue. Headwaters of Titman Creek originate within FB3 (photo 3, Appendix A). The confluence of Titman Creek with Morgan Creek is located east of the Titman property.

Fish distribution within the Morgan Creek/Old Logging Ditch system is dictated by the suitability of available habitats and the locations of obstructions and barriers to fish passage. The system sustains both resident and anadromous populations of salmonids. Movement of all species of fish is prevented by the presence of a control structure at the outlet of the cemetery pond located immediately east of the proposed Business Park location. An elevation difference of over 4 metres represents a complete barrier to fish passage.

The cemetery pond and reaches of Morgan Creek downstream are identified as Class A (red) on the City of Surrey stream classification map. This classification identifies watercourses which are inhabited by, or capable of being inhabited by, salmonids year-round. Reaches of Morgan and Titman Creeks upstream of the cemetery pond are designated as Class B (yellow) on the Surrey map, indicating that they are non-fish bearing but of importance in transporting nutrients to downstream fish-bearing reaches.

In this study, aquatic field investigations were conducted on November 6 and 7, 1997. The headwaters of both creeks were visually inspected and the majority of their lengths walked and assessed.

3.5.1 Fish Collections

No fish were captured or observed in the reaches of Morgan or Titman Creek during our November field inspections. Similar findings were documented for these reaches in July, 1995, although both rainbow and cutthroat trout were collected from the cemetery pond (NECS 1995). Urban Systems (1997) also did not electrofish, trap or observe fish in this system upstream of the cemetery pond.

3.5.2 Fish Habitat Characteristics

3.5.2.1 Channel Conditions

Within the study area Titman Creek extends for approximately 400 metres and is contained within a deeply incised ravine with bank heights of 2 - 4 m. The headwaters for this ephemeral watercourse is a shallow depression which originates just west of FB3 in a copse of red alder, salmonberry, and hardhack. The channel itself displays a relatively linear path as it travels eastward from the headwater to the confluence with Morgan Creek in FB1. The confluence is located downstream of the Titman property which comprises the eastern boundary of the study area. Gradients along the creek bed are moderate throughout (*i.e.*, 1 %) with several short sections of increased grade (up to 5%) occurring in the lower third, where the creek drops in elevation over a series of small falls (number of falls: 4; average drop 20cm). During our field investigation exercise, the wetted width of the creek ranged from 30 - 70 cm and had an average depth of 10 cm (range of 5 - 20 cm). Channel substrates of Titman Creek are mainly clay and gravel with large amounts of decomposing organic material along the lower third of the Creek. There were no visible signs of erosion or slope failure noted during our inspections.

Morgan Creek flows for approximately 800 m through a variety of vegetative and topographic zones on its course through the study area. Its headwaters originate within the open fields and roadside ditches of the hydro right-of-way in the southwest portion of the study area along Croyden Drive. From this point it travels, roughly northeast and meanders through forest blocks #2 then forest block #1. The confluence of Morgan and Titman Creek is located east of the study area boundary.

Channel gradients along Morgan Creek are low (< 1%). As the channel progresses from the headwaters it becomes larger and has cut a relatively, substantial ravine into the surrounding banks. This ravine has bank heights in the range of 2 - 4 m and the tops of the opposing banks are up to 20m apart in areas. Water depths observed during the course of our field investigations ranged from expanses of slow moving shallow water found in the depressions and undulations of the headwaters, to a well defined channel with a wetted width of 3 m and a depth of 50 cm at and east of the downstream study area boundary at the 156 Street unopened road allowance. Channel substrates are similar to those found within Titman Creek, with clay and gravel dominant, however, there were no deposits of organic material observed in Morgan Creek, presumably owing to the relatively higher

volume of water moving through the creek. There was one minor, but significant, erosional site observed. This is located at the south end of the Titman property (at the 156 Street road allowance) where livestock have unrestricted access to the creek for watering. The remainder of the channel flows through a well vegetated corridor which aid in controlling erosion.

3.5.2.2 *Riparian Habitats*

The riparian communities along Morgan and Titman Creeks have similar species assemblages. Stream-side vegetation is well developed along both creeks with red alder, and paper birch being the dominant tree species. Riparian understorey is composed of vine maple, coastal red elderberry, salmonberry and three species of fern (Sword, lady, and spiny wood fern). The dense canopy of vegetation provides complete shading to many reaches of both watercourses during spring, summer, and fall. This mature vegetation also provides abundant organic material (*i.e.*, leaf litter) which is important as a nutrient source to the Morgan Creek/Old Logging Ditch which are then available to fish populations downstream.

3.5.2.3 *Water Quality*

Water quality for both creeks can be described as clear, cool, well-oxygenated and of a moderately low specific conductance. Table 1 presents water quality measurements for both creeks. Water quality characteristics appear suitable to support life-stages of both resident and anadromous salmonid species at this time of year. Water quality values measured in both Morgan and Titman Creeks were within government limits established for the protection of aquatic health.

Table 1. Water quality field measurements for creeks on the Rosemary Heights property, November 6, 1997.

PARAMETER	MORGAN CREEK	TITMAN CREEK
Air temperature (°C)	12	14
Water temperature (°C)	12	12
Dissolved Oxygen (mg/l)	8.7	8.2
Conductivity (mS)	147	106
pH	7.1	7.1

3.6 Rare Species (Red- and Blue-listed Species¹)

The Conservation Data Centre (CDC) has no records of Red- or Blue-listed animals or plants within the study area. Their records indicate the presence of a great blue heron (*Ardea Herodias*) rookery about one kilometre northwest of the study area (B.C. Conservation Data Centre 1997). The study area offers few feeding areas for great blue herons. They may occasionally use the fields or areas of pooled water but these would not comprise major feeding sites. The Douglas-fir stands are most likely neither large enough, nor sufficiently isolated, to provide suitable nesting locations.

Barn owls have been recorded along the hydro corridor northwest of the study site (Scott Resource Services 1995). They may hunt in the fields within the study area and may nest within available, suitable buildings.

The CDC has reported a number of plants from historic and recent records which have been recorded for other areas of Surrey and Langley. None of these species were found in the study area.

No Red- or Blue-listed fish species have been reported for the study area by the CDC.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The proposed Rosemary Heights Business Park study area currently supports a number of significant environmental features and systems which should be considered in further planning phases of the area. Specifically, reaches of Morgan Creek and Titman Creek are found within or bordering the study area and sustain important habitat function for aquatic and terrestrial animals and plants. Both watercourses flow through moderately- to deeply-incised ravines which are vegetated with mature forest species. While neither watercourse support fish, these riparian corridors provide significant benefit to stream and ecosystem health by providing the following ecological function:

- stream shading on-site resulting in temperature regulation in downstream, fish-bearing reaches;
- a source of food items, such as terrestrial insects, which fall into watercourses and are consumed by fish, as well as a source of organic matter which provides food for aquatic insects which are then consumed by fish;
- filtering of sediments entrained in surface water runoff which would otherwise impact fish

The B.C. Conservation Data Centre explains Red-listed plants and animals as, "... any indigenous species or subspecies (taxa) considered to be Extirpated, Endangered or Threatened in British Columbia. Extirpated taxa no longer exist in the wild in B.C., but do occur elsewhere. Endangered taxa are facing imminent extirpation or extinction. Threatened taxa are likely to become endangered if limiting factors are not reversed. Red-listed taxa include those that have been, or are being evaluated for these designations." Blue-listed plants and animals include "... any indigenous species or subspecies (taxa) considered to be Vulnerable in B.C. Vulnerable taxa are of special concern because of the characteristics that make them particularly sensitive to human activities or natural events. Blue-listed taxa are at risk, but are not Extirpated, Endangered or Threatened." (B.C. Conservation Data Centre 1997).

- and fish habitat;
- maintenance of bank stability (*i.e.*, the reduction of bank erosion) through the consolidation of soils by root systems;
- habitat for a variety of wildlife; and
- corridor value for the dispersal and movement of animals, and the dispersal of plants.

Several upland forest areas are also found in the study area. These forest blocks provide cover, nesting and roosting sites, and foraging opportunities for a variety of animals found in the area. The protection of forested areas in Surrey, and the Lower Mainland, has become extremely difficult under the pressures of urban development. The reduction of numbers and areal extent of forest cover has increased the significance of remaining forest blocks.

No Red- or Blue-listed plant or animal species were observed or documented for the Rosemary Heights Business Park study area.

4.2 Recommendations

Based on the environmental characteristics of the site, and in consideration of the proposed industrial park, the following recommendations are made:

A. *Protect riparian corridors and establish leavestrips*

Based on the locations, topography and ecological function of study area watercourses and their attending riparian vegetation, these corridors should be protected from encroachment. As per the "Land Development Guidelines" authored jointly by the federal/provincial governments (Chilibeck 1992), leavestrips should be established along these watercourses/riparian corridors. Leavestrips should extend back from the high water mark or "top of bank" on both sides of the watercourses. The Land Development Guidelines require a leavestrip width (*i.e.*, setback) of 30 metres in areas of commercial/industrial development to protect area watercourses from the potential for increased impacts from higher utilization of land, more extensive areas of impervious surfaces, and contaminants used and/or stored on commercial/industrial properties. It is recommended that a relaxation of the leavestrip width be discussed with the regulatory agencies given that target tenants for the proposed business park development are "high end" executive clients. Given the large dimensions and the high density of vegetative cover of the existing ravines it is expected that relaxation of leavestrips to 15 metres, (or possibly smaller), would be appropriate for the protection of area watercourses in *some* locations. Reduced leavestrip widths, however will require commitments from the business park developer(s) to implement creative, state-of-the-art environmental management plans which address site layout (*e.g.*, building locations, road network, acceptable land uses), stormwater management, etc. which will ensure the protection of Titman and Morgan Creeks.

B. Retain at least some of the present forest blocks

FB1 is the best candidate for preservation because of its size, its insularity, its location at the confluence of Titman and Morgan Creeks, and its connection to the forest of large conifers east of the study area. Vegetation cover along Titman Creek is well developed and surprisingly free of invasive, introduced species. The upland forest of paper birch and red alder provides good cover and habitat for wildlife, and the tributaries within this block are rich in nutrients and other organic material. The two probable Cooper's hawk nests are the only potential raptor nests observed in the study area.

FB2 is less insular and more fragmented than FB1. Connectivity to FB1 within the study area is limited to a narrow band of vegetation along Morgan Creek which should be preserved. Outside the study area, the two forests are connected by a continuous forested area. If this outside forested area is compromised in future, connectivity between the forest blocks would be restricted to vegetation along the creek. The leavestrip width should therefore be maximized along Morgan Creek to optimize the maintenance of connectivity between FB1 and FB2, and the corridor and habitat values that it provides.

FB3, while small and affected somewhat by introduced species, has a great diversity of indigenous plants including the largest concentration of conifers (large Douglas-fir) among the three forest blocks. (As described in Section 3.3.6, the two groups of large Douglas-fir along the hydro corridor near 32nd Avenue and Croyden Drive are isolated, non-insular and disturbed by the buildings and clearings of residences.) For this reason, this forest block should be incorporated into site layout alternatives, where possible.

C. Consider the relocation of headwater reaches only

It is recommended that reaches of Titman and Morgan Creeks which are incised within ravines not be relocated or realigned. Some opportunity for relocation/realignment may occur in headwater areas of both systems to maximize developable area. Examples could include parts of the Stein and Morisawa properties along Titman Creek, and parts of the Armstrong and Raphael properties beneath the hydro right-of-way along Morgan Creek. All proposed modifications to the location/alignment of either channel would require approval by the Ministry of Environment, Lands and Parks, or the Department of Fisheries and Oceans.

D. Maintain water quality and quantity

During the field investigation exercise, water quality was described as clear, cool and well-oxygenated. The maintenance of high quality flows in Titman and Morgan Creeks is critical to sustaining populations of resident and anadromous fish species downstream of the impassable barrier at the cemetery. Measures should be incorporated into site-design and construction which will maintain existing quality standards by minimizing inputs of sediments and/or other deleterious substances.

Similarly, channel characteristics of Titman and Morgan Creeks have stabilized to the current flow regime of the study area. Modifications to the quantities of flow carried by each channel has the potential to negatively affect channel stability and water quality. Importing or exporting of flows to or from the Titman/Morgan Creek system should therefore be minimized.

E. Preserve some old field habitat

Where possible, areas of old field habitat should be preserved. Areas of the hydro corridor, for example, which may be of limited value could be retained as old field habitat. These habitats provide good foraging and hunting opportunities for wildlife.

4.3 Other Considerations for Planning and Development of the Rosemary Heights Business Park

In addition to the conservation of natural areas of Rosemary Heights through implementation of the recommendations described above, some general considerations which should be applied to all "natural areas" of the study area are provided below. These considerations should be addressed during the development of land use planning alternatives and scenarios in the Rosemary Heights business park.

While no development is seldom an option, careful development always is.

During the consideration of any development alternatives in the Rosemary Heights study area, consideration should also be given to the long-term effects on fish, wildlife and their natural habitats in the local and regional areas. Removal of natural habitats for any kind of development (e.g., residential, commercial, industrial, agricultural) produces a long-term, irreversible loss of that habitat. Reductions in biodiversity, natural processes, wildlife community characteristics, and ecosystem integrity almost always accompanies the loss of habitat.

Consider the interrelationship of species and habitat.

A development plan must consider not only individual plant and animal species, but also the significance of the interrelated environmental features on which they depend. A good example is the preservation of Cooper's hawk nest sites. If one or both of the nest sites found in Rosemary Heights are preserved and the surrounding habitat on which the birds depend for food is removed or altered, the birds will leave the area. This is, of course, not limited to the nests of Cooper's hawks but includes other wildlife, using the area. While it may not be possible to preserve all potential nest sites, a reasonable and favourable balance can be achieved by providing a suitable mosaic of developed and natural lands.

Consider the abundance of a certain habitat type (such as forest) within the area under review in the context of the larger, surrounding area.

Several forest blocks are found in the Rosemary Heights study area. By considering forest blocks or other habitats of the study area in isolation, these features may appear unimportant while they may be very important (rare) within a larger, regional context (e.g., within Surrey). A number of small

areas considered in this way may lead to the elimination of environmental features that did not appear important within the isolated, small area. The cumulative negative effect of these small, seemingly environmentally benign developments, therefore, has the potential to be considerable. Development plans for Rosemary Heights should consider the local and regional significance of a particular environmental feature. In addition to the examination of the individual merits of each feature, the remaining forest blocks should be considered in the context of the surrounding landscape.

Consider the importance of habitat corridors and connecting linkages.

Corridors and connecting linkages are critical to the integrity of a functioning ecosystem. Reaches of Titman and Morgan Creeks, and their vegetated ravines serve as an important linkages between core areas and other natural habitats within and beyond the Rosemary Heights study area. The hydro right-of-way also provides local and regional corridor function.

Natural features within urban landscapes should be viewed as assets and opportunities, not as obstacles to progress and development.

The City of Surrey is fortunate to have, within its municipal boundaries, a number of natural resources. These resources benefit the regional ecosystem of the lower mainland area, and are perceived by many residents to increase the attractiveness and liveability of an area. The remaining natural areas of the Rosemary Heights study area should be viewed in this light.

6.0 REFERENCES

- Abs, S, C. Berris, and A. Ferguson. 1990. Finding the balance: Environmentally Sensitive Areas in Surrey. Prepared for District of Surrey, Planning and Development Services.
- British Columbia Conservation Data Centre. 1997. Provincial Status List.
- Chilbeck, B. 1993. Land Development Guidelines for the Protection of Aquatic Habitat. Department of Fisheries and Oceans and BC Ministry of Environment, Lands and Parks.
- ECL. 1995. Environmental Overview of Rosemary Heights Central Neighbourhood, Surrey, B.C. ECL Project No.: 484-08. Prepared by Envirowest Consultants Ltd. Prepared for the City of Surrey.
- Fisheries Information Summary System (FISS). 1997. Department of Fisheries and Oceans, Vancouver, B.C. and B.C. Ministry of Environment, Lands and Parks, Victoria, B.C.
- NECS. 1995. Morgan Creek/Old Logging Ditch Master Drainage Plan Appendices. Prepared by New East Consulting Services Ltd. Prepared for City of Surrey Engineering Department.
- Pojar J., K. Klinka, and D.A. Demarchi. 1991. Coastal Western Hemlock Zone. **In.** Ecosystems of British Columbia. B.C. Ministry of Forests. Victoria, B.C.
- Urban Systems. 1997. North Grandview Heights - General Service Plan. Prepared for the City of Surrey.
- Williamson, J.I., and K.J. Scott. 1995. Preliminary Environmental Assessment for West Rosemary Heights Neighbourhood Concept Plan. Prepared by Scott Resource Services. Prepared for IBI Group, Vancouver, B.C.

**APPENDIX A:
REPRESENTATIVE SITE PHOTOGRAPHS**



Photo 1: Rosemary Heights Proposed Industrial Park. Looking east at FB1 from small field area. Note: black tailed deer.



Photo 2: Rosemary Heights Proposed Industrial Park. Looking west at alder forest in FB1 to the west of the Titman property on Morgan Creek.



Photo 5: Rosemary Heights Proposed Industrial Park. Looking east along hydro corridor. Headwater of Morgan Creek in foreground.

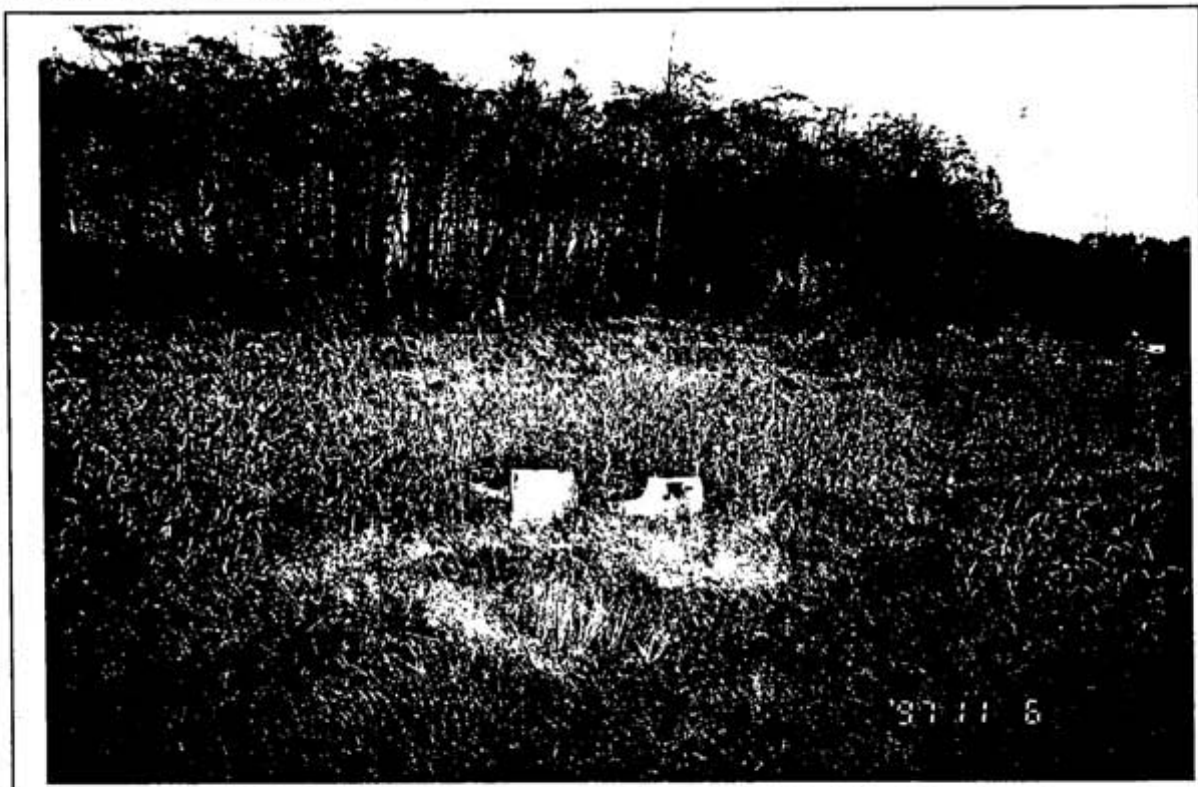


Photo 6: Rosemary Heights Proposed Industrial Park. Looking north at FB2 from hydro right-of-way.



Photo 3: Rosemary Heights Proposed Industrial Park. Headwaters of Titman Creek in FB2.



Photo 4: Rosemary Heights Proposed Industrial Park. Looking south at trail crossing on Morgan Creek at 156 Street right-of-way. Also, location for minnow trap.




DILLON
 CONSULTING
 DATE JANUARY 1999

TITLE
 Natural Features
 Proposed Rosemary Heights Industrial Park

PROJECT NO
 97-4800-01
 FIGURE NO
 2

ROSEMARY HEIGHTS TOP-OF-BANK INVESTIGATION

February 15, 1999



Submitted to

City of Surrey
Engineering Department
14245 - 56th Avenue
Surrey, B.C.
V3X 3A2

Submitted by

Dillon Consulting Limited
130-10691 Shellbridge Way
Richmond, B.C.
V6X 2W8
Tel. (604) 278-7847
Fax. (604) 270-3644

TABLE OF CONTENTS

	Page
1.0 INTRODUCTION	1
2.0 STUDY AREA	2
3.0 APPROACH	4
3.1 Background Mapping	4
3.2 Field Investigations	4
4.0 RESULTS	5
4.1 Location of TOB and Associated Setbacks	5
4.2 Opportunities for Setback Relaxation, Expansion, and Restoration	5
4.3 Developer Commitments	8
5.0 SUMMARY AND CONCLUSIONS	11
6.0 REFERENCES	12

LIST OF FIGURES

Figure		Page
1	Location of the Rosemary Heights study area within the City of Surrey	3
2	Top of bank and 15 and 30 meter setbacks for the Rosemary Heights study area	6
3	Proposed areas for setback relaxation and expansion for the Rosemary Heights study area	7
4	Overall developable area with implementation of proposed setback modifications	9

LIST OF TABLES

Table		Page
1	Summary of proposed areas for setback relaxation, expansion, and restoration	8

1.0 INTRODUCTION

The City of Surrey is currently developing a Neighborhood Concept Plan (NCP) in the Rosemary Heights area of the City to consider the future development of a business/industrial park. The purpose of the Rosemary Heights NCP is to develop a comprehensive land use, servicing, and financial plan which, once approved, will provide the basis for the subsequent review and approval of rezoning and subdivision applications received by the City.

As development proceeds in the Rosemary Heights area, riparian setbacks will need to be established along the watercourses of the study area as per the "Land Development Guidelines", a joint publication of DFO and MoELP (Chilibeck *et al.* 1993). Riparian setbacks are critical to the maintenance of a healthy aquatic environment, by providing food and nutrient sources, water temperature regulation, buffers for surface water runoff, stream cover, and streambank stability. Setbacks also help protect private property from flooding and potential loss of land due to stream erosion and instability.

Setbacks or leavestrips should extend back from the high water mark or "top of bank" on both sides of a watercourse. The Land Development Guidelines require a riparian setback of 30 m in areas of commercial/industrial development to protect area watercourses from the potential for increased impacts from higher utilization of land, more extensive areas of impervious surfaces, and contaminants potentially used and/or stored on commercial/industrial properties. Residential/low density development requires a minimum setback of 15 m.

Due to the location of existing drainage pathways on the site, the amount of developable land is significantly reduced and becomes considerably fragmented by the setback requirements of environmental agencies. In some areas of the NCP study area it was unclear where the top-of-bank (TOB) was located and hence, the potential amount of developable area was uncertain. Arguments have also been developed which support the relaxation of setbacks in some areas and/or the swapping of setback relaxations in one area for setback expansions in other areas. For this reason, Dillon Consulting Limited was retained by the City's Engineering Department to delineate TOB of study area watercourses and the limits of the 15 and 30 m setbacks.

Specific project objectives were:

- to physically identify and mark/delineate in TOB and 15 and 30 m setbacks;
- to produce a digital basemap of the study area, based on the field investigations, which shows the locations of TOB and 15 and 30 m setbacks; and
- to summarize the findings in a brief report, including the identification of areas for possible riparian setback relaxation and expansion.

2.0 STUDY AREA

The Rosemary Heights area is located in the south-central Surrey and is roughly bounded by Highway 99 to the south, 152 Street to the west, 32 Avenue to the north, and 156 Street to the east (Figure 1).

The proposed study area is relatively small (64 ha) and dominated by large residential properties. Only two parcels of land in the study area are given a rural zoning classification. Suburban development comprises the remaining portion of the study area.

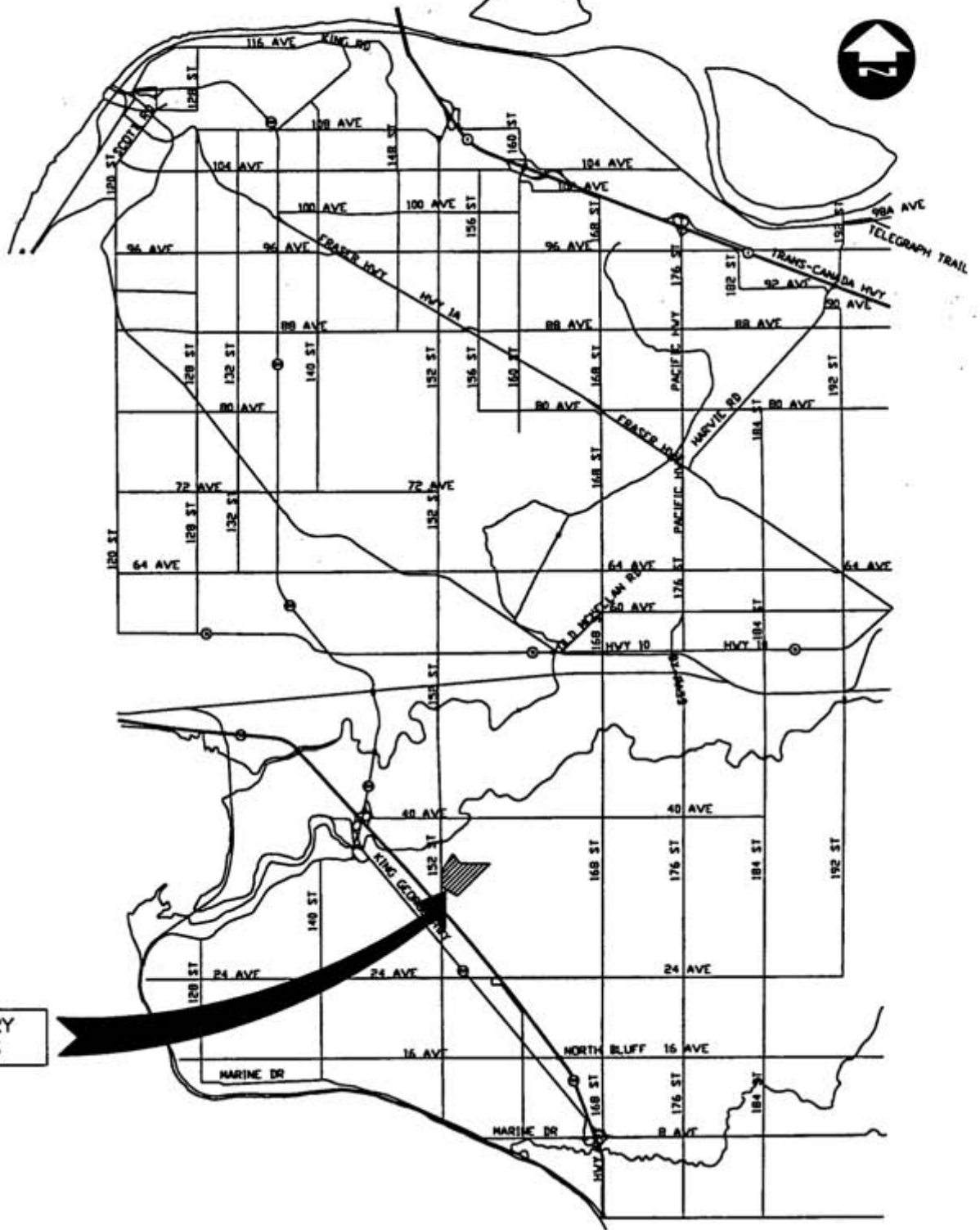
Two small streams are located on the property: Titman and Morgan Creeks. They are both headwater tributaries to the Nicomekl and flow from west to east across the study area. Previous studies have revealed that no fish are present within the study area, however the waters are considered Class B (i.e., yellow-coded) according to the City of Surrey Stream Classification Guidelines. Class B indicates that they provide valuable food and nutrient inputs to downstream salmonid-bearing waters. Movement of all species of fish into watercourses of the study area is prevented by the presence of a control structure at the outlet of the cemetery pond located immediately east of the proposed Business Park location. The elevation difference at this structure is over 4 m.

The larger of the two watercourses, Morgan Creek, generally flows from west to east along the southern and eastern borders of the study area. The headwaters of the creek originate at two locations in the hydro right-of-way, which runs parallel to Croyden Drive. The channels eventually become larger forming a ravine with bank heights between 2 and 4 m. Channel gradients are generally quite low (< 1%).

Titman Creek is an ephemeral watercourse which bisects several properties along 32nd Avenue. The Creek extends approximately 400 m within a deeply incised ravine with bank heights of 2 to 4 m. The Creek is characterized by moderate gradients along its length in the study area (approximately 1%), although there are several short sections of increased grade (up to 5%) in the lower third of the creek. Titman Creek joins with Morgan Creek to the east of the Titman property.

Riparian habitat consists of tree species such as red alder (*Alnus rubra*) and paper birch (*Betula papyrifera* var. *commutata*), and understorey vegetation such as vine maple (*Acer circinatum*), coastal red elderberry (*Sambucus racemosa* ssp. *Pubens* var. *arborescens*), salmonberry (*Rubus spectabilis*), and ferns (*Athyrium* spp.).

Vegetation on the site is quite variable and includes small forest blocks and small clearings in various stages of disturbance. The majority of non-forested area consists mostly of old field, shrub, young alder stands. Detailed descriptions of all vegetation communities are presented in a recent bio-inventory report for the area (Dillon Consulting Limited and Strix Environmental Consulting 1998).



ROSEMARY HEIGHTS

SCALE: N.T.S.



DATE JANUARY 1999

TITLE

LOCATION OF ROSEMARY HEIGHTS STUDY AREA

PROJECT No.
98-5668

PROJECT

ROSEMARY HEIGHTS TOP OF BANK SURVEY

FIGURE NO.
1

3.0 APPROACH

3.1 Background Mapping

Background maps, consisting of both 1:2500 orthophotos and contour maps, were reviewed prior to initiating the field survey to provide an initial understanding of study area topography, and the location of TOB. Information obtained from basemaps included:

- site access points;
- location of property and fence lines, hydro right-of-way, etc.;
- location of buildings such as houses, barns, sheds, etc.;
- extent of existing vegetation and forest cover.

3.2 Field Investigations

Detailed field investigations were completed on October 15, 16, and 28, 1998. The location of TOB and the limits of the 15 and 30 m setbacks were determined at approximately 20 to 30 m intervals along each bank of each watercourse. The frequency of setback measurements was dependent on site-specific features within a particular section of the watercourse. Generally fewer measurements were taken in areas which were characterized by relatively homogeneous topography.

All points were marked with labeled wire survey pins and flagging tape. The location of each measurement was positioned according to existing discrete site features such as fences, buildings, etc. and transferred in the field to a large scale map.

The locations of all TOB measurements were subsequently transposed to a digital map using AutoCad.

4.0 RESULTS

4.1 Location of TOB and Associated Setbacks

The location of TOB was determined at over 100 locations in the study area during the detailed field investigations. Figure 2 illustrates the locations of individual TOB measurements, as well as the locations of TOB, 15 and 30 m setbacks for Titman and Morgan Creeks.

Based on a riparian setback of 30 m from TOB, the area available for development is approximately 190,500 m². With a 15 m setback, the area increases to an estimated 226,000 m².

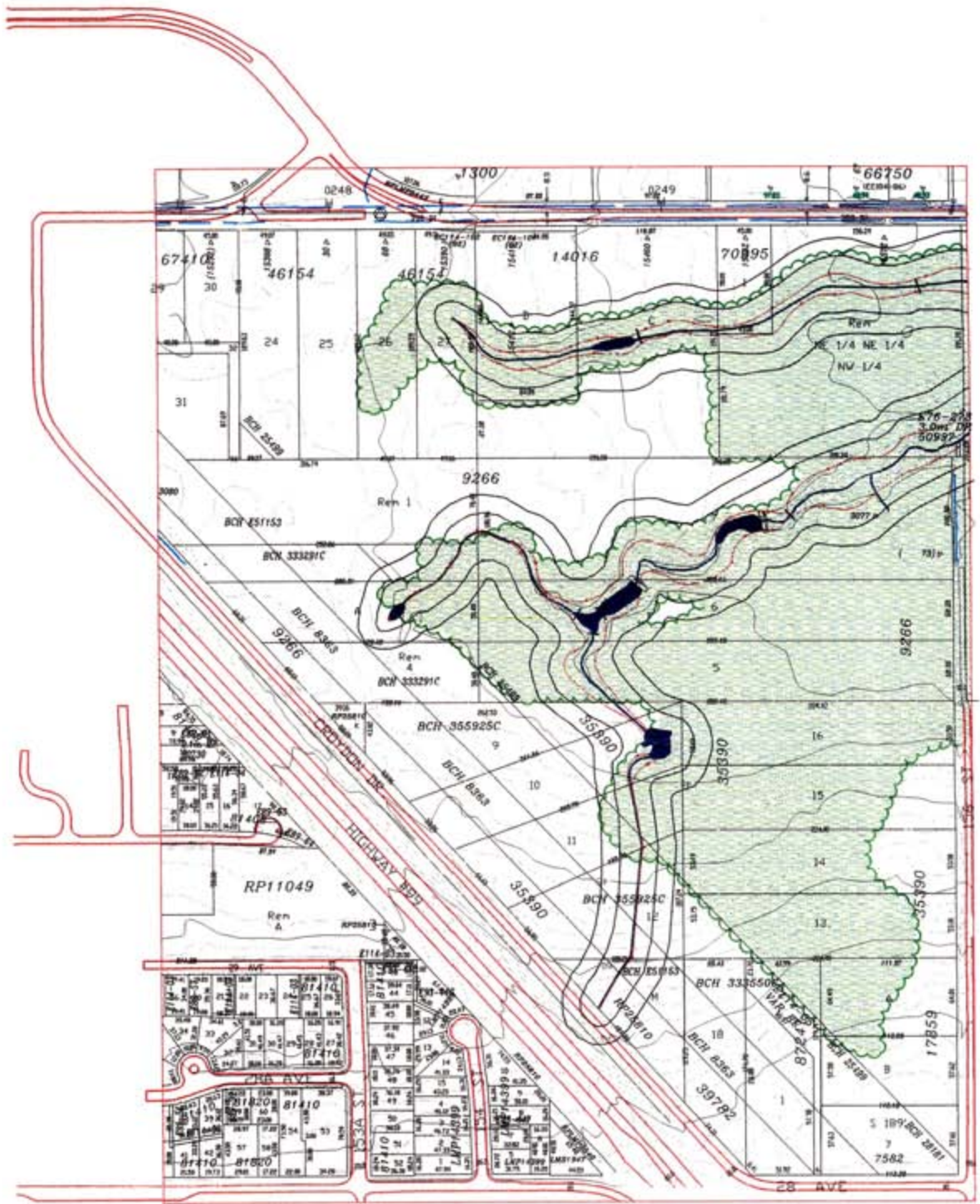
4.2 Opportunities for Setback Relaxation, Expansion, and Restoration

The final objective of this assessment was to identify areas where potential modifications could be made to riparian setbacks at the proposed Rosemary Heights Business Park, including areas for setback relaxation and expansion, as well as riparian habitat restoration (Figure 3). This was considered a key component of this investigation, given that the establishment of TOB and identification of areas for setback modification is extremely important at the early planning level, as it provides "big-picture" consideration for the development of the overall site.

Relaxation of some riparian setbacks have been proposed to improve the functional development area of the proposed business park without compromising the important values of study area watercourses in providing a source of nutrients and flows of a quality suitable to downstream fisheries resources. Although relaxation of the 30 m setback has been recommended in some locations of the business park, encroachment within the 15 m riparian setback was not considered at any location. In almost all cases the proposed areas for setback relaxation are restricted to areas where extensive tree cover does not currently exist.

Concurrent with proposed setback relaxations, areas have also been identified where increased riparian setbacks beyond 30 m could be considered. These areas would provide compensation for areas of setback relaxation. Attempts were made, where possible, to identify potential areas for setback expansion in areas with significant tree cover (e.g. Titman Property). This was considered extremely important given the importance of these areas for wildlife, as well as for downstream fish populations (sources of terrestrial insects, leaf litter/nutrient inputs, temperature regulation). The preservation of areas of significant forest habitat also fits with recommendations of the Rosemary Heights Bio-Inventory Report (Dillon and Strix 1998).

Areas for proposed riparian habitat restoration within the 15 m setback were also identified. These are areas that have been cleared of vegetation (shrubs, trees, etc.) and as such are not providing their full riparian function. In most cases, the areas proposed for habitat restoration (i.e. planting) are adjacent to areas where setback relaxations have been proposed. The restored riparian habitat will protect adjacent watercourses from any potential development impacts.



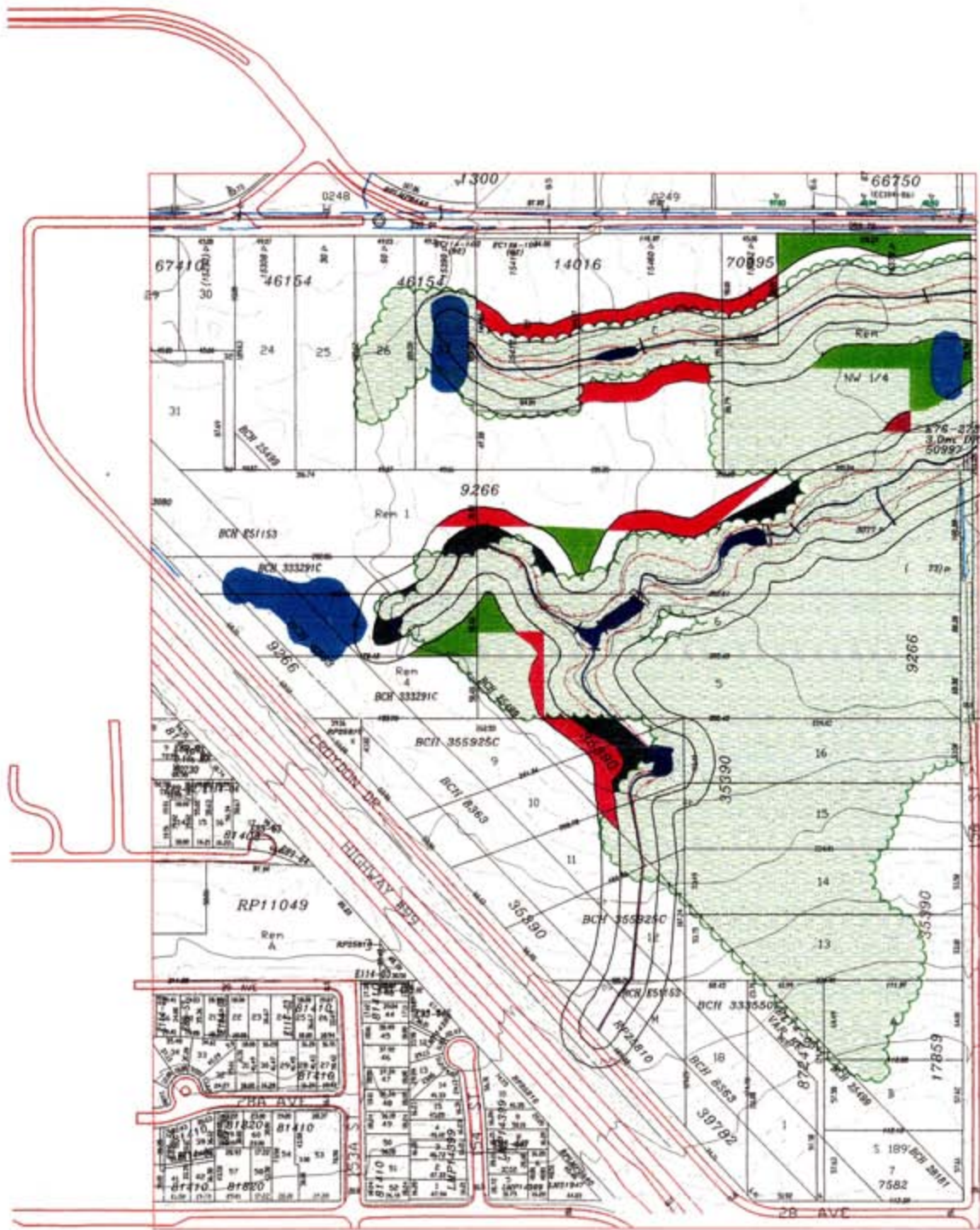
FILENAME: FULLMAP3.DWG
 DWG NO:
 SCALE:
 DRAWN BY: SKY



PROJECT TITLE
 ROSEMARY HEIGHTS STUDY AREA
 DWG TITLE
 TOP OF BANK AND 15 AND 30 METER
 SETBACKS



PROJ. NO.
 98-5668
 FIG. NO.
 2





LEGEND

 AREAS FOR PROPOSED SET-BACK RELAXATION	 TOP-OF-BANK
 AREAS FOR PROPOSED SET-BACK EXPANSION	 15m AND 30m SET-BACKS
 AREAS FOR POTENTIAL RIPARIAN ZONE ENHANCEMENT	
 EXISTING PONDS	
 PROPOSED STORMWATER PONDS	
 FORESTED AREAS	

FILENAME: FULLMAP2.DWG		PROJECT TITLE	PROJ. NO.
DWG NO.		ROSEMARY HEIGHTS STUDY AREA	98-5668
SCALE:	SURREY 2015	DWG TITLE	FIG. NO.
DRAWN BY: SKY		FEBRUARY 1999	PROPOSED AREAS FOR SETBACK RELAXATION AND EXPANSION
			

In anticipation that some flexibility with the setback requirements will be considered by the agencies, Table 1 on the following page provides a summary (balance sheet) of proposed areas for setback relaxation, expansion, and restoration. The example provided results in a net gain of treed habitat (3,226 m²) and a net loss of non-treed habitat (2,147 m²). Overall, this example results in a net habitat gain of almost 1,100 m² (Table 1), and an overall developable area of approximately 191,500 m² (Figure 4).

Table 1: Summary of proposed areas for setback relaxation, expansion, and restoration

	Area with existing tree cover (m ²)	Area without extensive tree cover (m ²)	Total area (m ²)
Riparian encroachment within 30 m setback	957	8046	-9003
Riparian expansion outside 30 m setback	4183	3096	+7279
Areas for habitat enhancement within 15 setback	na	2803	+2803
Net Loss/Gain	+ 3226	-2147	+1079

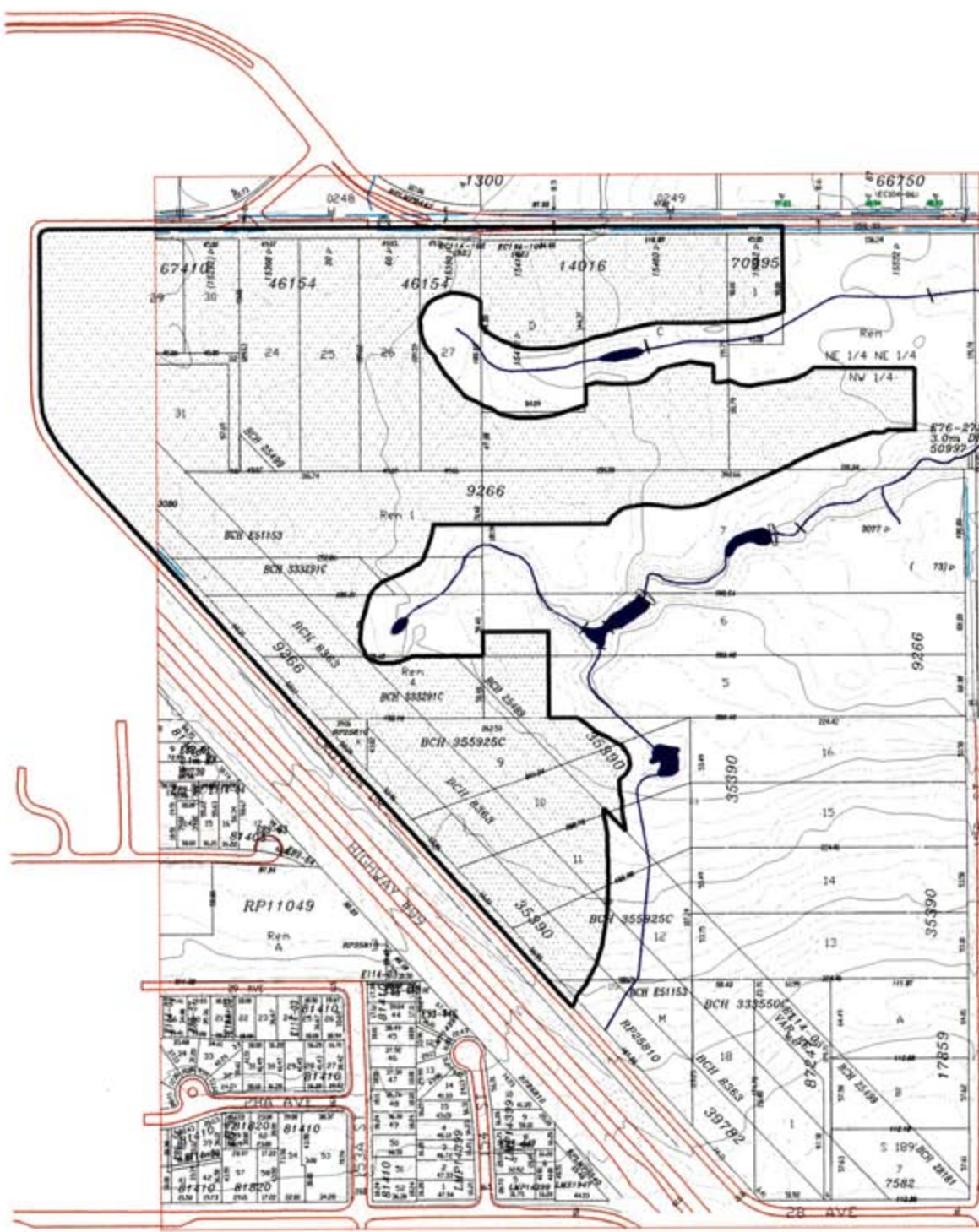
- Notes: 1. "-" = loss, "+" = gain
2. summary does not include areas for proposed stormwater retention ponds or roads

4.3 Developer Commitments

It was recognized that any reduction in the size of riparian setbacks would require commitments from the business park developer(s) to ensure the protection of Titman and Morgan Creeks, as well as the maintenance of habitat integrity of the study area.


These commitments would include:

- the implementation of creative, up-to-date environmental management plans which address development considerations such as site layout (e.g. building locations, road network, acceptable land uses), stormwater management, etc.;
- the placement of restrictive covenants on riparian areas;



LEGEND

- EXISTING PONDS
- OVERALL DEVELOPABLE AREA

FILENAME: FULLMAP4.DWG DWG NO.: SCALE: DRAWN BY: SKY	 FEBRUARY 1999	PROJECT TITLE: ROSEMARY HEIGHTS STUDY AREA DWG TITLE: OVERALL DEVELOPABLE AREA WITH IMPLEMENTATION OF PROPOSED SETBACK MODIFICATIONS	PROJ. NO.: 98-5668 FIG. NO.: 4
---	--	---	-----------------------------------



- the identification and implementation of opportunities for habitat enhancement and restoration (e.g. see previous discussion for riparian enhancement within the 15 m riparian zone). Habitat enhancement/restoration activities would be implemented as part of proposed developments at a particular site, and would incorporate natural plant and tree species as per MoELP's Recommended Native Tree and Shrub Species for Restoration and Enhancement of Fish and Wildlife Habitat; and DFO/MoELP's Guide to Riparian Revegetation;
- fencing requirements to protect riparian areas; and
- further, standard environmental approvals for site development.

5.0 SUMMARY AND CONCLUSIONS

Although neither of the on-site watercourses support resident fish populations, it is recognized that these riparian corridors are of significant importance to overall stream function and health. Ecological functions provided by the riparian zone include stream shading (temperature regulation), food source (terrestrial insects and organic matter), and sediment filtration (surface runoff/improved water quality). The importance of local watercourses is reflected in the considerable effort and financial resources have been invested in Morgan Creek downstream of 32 Avenue for the protection and enhancement of fish habitat. The riparian areas and existing forest habitats on site also provide important habitat for various birds and mammals (nesting, roosting, foraging, etc.).

This study identified TOB and associated 15 and 30 m setbacks for Titman and Morgan Creeks. Based on a riparian setback of 30 m from TOB (as per the Land Development Guidelines), the area available for development within the Business Park is estimated at approximately 190,500 m², although given the location of existing drainage pathways on the site, the actual amount of "developable" land is likely considerably lower as a result of fragmentation due to setback requirements.

For this reason, the TOB mapping was subsequently used to identify potential areas/opportunities for riparian setback relaxation and expansion within the study area. These opportunities also included, where appropriate, the identification of areas within the 15 m setback where planting and other restoration activities could potentially restore functional riparian habitat.

The implementation of the proposed setback modifications (both relaxations and expansions) results in an increase in the functional "developable" area of the proposed business park without compromising the important values of study area watercourses. Overall available area within the business park, with the implementation of setback modifications, is approximately 191,500 m², almost identical to the area found with a 30 m setback.

6.0 REFERENCES

Chilibeck, B., G. Chislett and G. Norris. 1993. Land Development Guidelines for the Protection of Aquatic Habitat. Department of Fisheries and Oceans and the Ministry of Environment, Lands, and Parks. 128 pgs

Dillon Consulting Limited and Strix Environmental Consulting. 1998. Rosemary Heights Business Park Bio-Inventory Report. Report prepared for the City of Surrey, Planning and Development Department, May 5, 1998. 21pgs + Appendix.



Fisheries
and Oceans

Pêches
et Océans

Department of Fisheries & Oceans
610 Derwent Way
New Westminster, B.C.
V3M 5P8

Your file Votre référence

March 15, 1999

Our file Notre référence

Wendy Whelen, Senior Planner
City of Surrey
14245 - 56th Avenue
Surrey, B.C.
V3X 3A2

Dear Ms. Whelen,

RE: ROSEMARY HEIGHTS BUSINESS PARK LAND USE PLAN

Thank you for the opportunity to review the subject plan. It is our understanding that the City would like the Department of Fisheries & Oceans to comment specifically on the proposed setback reductions in the plan. DFO endorses these higher level planning initiatives and agree that setbacks should be defined at this early stage. As you are aware, the setbacks defined in the document "Land Development Guidelines for the Protection of Aquatic Habitat" (LDG) are intended to provide **minimum** setback requirements to sustain fish habitat. Relaxations are only considered where two conditions are met. First, the land use for which the area is already zoned is unachievable if the minimum setbacks are imposed. Second, there must be biological justification for a reduced setback (i.e. a very highly impacted site with poor fish habitat values where the redevelopment of land would improve habitat productivity).

As compensation for the proposed setback relaxations from 30 metres to 15 metres, the plan indicates that several areas outside of the 30 metre fisheries sensitive zone (FSZ) will be protected. However, we note that these areas have less fish habitat value due to their distance from the creek and therefore do not provide sufficient habitat compensation. Planting within denuded riparian areas does provide habitat value, but the preservation of a significant riparian leave strip is of far greater value than replanting within a small setback area. Large setback areas, even without replanting, will regenerate naturally over time.

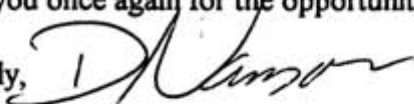
In addition, DFO and the City should proceed cautiously where a proposed setback relaxation is justified on the basis of poor existing habitat values. By giving relaxations on sites where the land owner has previously altered the stream and/or riparian habitat, a perception may be created that those who have altered fish habitat get rewarded with more redevelopable land. In this regard, it is DFO's general opinion that the City should be very strict with setbacks by being consistent with the LDG's.




Should the City wish to pursue the issue of setback relaxations and sufficient justification can be provided for such action, we recommend that the land use plan identify parameters within the watershed which limit fish productivity and focus on a watershed prescription to remedy these limitations. In this regard, DFO and the City of Surrey may wish to enter into an agreement whereby setback reductions occur in certain areas where justification can be provided, but that fish habitat is generally restored within the watershed resulting in a clear gain in habitat value. Under such an agreement, DFO would need a restoration plan complete with timelines for completion. We assume that the City would be the proponent for any such restoration project and could provide certainty on the long term protection of the stream and riparian corridor.

Thank you once again for the opportunity to comment on this plan.

Sincerely,



 Bruce J. Reid, R.P.Bio.
Head, Land Use Section
Habitat Enhancement Branch
Fraser River Division

cc: D.Nanson, DFO
M.Stratholt, BCE

APPENDIX V

Synopsis of the Engineering Consultant's Report



SYNOPSIS OF THE CONSULTANT'S REPORT.

The information contained in the Consultant's report is based on existing information and is intended as a conceptual level servicing plan.

Sanitary Sewer

[Attached Sketch 1]

The business park area is divided into eastern and western catchments by a low ridge of land which traverses the site along a north-westerly line.

Development within the western catchment consisting of some 8.0 hectares is dependent on the extension of sewers westward, through West Rosemary Heights. It is possible - as an interim measure - to connect this catchment to the system for the Central Rosemary Heights until such time as the ultimate system progressively develops in the West Rosemary Heights.

Development of the eastern catchment, comprising of some 9 hectares, could proceed by connecting to the existing system on 32 Avenue. Both the existing sewer system and Morgan Creek Pump Station No. 2 were sized to accommodate this industrial wastewater component.

On-site, a private lift station is proposed to service a "tongue" of land situated between the north and south branches of Wills Brook (please see Sketch 1). This tongue area needs to be consolidated and developed as one "strata-titled" lot with frontage on a City sewer within the cul-de-sac, so that it can develop with an on-site sewage pump station, owned, operated and maintained by the strata-corporation.

All sewer works required to develop this NCP area are local 'frontage' services (i.e., not "trunk") and, therefore, will be at cost to the developer.

Water

[Attached Sketch 2]

There are no off-site major infrastructure requirements to service the NCP area with water. The site is adequately serviced with off-site trunk mains and only the local distribution mains are required.

All water works required to develop this NCP area are local 'frontage' services and will be at cost to the developer.

Traffic & Transportation

[Attached Sketch 3]

A detailed traffic operations analysis has not been undertaken and would be required to determine intersection laning, traffic controls and other traffic operations requirements. This analysis cannot be undertaken until an accurate estimate is available of future development within the business park.

The key features of the road network include:

- Croydon Drive and Old 32 Avenue would provide access to and through the site. These would be two-lane roadways (with additional turn lanes at the 32 Avenue intersection as

required), and would be classified as collector roads in accordance with the Grandview Heights Neighbourhood Community Plan.

- Old 32 Avenue would be realigned to intersect with 32 Avenue at the signalised 154 Street intersection.
- Access to most properties within the business park would be via two internal roadways, to be constructed to 'industrial - local' standard. Properties in the north-west corner of the site would access Old 32 Avenue directly.

Traffic Operations

Considerations which should be addressed as part of a traffic operations review include:

- Laning at the signalised Old 32 Avenue/154 Street/32 Avenue intersection. In particular, the need for a dual northbound-to-westbound left turn lane should be considered.
- Vehicle storage length requirements at the signalised Old 32 Avenue / 154 Street / 32 Avenue intersection, and the spacing of the frontage road intersection on Old 32 Avenue. At minimum, this spacing should be not less than 120 metres to allow for full movement from the frontage road.

Other Transportation Modes

Access to the business park by transit would be possible in three ways:

- The proposed Park-and-Ride, to be located on the west side of 152 Street between Highway 99 and 32 Avenue. The Park-and-Ride facility would be served by local South Surrey and White Rock buses, as well as express buses to Surrey City Centre and destinations along Highway 99 and 91.
- Transit services operating on 152 Street. Bus stops would be located at 32 Avenue, as well as at the Park-and-Ride facility.
- Possible transit service operating through the business park via Croydon Drive and 28 Avenue. This service would likely only be implemented when the South Grandview Heights area is redeveloped to an urban density.

Croydon Drive and Old 32 Avenue are proposed to be constructed to Surrey's current 'industrial-collector' road standards, which incorporate wide curb lanes for cyclists.

Within the business park, the most important bicycle facilities would be end-of-trip facilities such as secure bicycle parking, short-term bicycle parking, showers, lockers and change facilities. These should be provided in accordance with the requirements identified in the City's *Bicycle Blueprint*.

In order to accommodate pedestrians (including transit users walking to/from bus stops), sidewalks are proposed on both sides of Old 32 Avenue and Croydon Drive, and on at least one side of other internal streets.

Stormwater

[Attached Sketch 4]

A comprehensive storm water study was included as part of the engineering study. As shown, the plan consists of on-site detention. The details of the finding are included in the engineering report. This plan is a revision to the Morgan Creek Master Drainage Plan reflected in the current 10 Year Servicing Plan. The community detention pond required for the existing urban areas upstream of Hwy. # 99 is relocated from 32 Ave./156 St. to the City-owned land within the BC Hydro right-of-way.

Existing topography of the Rosemary Heights Business Park dictates that drainage for the area be divided into two primary catchment areas. Taking into account the alignment of the 32 Avenue interchange with Highway 99, an estimated 8.0 hectares of the Business Park area will drain north-west and be serviced by the storm sewer on 152 Street, ultimately discharging directly to the Nicomekl River. The remaining 24.8 hectares of the study area will drain east to Morgan (Titman) Creek.

Riparian Corridors

Riparian corridor setbacks on creeks have been established through the completion of a top-of-bank survey initiated directly by the City of Surrey and completed independently of this NCP report. The riparian corridors have been shown with a 30-metre setback, in accordance with the Ministry requirements for commercial / industrial development.

Land Uses

The sizing of storm water infrastructure has been based on commercial / industrial land uses for all developable lands within the NCP boundary. Land uses for lands outside of the NCP have to be obtained either from the Central Rosemary Heights NCP report, or the current Official Community Plan.

Topography and the alignment of the riparian corridors will limit the opportunity to service all development with community detention facilities; therefore, the use of on-site detention will be required in certain areas.

Even for those areas which may be serviceable with a community detention facility, the specific form and location of the detention facility may need to be revisited by the developers.

Although overall objectives remain consistent, the nature of the proposed development and various site constraints limit the ability to apply a single "blanket strategy" for storm water management to all areas of the Business Park.

Best Management Practices [- 'BMPs']

The specific businesses within the park are not yet known, but it is predicted that sediments, heavy metal and oils and greases characteristic of parking areas will be of concern. The pavement surface within the development is expected to be comparatively extensive; therefore, a regular pavement sweeping and catch-basin cleaning program would also provide significant control of pollutants washed from the site.

While the soils conditions in the area may not be conducive to rapid infiltration, the opportunity to provide on-site infiltration trenches or dry wells must be reviewed by the proponent(s) at the development application stage.

Environmental Issues

Environmental issues, except for the fishery requirements for storm water management and other engineering infrastructure, have been addressed separately by the Planning and Development Department. A top of bank survey was completed by the Planning and Development Department.

The City held meetings with B.C. Environment and Fisheries & Oceans to review the storm water management plan for NCP. The proposed storm water management plan addresses comments received through the review of the Morgan Creek Master Drainage Plan.

Development Phasing

Phase 1(a) of the plan can develop, from a servicing perspective, without any new major DCC infrastructure. This Phase will require a significant investment in infrastructure by the development community in local and on-site works. This Phase can be supported by the existing sanitary sewers developed along 32 Avenue. Water servicing for this area is dependent upon local water mains being built as development occurs. Stormwater detention and storm water quality BMP's will be required of development in this area. The ponds identified for this area are not community ponds. The proposed local cul-de-sac and strata road will be built by the development community as this area develops off Croydon Drive.

Phase 1(b) is also ready to develop subject to the construction of sanitary sewers and storm drainage north along 152 Street and a storm drainage diversion at 36 Avenue including the 152 Street outfall to the Nicomekl River. These works are classified as local works which the developers will need to construct. These works are also required for the West and Central Rosemary Heights NCP's. The existing road network can service this area subject to modifications. The proposed traffic signal at 154 Street was previously identified in the Central Rosemary Heights NCP.

The proposed community detention pond located in the B.C. Hydro right-of-way is necessary to service a large catchment outside the boundaries of this business park. The timing of this pond is dependent on the servicing needs of an area south of the business park, outside the NCP.

The area, east of Croydon Drive and generally south of the projected 30 Avenue, has been identified for a future role in the business park. Until such time that the North Grandview Sanitary Interceptor is in place, this area will not have access to a sanitary sewer which would permit business park development at this time. The area is further constrained by the existing creeks, riparian setbacks and the B.C. Hydro towers and transmission lines. The general servicing plan contained in this report will service this unique area once the sanitary interceptor sewer is built. The timing of this sewer is not known at this time.

Financing

The major off-site works identified to service the business park are contained within the current 10 year Engineering Servicing Plan or have been previously identified in either the Central Rosemary Heights or Grandview NCP's. The most significant cost includes the Grandview North Sanitary Interceptor. The business park does not require any additional independent DCC infrastructure to support the proposed land use save for its contributions for the major DCC infrastructures required for the adjoining larger NCPs. The necessary infrastructure is classified as local servicing which is the responsibility of the development in the area.

For storm drainage, the changes - noted in the Table below, will need to be incorporated the current servicing plan. The proposed development within the business park will provide sufficient DCC to finance its share of the DCC financed infrastructure.

Table

Project ID	Project	Status	(\$ DCC	(\$ Utility	Comment
3956	Old logging ditch	In 10 Yr.	402,000	198,000	- keep
13717	trunk	In 10 Yr.	(740,000)		- delete
13772	trunk	In 10 Yr.	(340,000)		- delete
13718	det. pond	In 10 Yr.	(970,000)		- delete
New	det. pond	New Item	+ 562,500	1,312,500	addition
New	1200 trunk	New Item	+1,576,080	525,360	addition
Net change			+ 88,580	+ 1,837,860	




AL\km







Supporting Documentation:

Report - 'Rosemary Heights Business Park Neighbourhood Concept Plan'
prepared by Urban Systems Consultants Ltd.

(This report is bound separately, kept in the Engineering Department and available for reference.)

LEGEND

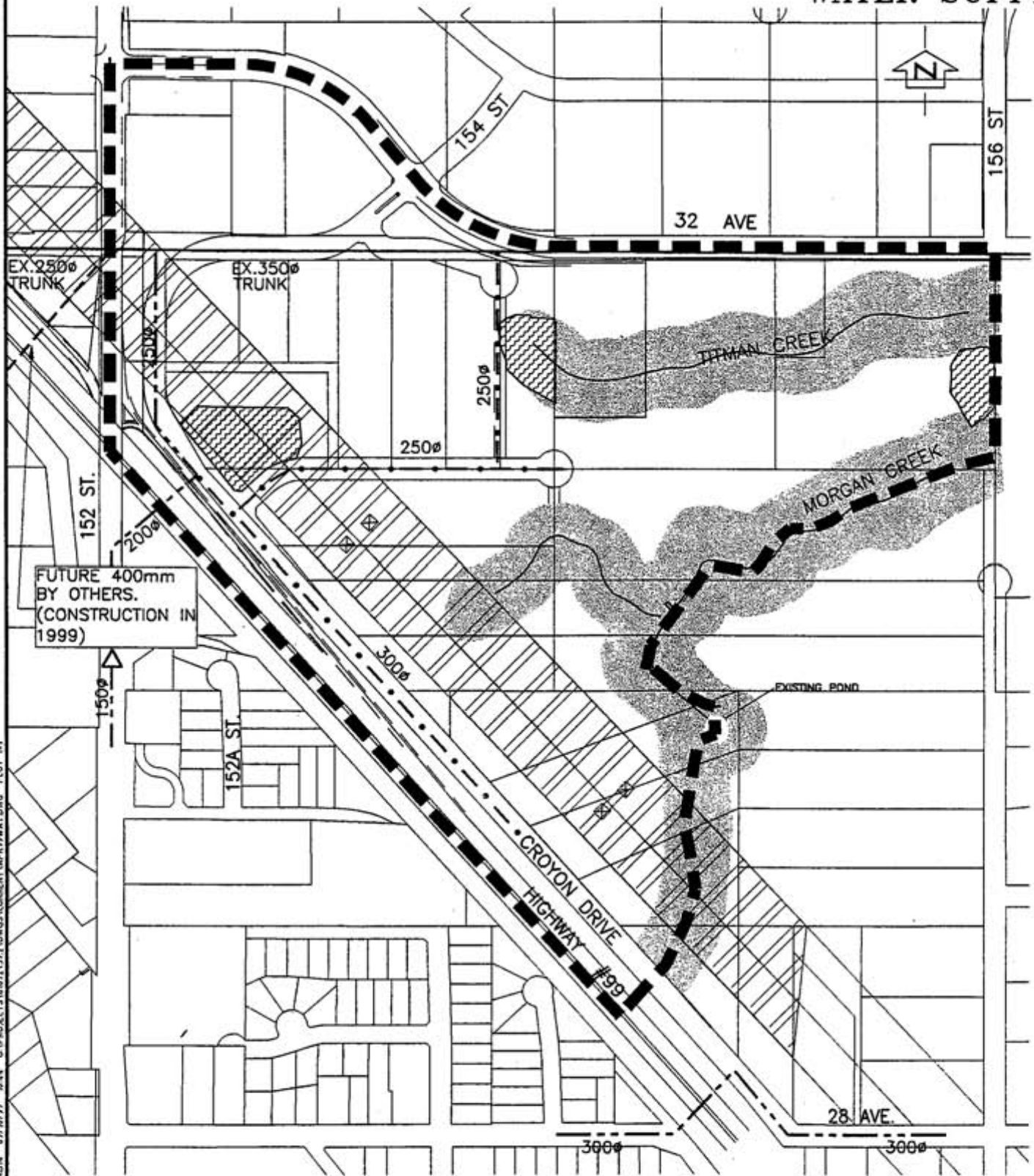
-  ROSEMARY HEIGHTS BUSINESS PARK AREA
-  RIPARIAN SETBACK
-  HYDRO RIGHT OF WAY / GREENWAY

-  EXISTING PRV
-  PROPOSED ROAD ALIGNMENT
-  FUTURE TRUNK WATER MAIN
-  EXISTING TRUNK WATER MAIN
-  FUTURE LOCAL WATER MAIN
-  EXISTING LOCAL WATER MAIN



CITY OF SURREY

ROSEMARY HEIGHTS
BUSINESS PARK
Sketch #2
WATER SUPPLY



FUTURE 400mm
BY OTHERS.
(CONSTRUCTION IN
1999)







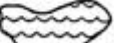
ACADIN 09/10/99 10:44 U:\PROJECTS\M071\317\0665\CURRENT\APPROV\WATERING_PLOT 1-1



DATE: AUGUST, 1999

URBANSYSTEMS

LEGEND

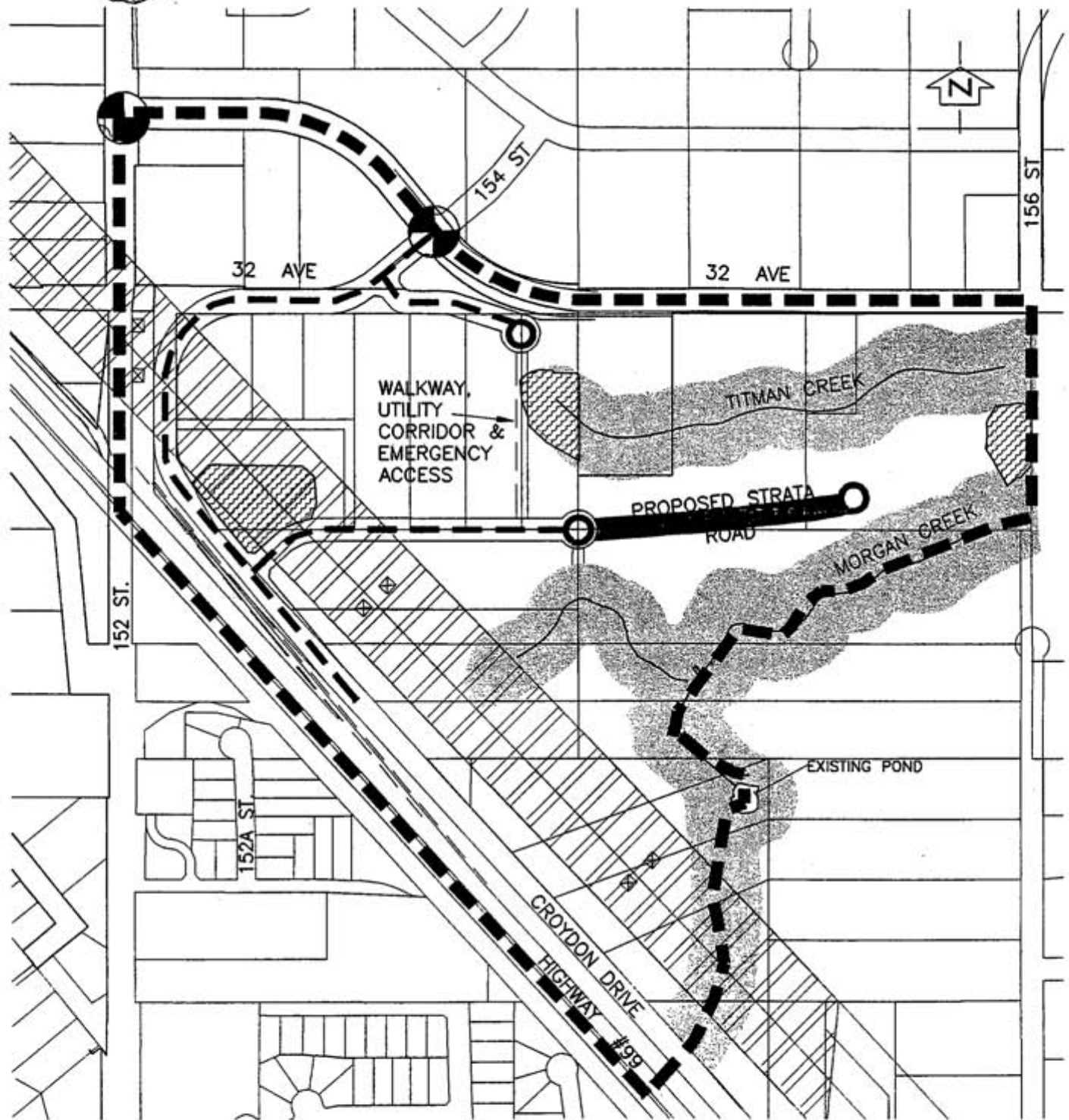
-  ROSEMARY HEIGHTS BUSINESS PARK AREA
-  RIPARIAN SETBACK
-  HYDRO RIGHT OF WAY / GREENWAY
-  PROPOSED ROAD ALIGNMENT
-  PROPOSED STRATA ROAD
-  TRAFFIC SIGNAL
-  DETENTION POND



CITY OF SURREY

ROSEMARY HEIGHTS
BUSINESS PARK
Sketch #3
ROAD LAYOUT

(ALIGNMENTS ARE APPROXIMATE)










AC4014 09/10/98 10:53 U:\PROJECTS\154\071\31\2\0665\CURRENT\APPROBLAYOUT.DWG PLOT 1-1



DATE: AUGUST, 1999

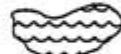

URBANSYSTEMS

LEGEND

-  ROSEMARY HEIGHTS BUSINESS PARK AREA
-  RIPARIAN SETBACK
-  HYDRO RIGHT OF WAY / GREENWAY
-  PROP. ROAD ALIGNMENT
-  CATCHMENT BOUNDARY
-  TRUNK STORM SEWER
-  SERVICE AREA



CITY OF SURREY
ROSEMARY HEIGHTS BUSINESS PARK
 Sketch #4
ON-SITE STORMWATER MANAGEMENT

-  PROPOSED DETENTION POND
-  OVERLAND DIRECTION OF FLOW

FOR PROP. 152nd STORM SEWER UPGRADE. SEE "CENTRAL ROSEMARY HEIGHTS NCP, USL 1996.

BUSINESS PARK WEST CATCHMENT: ON-SITE BMP'S AND POSSIBLE INTERIM DETENTION.

PORTION OF CENTRAL ROSEMARY HEIGHTS CONTRIBUTING TO 32nd AVE. WEST TO 152nd ST.

SERVICE CONNECTIONS OF AREA C CONNECT TO 32nd AVE. STORM SEWER.

DIRECT DISCHARGE TO 152nd ST. STORM SEWER WITH ON-SITE BMP'S FOR WATER QUALITY.

(A)

POND #1
1.0 Ha

(B)

AREA D SERVICED BY POND #3. ALSO ON-SITE BMP'S FOR WATER QUALITY

EXISTING POND

LOCAL SEWERS AND SERVICES OF AREA B TO CONNECT TO POND #2. NOT DIRECTLY TO TRUNK SEWER. ALSO, BMP'S FOR WATER QUALITY.

(E)

DEVELOPMENT IN SERVICE AREA E IS DEPENDANT ON GRANDVIEW NORTH SANITARY INTERCEPTOR

ON-SITE DETENTION FOR PEAK FLOW ATTENUATION & BMP'S FOR WATER QUALITY.

SPLITTER TO MAINTAIN 1.2 YR. BASEFLOW TO CREEK

EXISTING HIGHWAY CULVERT CROSSING FOR SERVICE AREA F



DATE: AUGUST, 1999

URBANSYSTEMS

ACADIL 09/10/99 10:52 U:\PROJECTS\817131\2\DWG5\CURRENT\APPRIOR-5TH.DWG PLOT 1-1

APPENDIX VI

Design Guidelines



APPENDIX VI

Rosemary Heights Business Park and Live/Work Area Design Guidelines

The following Design Guidelines will apply to developments within the Rosemary Heights Business Park and Live/Work Neighbourhood Concept Plan area. These Guidelines are intended to complement the Development Permit Guidelines contained in Surrey's Official Community Plan (OCP) and the British Columbia Ministry of Environment Guidelines. Development Permits will be required for all developments to ensure compliance with these policies and guidelines.

1. Objectives

The objectives of these Design Guidelines are:

- a) to encourage the development of a comprehensively designed business park and live/work area in an open space/campus-like setting;
- b) to achieve a high level of visual identity for the business park and live/work area;
- c) to facilitate the co-ordinated development between buildings, landscaping and site features;
- d) to achieve an effective, aesthetically appealing interface between the business park and the live/work area; and
- e) to maintain as much of the natural environment as possible toward protecting and enhancing the creek preservation areas as natural amenities for the area.

2. General Guidelines

The following general Guidelines should be incorporated into all proposed developments within the Neighbourhood Concept Plan area:

- a) compatibility of the building design (scale, massing, material) with the architecture of adjacent buildings is recommended;
- b) to provide visual landmarks, and to promote a sense of enclosure, the principal building of a corner property should be located so as to anchor the corner, and be designed to be visually attractive from both abutting streets;
- c) a consistently maintained wide front yard landscaped setback of not less than 7.5 metres to parking areas and/or to buildings must be established on all sites, regardless of the use or character;

- d) a row of alternating trees along the street to complement the street trees must be planted within the lot to achieve a canopy effect over the sidewalks;
- e) landscaped screening must be provided for all mechanical, electrical equipment, garbage collection areas, large paved parking areas, blank walls, fences, and loading areas that are visible from the streets;
- f) parking within the front yard setback is discouraged, however, where it is proposed, it must be visually screened from the streets by a combination of berming and high quality landscaping;
- g) all planting material must conform to the Official Community Plan guidelines for Landscaping and Fences, Section A.6; and
- h) in general, fences along property lines that abut streets will not be permitted; a fence may be permitted provided that the fence is set back the same distance as the principal building and substantial landscaping is provided on the street side of the fence.

3. Streetscape Guidelines for 32 Avenue, 32 Avenue Cul de Sac, 31 Avenue Cul de Sac and Croydon Drive

The following Guidelines will apply to developments facing all public streets within the NCP area:

- a) buildings along 32 Avenue and Croydon Drive should be designed to include glazing as a major component;
- b) loading bays/overhead garage doors will not be permitted to face 32 Avenue or the Diversion, 31 or 32 Avenue Cul de Sacs and Croydon Drive;
- c) no parking or vehicle laneways within the required 32 Avenue and Croydon Drive setbacks will be permitted towards the street;
- d) a consistently maintained 7.5 metre wide high quality landscaped frontage is required;
- e) no free-standing signs will be permitted along 32 Avenue, 32 Avenue Cul de Sac, or Croydon Drive frontage;
- f) free standing signs should be integrated into the landscaping and be designed in a similar style to the architecture of the buildings; single pole pylon signs are not permitted; the maximum height of any free-standing sign is 2.4 metres (8 feet);
- g) fascia signs facing the street may be permitted provided they are integrated and/or co-ordinated with the architecture of the buildings;
- h) architectural compatibility (scale, massing, finishing materials) between buildings is highly recommended
- i) the 5 metre-wide buffer along 32 Avenue must be planted with high quality landscaping material;

- j) all planting material must conform to the Official Community Plan guidelines.
- k) a double row of alternating trees should be planted to achieve a canopy effect over sidewalks on internal roads;
- l) compatibility of the building design with architecture of adjacent buildings must be considered; and
- m) for consistency from development to development, the type of street lamp, their height, intensity intervals, etc., will be co-ordinated by Engineering through the servicing agreement process.

4. Guidelines for the Creek Preservation Areas

The following Guidelines will apply to developments in the vicinity of creek preservation areas identified on the plan:

- a) the preservation areas will be left undisturbed in accordance with the Specifications of the B.C. Ministry of Environment, Lands and Parks;
- b) areas located within the setback areas which require restoration, must be improved, landscaped and planted to the specifications of and satisfaction of the B.C. Ministry of Environment, Lands and Parks. and the Department of Fisheries and Oceans; and
- c) no discharge of waste water, effluent or other materials is permitted within the 15-metre or 30-metre setback areas.

5. Interface between the Business Park and Optional Live/Work Area and the Pedestrian Laneway

The following Guidelines will apply to development adjacent to the boundary between business park uses and live/work uses, including the emergency vehicle/pedestrian laneway connecting the two cul de sacs in the NCP area:

- a) appropriate landscaped buffers are required between the business park and the live/work area, along with a pedestrian friendly laneway landscaped along both sides and lit with pedestrian-scale lighting;
- b) the laneway will be 6 metres wide;
- c) walkway surfaces must facilitate pedestrian traffic and emergency vehicle access;
- d) fencing between the pedestrian laneway corridor and the neighbouring properties should be low, enabling casual surveillance of the pedestrian area from adjacent buildings; and
- e) buffers will be designed to visually mitigate the impacts of business park development from live/work developments and may include a combination of a berm and high quality landscaping.

6. Guidelines for Gateways, Stormwater Pond Amenity Area and Tree Preservation

To enhance the quality of the Business Park and create its unique identity, several aesthetic features should be considered as the Guidelines below suggest:

- a) specially lit and landscaped identification signs, ponds, fountains, decorative pavers and enhanced landscaped cul de sac islands are encouraged to be provided on private property by developers;
- b) where these features are located on public land, funding for the features will be derived in part from amenity contributions associated with landscaping open spaces and also through cost sharing arrangements determined at the time of development through servicing agreements;
- c) gateway features must be developed in the locations depicted in Figures 1.0 and 2.0 attached;
- d) gateway features should incorporate unique lighting and landscaped medians as conceptually shown in Figures 1.0 and 2.0;
- e) these gateways must be developed with high quality soft and hard landscaping;
- f) main entry signs or major identification signs should be of high quality, durable material and should be co-ordinated with the architecture of the business park and live/work area;
- g) the entry signs should make provision for identifying the individual businesses located in the business park and live/work area; and
- h) wherever possible, trees should be retained in the area, and the creek preservation areas must be preserved in an undisturbed state.

7. Lands Affected by Hydro Right-of-Way

Due to development limitations on some properties along Croydon Drive because of the existence of a 100 metre hydro right-of-way, the properties may be difficult to develop in accordance with the IB - Business Park Zone. One possible development scenario is depicted in Figure 3 which shows several smaller buildings on either side and parking under the right-of-way. This scenario may be possible depending on the specific site-conditions.

8. Stormwater Pond Amenity Area

The municipal stormwater pond (pond #1 on the NCP plan) will be developed as a water amenity for the area with landscaping, appropriate park features, pedestrian paths and lighting.

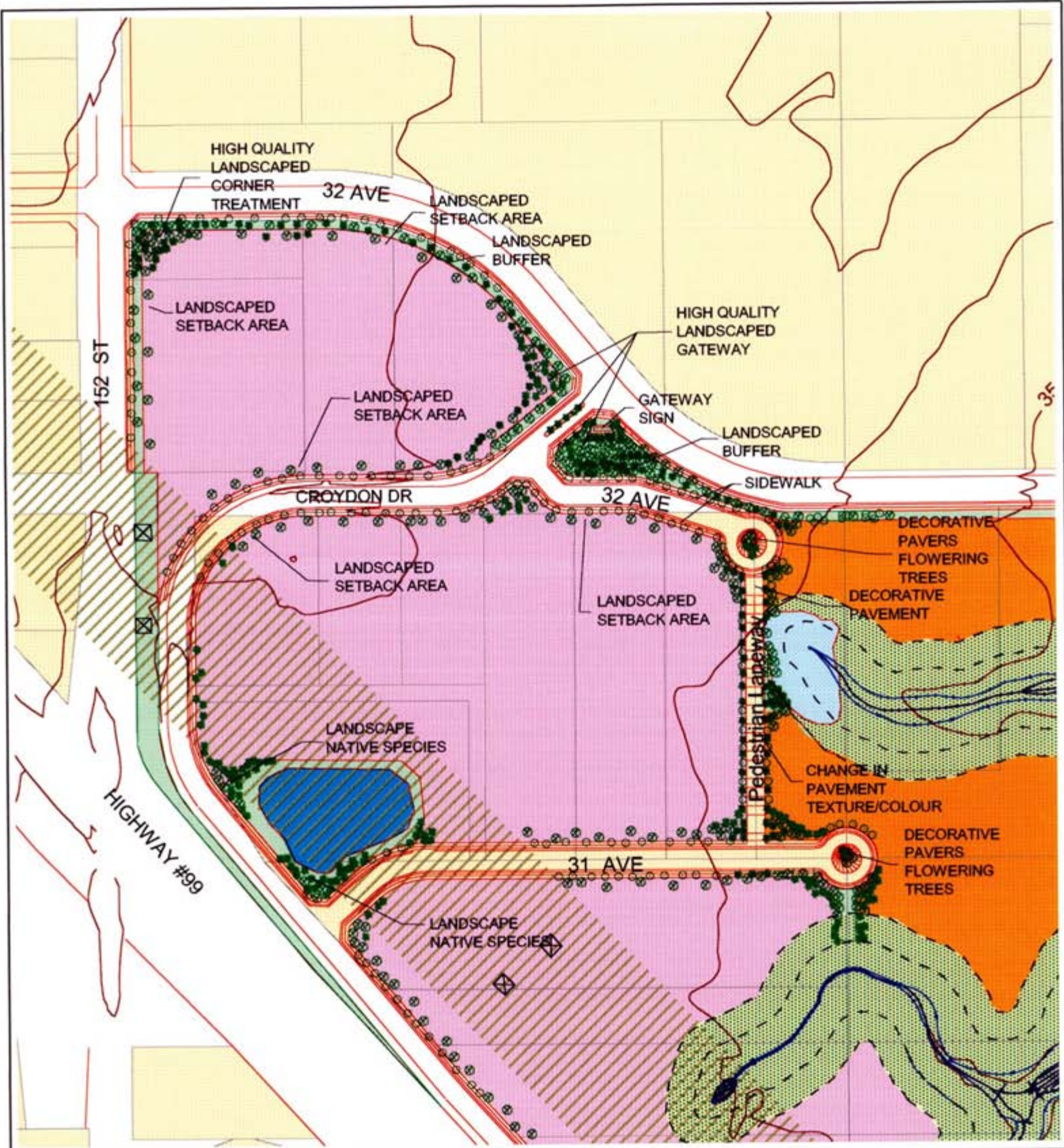
9. Preliminary Design Guidelines for Live/Work Developments

Specific densities and forms of the live/work developments proposed in Rosemary Heights will be determined in conjunction with a study of this land use currently being undertaken by the Planning & Development Department (as of January, 2000). This type of housing/work opportunity is not currently available in Surrey and research is required to adapt this innovative product to the conditions in Rosemary Heights.

The following preliminary General Guidelines will be used to guide live/work development proposals until a more complete set of guidelines, policies and regulations are developed. Developers are encouraged to discuss alternative proposals with the City and to prepare innovative designs and ideas for discussion.

- a) developments should be comprehensively designed including architecturally controlled building facades, signs and landscaping, and appropriate building form and density;
- b) the site design of a comprehensive development should take into consideration mature trees and water courses and should be designed to maintain as much of the natural environment as possible;
- c) development projects should provide outdoor amenity space and indoor amenity space for the enjoyment of the residents, along with common space for meetings and shared support work space (i.e. copier, secretarial services), depending on the nature of the live/work proposal;
- d) provision should be made for adequate parking to accommodate the residents and visitors/customers, and visitor parking should be located so as to minimize disruption to the residents;
- e) the entire development should be large enough for the users to share facilities and also to feel some sense of community;
- f) there should be a mechanism to ensure that prospective purchasers of the units are aware of the types of uses in the development (by a covenant or signs/plaques on the buildings);
- g) the work areas must be adequately sized and tied in tenure to the living space; dwelling use would not be permitted in the work space;
- h) the units would provide functional features to accommodate businesses such as larger doors, suitable electrical, plumbing, ventilation;
- i) the buildings would resemble typical residential buildings (e.g., single detached, duplex or attached groups); and
- j) at the time of rezoning, the City would work with the developers in defining the site layout, building designs, floor plans, parking areas, setbacks and other site design issues.

Attached: Figures 1.0, 2.0, and 3.0



Rosemary Heights Business Park Proposed Land Use Plan

City of Surrey Planning & Development Department

NOTE: This plan is conceptual in nature and is only intended to reflect a general pattern of land use.

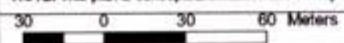


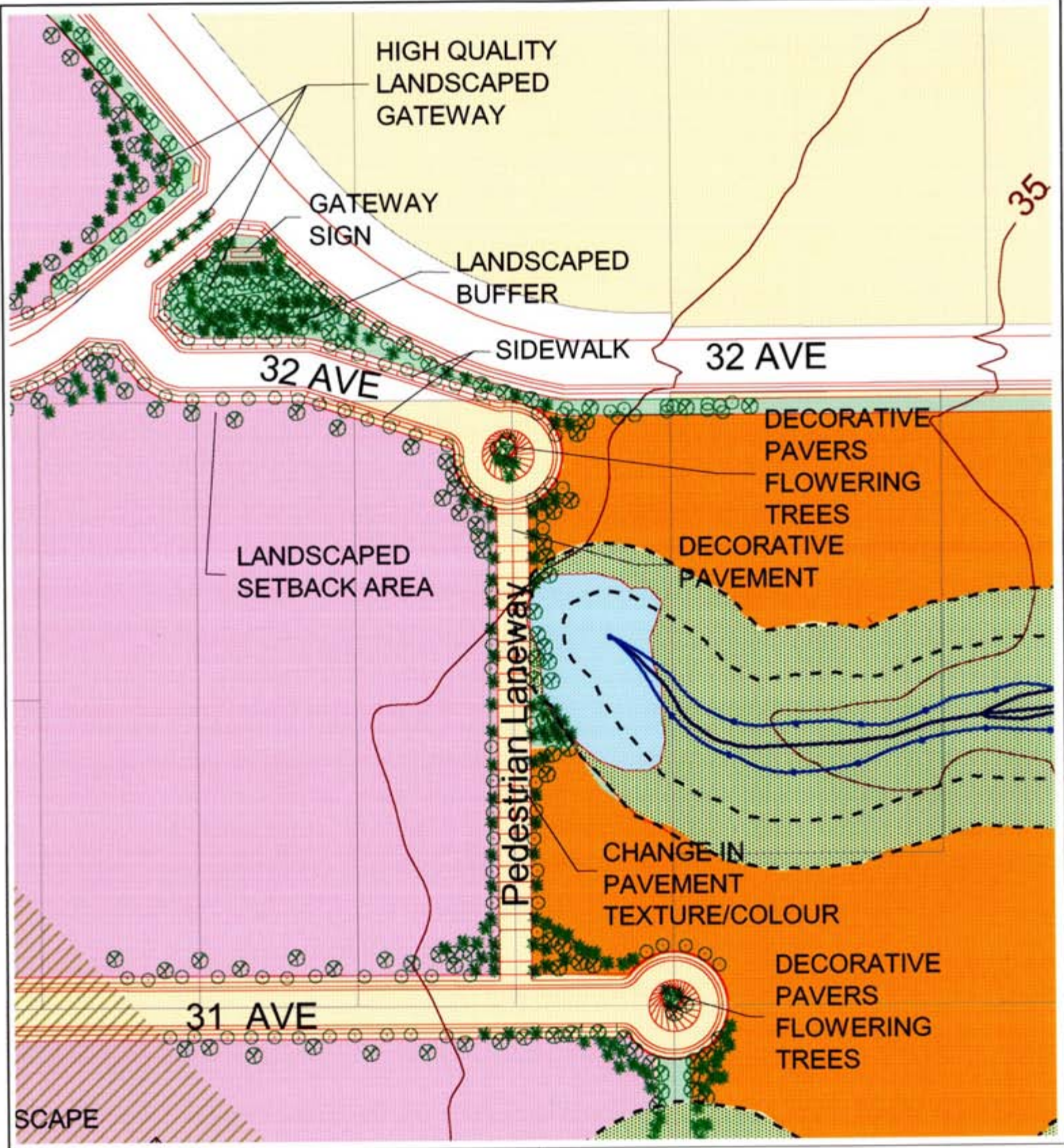
Figure #1

DATE Feb 4, 2000

LEGEND

GATEWAY FEATURES DESIGN GUIDELINES





**Rosemary Heights Business Park
Proposed Land Use Plan**

City of Surrey Planning & Development Department

NOTE: This plan is conceptual in nature and is only intended to reflect a general pattern of land use.

20 0 20 40 Meters

Figure #2

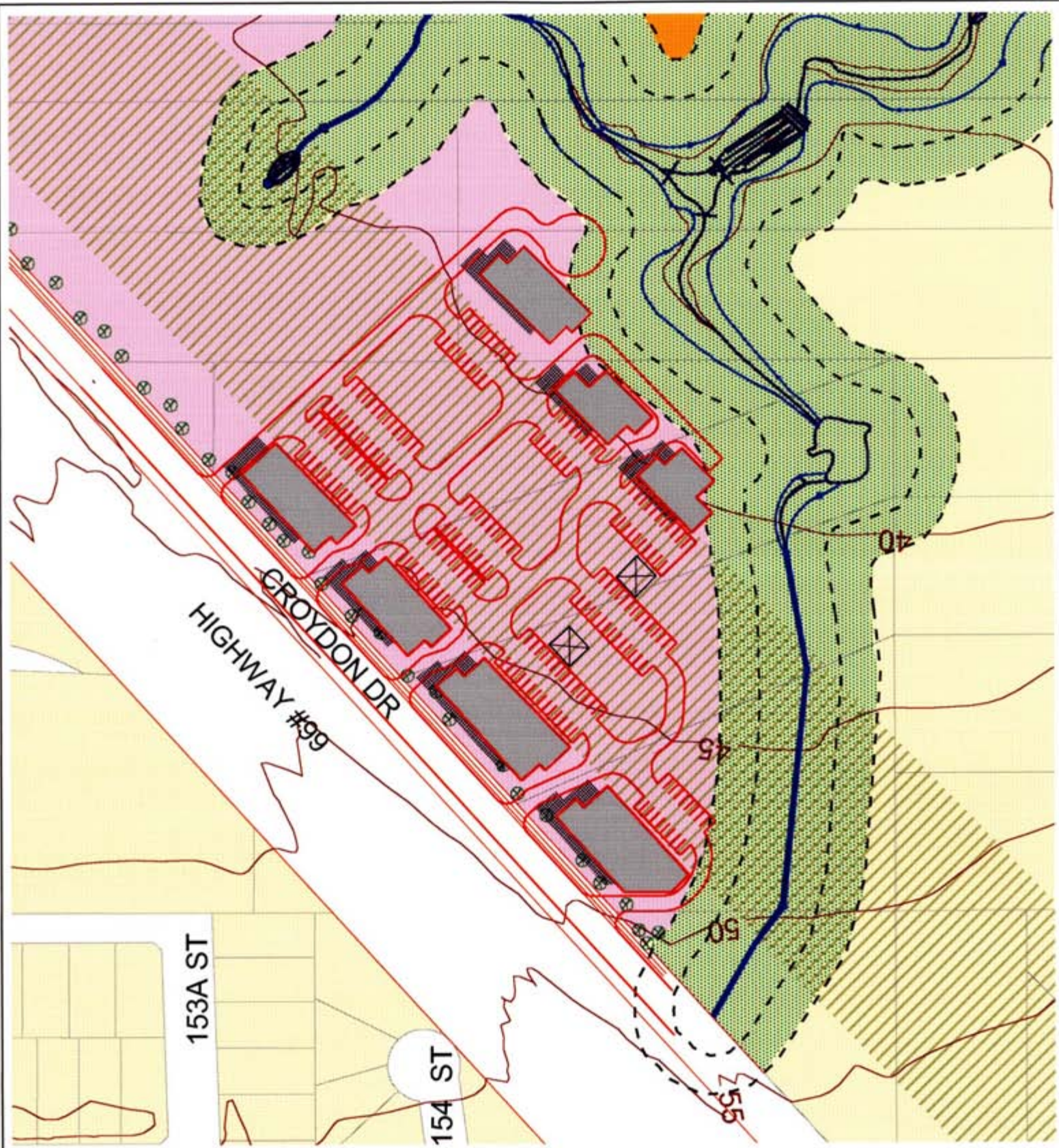
DATE Feb 4, 2000

LEGEND

GATEWAY FEATURES DESIGN GUIDELINES



SURREY
City of the Future



**Rosemary Heights Business Park
Proposed Land Use Plan**

City of Surrey Planning & Development Department

NOTE: This plan is conceptual in nature and is only intended to reflect a general pattern of land use.

20 0 20 40 Meters

Figure #3

DATE Feb 4, 2000

LEGEND

Potential Site Design for
Business Park Development
Adjacent to Hydro Lines



A Report to

CITY OF SURREY

***Rosemary Heights
Business Park***

***Engineering Servicing
Plan***

URBANSYSTEMS.

October 1999

6107237.2

**Rosemary
Heights Business
Park**

**Engineering
Servicing Plan**

Final Report

CONTENTS

1. Introduction.....	1
1.1 Purpose of the Engineering Servicing Plan	2
1.2 Issues of Opportunities	2
2. Land Use Concept Plan.....	4
2.1 Rosemary Heights Business Park	6
3. Sanitary Sewer	7
3.1 Catchment Areas	7
3.1.1 Western Catchment.....	7
3.1.2 Eastern Catchment.....	10
4. Water.....	11
5. Stormwater Management.....	13
5.1 Riparian Corridors	13
5.2 Land Uses.....	13
5.3 Hydrology	15
5.3.1 Design Flows	15
5.3.2 Stormwater Detention Volumes.....	16
5.4 Service Area Requirements.....	17
5.4.1 Service Area A (West Catchment).....	17
5.4.2 Service Area B	20
5.4.3 Service Area C	21
5.4.4 Service Area D.....	21
5.4.5 Service Area E	22
5.4.6 Service Area F	22
5.4.7 Trunk Storm Sewer	23
5.5 Best Management Practices	24
6. Transportation Considerations.....	26
6.1 Traffic Volumes	26
6.2 Road Network	26
6.3 Traffic Operations.....	28
7. Development Phasing	30
8. Infrastructure Financing and Funding.....	32
8.1 Local Infrastructure Needs.....	33
8.2 DCC Revenues and Expenditures	33

A Report to

CITY OF SURREY

**Rosemary
Heights Business
Park**

*Engineering
Servicing Plan*

Final Report

FIGURES

Figure 2.0	Proposed Land Use Plan Concept B2.....	5
Figure 3.1	Sanitary Sewer.....	8
Figure 3.2	Off-Site Sanitary Sewers.....	9
Figure 4.0	Water Supply.....	12
Figure 5.1	Stormwater Catchment Plan.....	14
Figure 5.2	Stormwater Service Areas.....	18
Figure 5.3	On-Site Stormwater Management.....	19
Figure 6.1	Road Layout.....	27
Figure 7.0	Development Phasing Plan.....	31

REFERENCES

APPENDIX

Appendix A Stormwater Infrastructure Necessary for the Rosemary Heights Business Park and Off-Site Catchment

URBANSYSTEMS

October 1999

6107237.2

990628fs final report.doc

1. Introduction

In April 1993, City of Surrey planning staff initiated a series of public workshops to develop a local area plan for Rosemary Heights. Over the next year various land use options were considered. In February 1994 the Rosemary Heights Local Area Plan was adopted by City Council. One of the objectives of the plan was to provide employment opportunities for the Rosemary Heights area, within the local area plan, without being intrusive into the residential area. The plan recommended a work place area to accomplish this goal.

The work place area, now referred to as the Rosemary Heights Business Park, is located between 152 Street and 156 Street, 32 Avenue and Titman Creek. Over the past year a number of planning and engineering studies have been undertaken in the local plan area and in the North Grandview Heights area. The Rosemary Heights West and Central Neighbourhood Concept Plans (NCP) and North Grandview Heights NCP have been completed. In 1998 the City of Surrey planning department initiated the Rosemary Heights Business Park land use plan study. The environmental assessment and marketing study have been completed by the City's planning department with assistance from consultants. The planning study is now complete after going through numerous changes and refinements. Of particular interest is the new concept of a live/work land use for part of the study area. A separate investigation was completed by the City on this new type of land use for Surrey. This engineering study was initiated by the City's engineering department, building from the work completed on the North Grandview Heights General Servicing Plan.

The information contained in this document is not extensive and is meant as a review of the general servicing concepts identified in previous studies. Additional investigation has taken place to update the servicing strategies already developed for the area. The issues identified in this report have been investigated as part of the proposed land use plan for the Rosemary Heights Business Park.

The report is divided into sections based on the engineering services necessary for the plan area. Environmental issues, except for the identification of environmental issues related to stormwater management and other engineering infrastructure, have been addressed separately by the City's Planning Department. A separate top of bank survey has also been completed by the Planning Department.

1.1 Purpose of the Engineering Servicing Plan

The purpose of the Engineering Servicing Plan is to consolidate the finding of various background documents and on-going studies which will define a servicing strategy for sanitary sewer, water, stormwater management, transportation infrastructure and financial support necessary for the engineering infrastructure. Further investigation of the various servicing options were completed. The final servicing plan presented in this report addresses the engineering requirements of the chosen land use plan.

1.2 Issues of Opportunities

A number of issues arise from the review of the servicing plans for the surrounding urban areas. These issues are related to existing conditions such as topography and the natural habitat and also the City infrastructure such as Croydon Drive and the proposed 32 Avenue interchange.

The following is a summary of issues which were addressed in the engineering servicing plan and separate environmental studies:

1. Minimize the road infrastructure to help optimize the available business park area.
2. Confirm the land requirements of the proposed 32 Avenue interchange and impact of both the Titman Creek riparian area and BC Hydro right-of-way on the potential developable area.
3. Confirm whether it is necessary to extend Croydon Drive through the business park area to 32 Avenue.
4. Provide the safest and most efficient internal road network given the 32 Avenue interchange plan and 32 Avenue.
5. Ensure the internal road network coordinates with the revised 32 Avenue ramp alignment.
6. Define an acceptable location for a community detention pond. The pond is required to service a catchment outside the business park area.
7. Confirm the environmental value of both Titman Creek and its northern tributary along 32 Avenue.
8. Confirm if stormwater treatment is required for the business park due to the industrial land use.
9. Investigate if the western area of the business park should be serviced by the existing Morgan Creek sanitary pump station and

**Rosemary
Heights Business
Park**

**Engineering
Servicing Plan**

Final Report

force main or if the western area should wait until a gravity main is brought through the Rosemary Heights West area.

The development of a business park in this area present a number of unique opportunities. The natural resources of the wooded lots and class "B" fisheries habitat present an opportunity to create a unique business park. In addition, with the 32 Avenue interchange, park and ride facility, and arterial road network the site presents some significant transportation choices.

The following are a few opportunities which were investigated during the development of the engineering servicing plan and land use plan.

1. Optimize the road access to the business park to provide the most efficient and effective manner to service the business park. Opportunities exist to provide many alternative access points and an attractive principle access.
2. Cluster the development such that the creek system and riparian area is seen as both an amenity to the business park and an asset to the broader Rosemary Heights residential community. Pedestrian walkways and greenway linkages should be considered.
3. Locate the community detention pond such that it is an asset to the business park both from an environmental position and a marketing perspective. A pond should be an attractive focal point and retreat area for future workers in the business park.
4. Define the riparian setback to enough detail that specific land use and density choices could be established.
5. Define the financial impact of the required engineering services on the City's DCC program.

2. Land Use Concept Plan

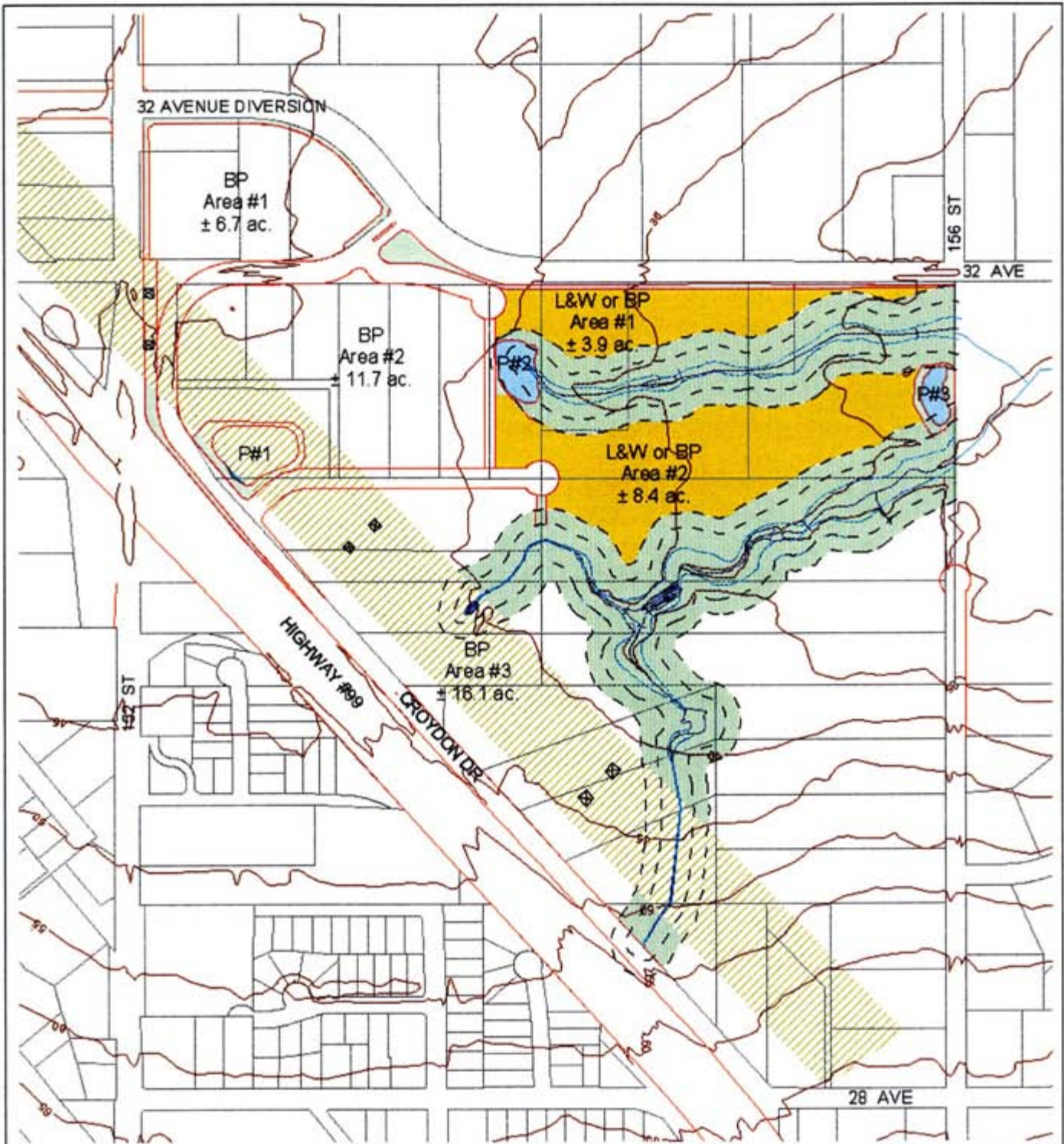
The February 1994 Rosemary Heights Area Plan defined this area as a "work place". The estimated land area was 35 ha., approximately 3.9 % of the local area plan. The area was envisioned as an employment area, such as a business park, in close proximity to the residential parts of Rosemary Heights and the transportation systems of Highway #99 and the City's arterial road network. Integral to the success of the business park are design controls which should be established to ensure a high standard of development. It was also envisioned that a linear park system with biking and walking paths could be developed through the area and link with the rest of Rosemary Heights. **Figure 2.0** shows the Rosemary Heights Business Park study area.

The Official Community Plan (OCP) defines this area as industrial. The specific industrial land use and density have not been approved by City Council to date.

The existing land use designation is for the most part, residential acreage (RA). There are two pockets of agricultural zoned land (A-1 and A-2) both on 32 Avenue. One parcel is in the northeast corner of the plan area, the other site is in the northwest corner of the business park.

BC Hydro has purchased property near the old 32 Avenue alignment at 152 Street. They propose to build a Hydro substation at this location which is next to the existing overhead transmission lines. The transmission lines run parallel to Highway #99 throughout the plan area. BC Tel has also expressed interest in locating a switching station along 152 Street near 32 Avenue. This station is required for future residents of Rosemary Heights.

The environmentally sensitive areas study has classified the business park area as low value. Titman Creek (Morgan Creek) and its tributaries have been classified as "B" class stream habitat by the City. Both of these studies were developed based on large areas. The City has completed a detailed environmental assessment of the business park area which refined the current environmental assessments. The study included fish and wildlife habitat, a general environmental assessment and a detailed top of bank survey.



**Rosemary Heights Business Park
Proposed Land Use Plan**

City of Surrey Planning & Development Department

Figure 2.0

LEGEND

- Business Park
- L&W or Work of Business Park Area
- Buffer
- Close Water Detention Pond (municipal, water city-owned)
- Close Water Detention Pond (municipal, water privately-owned)
- Close Proximity Areas

- 15m & 30m Private Setbacks
- Road Concept
- Hydro Towers
- Creek
- Contour Line
- Hydro Right of Way



DATE: 21/1/99

A Report to
CITY OF SURREY

**Rosemary
Heights Business
Park**

Engineering
Servicing Plan

Final Report

The detailed top of bank survey defined a 30 m setback area. This area is shown on Figure 2.0. This boundary was used for all our engineering analysis and the determination of our recommended solutions.

The engineering servicing plan has been presented to the Ministry of Environment, Lands and Parks (MELP) and the Department of Fisheries (DFO). We have also walked the site with staff from these agencies. The basis of the stormwater plan presented in this report is in general agreement with previous studies reviewed by MELP and DFO. Those studies included the Central Rosemary Heights NCP, North Grandview NCP, Old Logging Ditch Master Drainage Plan and Morgan Creek drainage studies. We have not received a written response to our servicing plan from the agencies. We have incorporated their verbal comments from various meetings and believe the stormwater plan meets their guidelines and general direction. Specific environmental issues related to the individual parcel development can be addressed through the land development and rezoning process by the City of Surrey. Land development referrals to MELP and DFO will be necessary.

2.1 Rosemary Heights Business Park

The planning department has completed the land use plan for the Rosemary Height Business Park. To complete this work they worked with a Citizen Advisory Committee (CAC). This Committee had numerous on-going meetings with the planning department to explore various development layouts and discuss marketing and environmental issues.

Numerous public meetings were held to present various land use and servicing options to the public. The input provided by the CAC and the public have been incorporated into the final land use plan. The recommended land use plan is shown on Figure 2.0.

URBANSYSTEMS

October 1999

6107237.2

990628fs final report.doc

3. Sanitary Sewer

3.1 Catchment Areas

The business park area is divided into eastern and western catchments by a low ridge of land which traverses the site along a northwesterly line, see **Figure 3.1**. The approximate developable area within each catchment is 5.0 hectares to the west and 9.9 hectares to the east.

3.1.1 Western Catchment

The western catchment will flow to sewers along 32 Avenue and 152 Street feeding into the catchment system for the Western Neighbourhood of Rosemary Heights. As per the City of Surrey Design Guidelines, the minimum size sewer allowed for industrial lands is 250 mm. Based on existing contour map information 250 mm diameter sewers are adequate to service this area. All downstream sewers must be sized at 250 mm diameter or larger to comply with the Design Guidelines.








Sewering of the western catchment is dependent on the extension of sewers westward, through Rosemary Heights West, and connecting to the proposed pressure sewer on 150 Street. This is consistent with the servicing strategy for Rosemary Heights West. **Figure 3.2** illustrates the conceptual off-site servicing route and proposed downstream sanitary sewers in the Rosemary Heights West and Central area.

South of 34 Avenue, along 152 Street, a sewer system is proposed as part of the servicing plan for Central Rosemary Heights. It is possible to connect the western catchment of the industrial park to this system however, this can only be considered as an interim measure as:

- pipes downstream of this point are not sized to service the industrial park; and
- this system flows to P.S. No. 2 which was not sized to service these lands.

Peak flow from the Western Catchment is calculated to be 7.4 l/s. This agrees with the allowance of 7.5 l/s contained in the servicing study for West Rosemary Heights NCP.

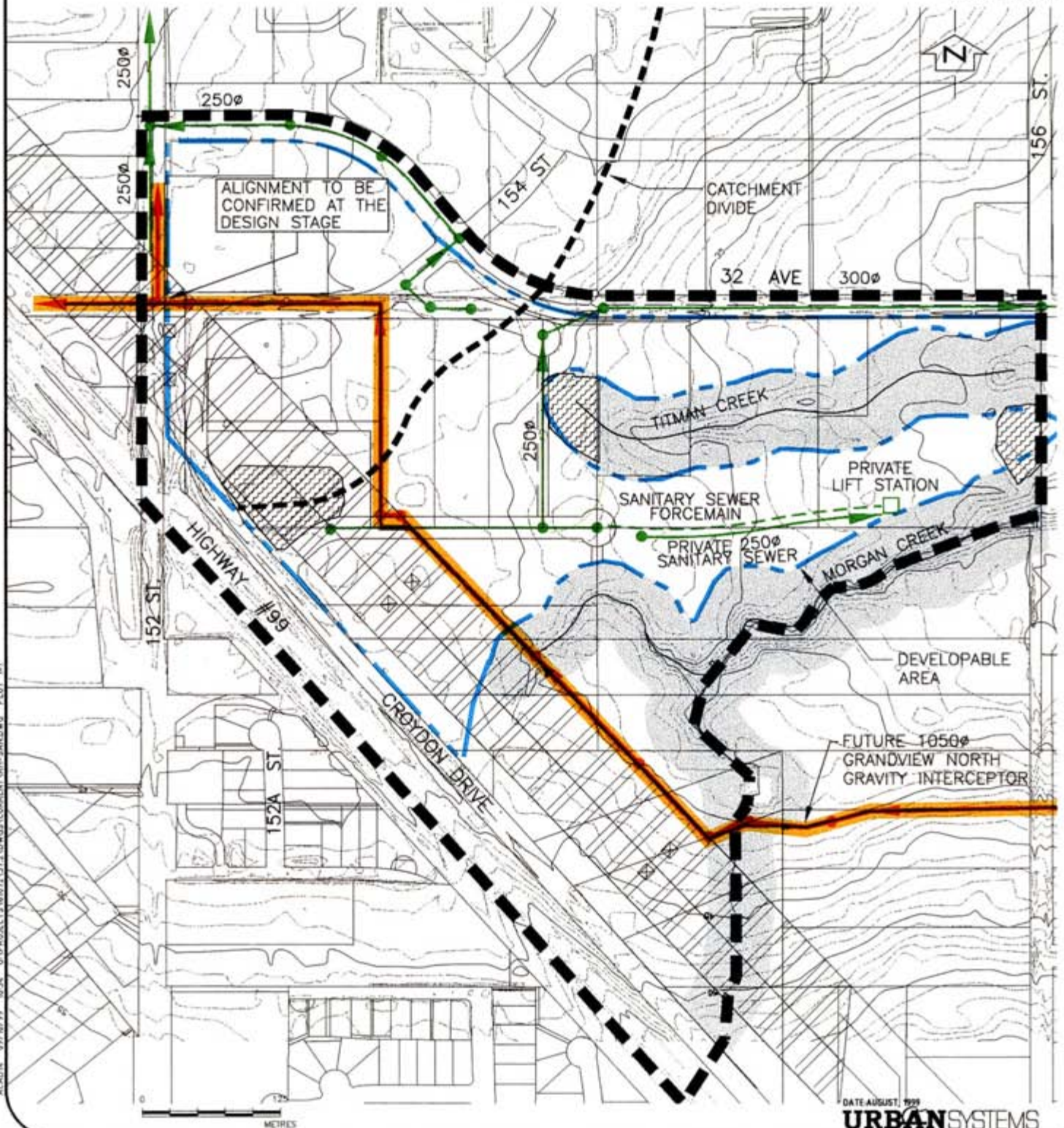
LEGEND

-  ROSEMARY HEIGHTS BUSINESS PARK AREA
-  RIPARIAN SETBACK
-  HYDRO RIGHT OF WAY / GREENWAY
-  PROPOSED ROAD ALIGNMENT
-  PROPOSED LOCAL SANITARY SEWERS
-  FUTURE GRANDVIEW NORTH GRAVITY INTERCEPTOR
-  SERVICEABLE AREA PRIOR TO CONSTRUCTION OF NORTH GRANDVIEW INTERCEPTOR



CITY OF SURREY

ROSEMARY HEIGHTS
BUSINESS PARK
Figure 3.1
SANITARY
SEWER



ALIGNMENT TO BE
CONFIRMED AT THE
DESIGN STAGE

DATE: AUGUST, 1999

URBANSYSTEMS

ACAD14 09/18/99 10:34 U:\PROJECTS\4072\3720\W05\CURRENT\BH-SAN.DWG PLOT 3/1



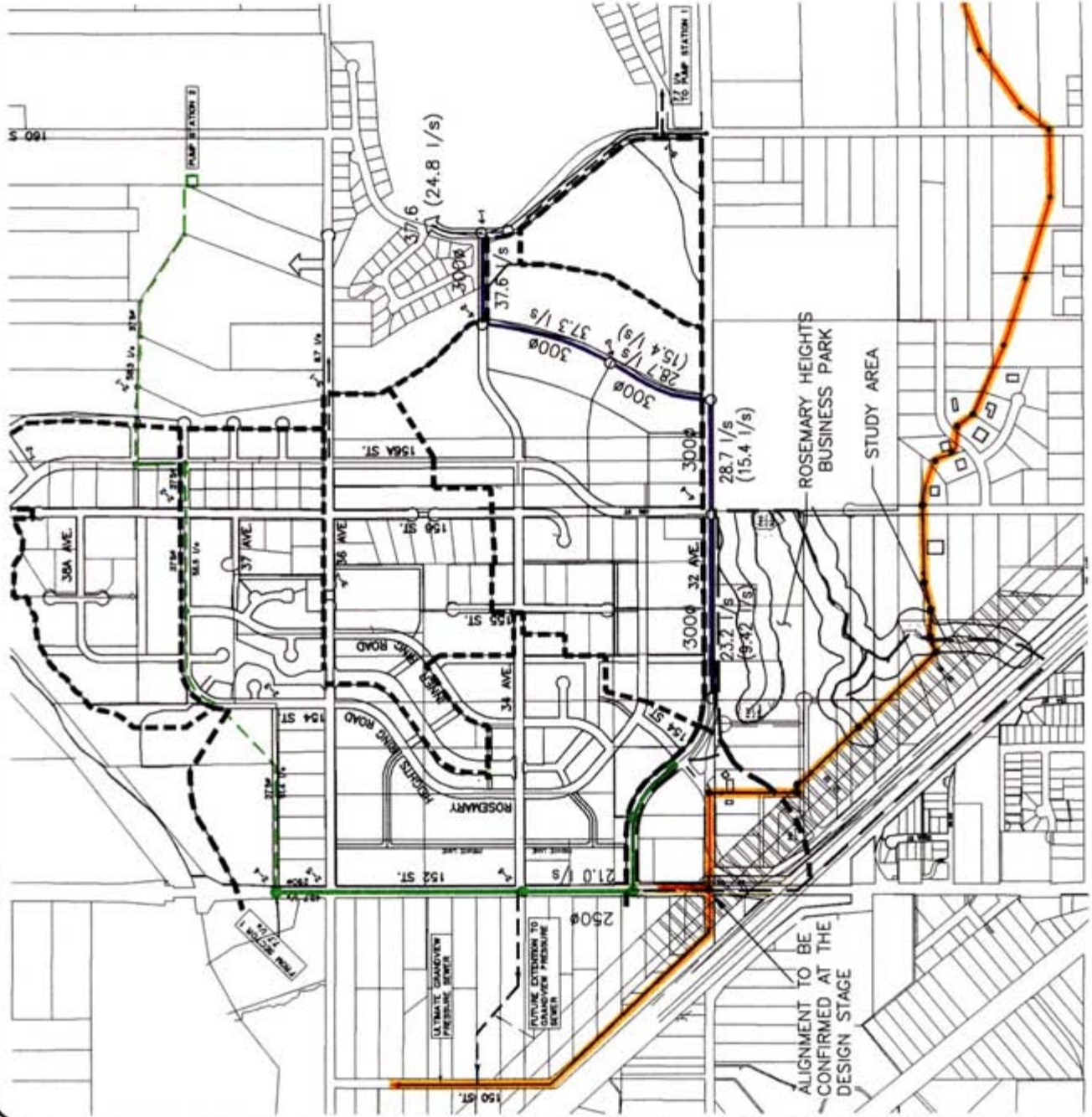
CITY OF SURREY

ROSEMARY HEIGHTS BUSINESS PARK Figure 3.2 OFF-SITE SANITARY SEWERS

NOTE:
FLOWS SHOWN IN BRACKETS ARE
EXCLUSIVE OF BUSINESS PARK

LEGEND

	EXISTING SEWERS
	PROPOSED TRUNK SEWERS
	PROPOSED LOCAL SEWERS
	FUTURE GRANDVIEW NORTH GRAVITY INTERCEPTOR
	CATCHMENT BOUNDARY
	STUDY AREA



DATE: AUGUST, 1999

URBANSYSTEMS

3.1.2 Eastern Catchment

Peak flow from the eastern catchment is calculated to be 14.2 l/s. A system of internal sewers will direct the wastewater flow to 32nd Avenue. Based on existing contour map information a system of 250 mm diameter sewers will be adequate.

Along 32 Avenue, east of 156 Street, a minimum sewer size of 300 mm diameter is proposed to overcome the shallow gradients in this area. This sewer will eventually connect to the existing 300 mm diameter sewer at the intersection of 34 Avenue and Morgan Creek Way. Wastewater will then be conveyed to Morgan Creek Pump Station No. 2 through the system of existing sewers. Both the existing sewer system and Morgan Creek Pump Station No. 2 were sized to accommodate this industrial wastewater component.

Figure 3.2 illustrates conceptual off-site sizing and routing of the 250 mm and 300 mm diameter sewers to service this area. The final alignment and size should be verified by field survey as grades through this area are critical.

On-site, a private lift station is proposed to service a tongue of land situated between the north and south branches of Wills Brook (see Figure 3.1). As this is a small lift station serving 3.8 hectares its construction will be at cost to the developer. A 250Ø sewer is shown for the collection system, this complies to the minimum size required for industrial lands. If the site is developed as a work & live Area it may be possible to service the area with a 200Ø sewer. All sewer works within this area will be at cost to the developer. This "tongue" area needs to be consolidated and developed as one "strata titled" lot with a private sewage lift station, owned, operated and maintained by its owners and strata development which needs to front the city sewer on the cul-de-sac.

A Report to

CITY OF SURREY

**Rosemary
Heights Business
Park**

*Engineering
Servicing Plan*

Final Report

4. Water

Previous analysis has shown that the existing system of water mains can provide fire flows up to 90 l/second, this does not meet the design criteria requirements of 250 l/second for industrial lands. The required fire flows will be met once the 400 diameter water main is constructed along 152 Street. Construction of this water main is included in the servicing strategy for Rosemary Heights and 32 Avenue Interchange construction. No other off-site works are required to service the site with water. **Figure 4.0** illustrates the location of the off-site 400 diameter water main.










URBANSYSTEMS

October 1999

6107237.2

990628fs final report.doc

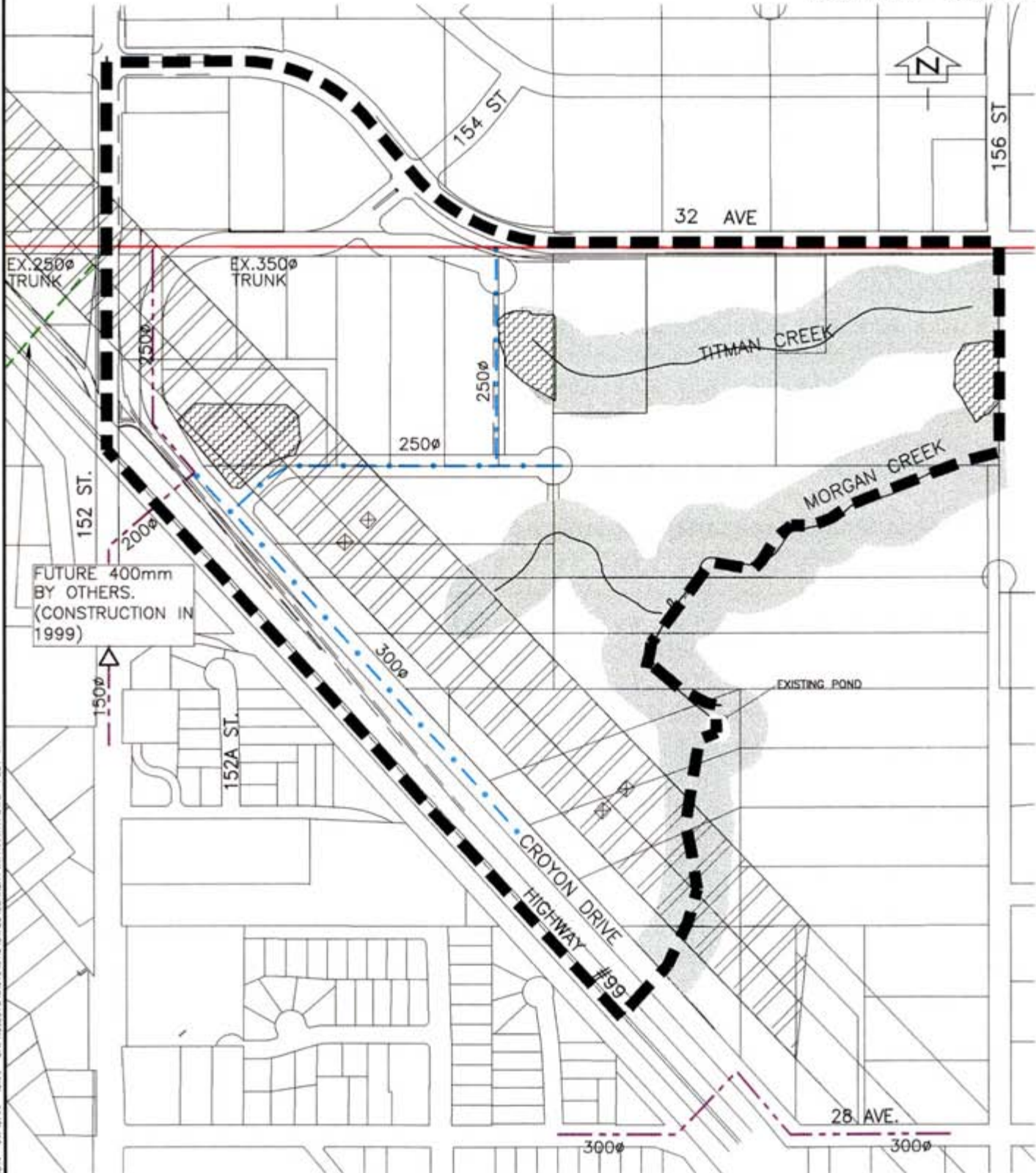
LEGEND

-  ROSEMARY HEIGHTS BUSINESS PARK AREA
-  RIPARIAN SETBACK
-  HYDRO RIGHT OF WAY / GREENWAY
-  EXISTING PRV
-  PROPOSED ROAD ALIGNMENT
-  FUTURE TRUNK WATER MAIN
-  EXISTING TRUNK WATER MAIN
-  FUTURE LOCAL WATER MAIN
-  EXISTING LOCAL WATER MAIN



CITY OF SURREY

ROSEMARY HEIGHTS BUSINESS PARK
Figure 4.0
WATER SUPPLY



ACAD14 09/10/99 10:44 U:\PROJETS\16\072\17\2\DWG\5\CURRENT\APPROX\MAT.DWG PLOT 1/1

DATE: AUGUST, 1999

URBANSYSTEMS

5. Stormwater Management

Existing topography of the Rosemary Heights Business Park dictates that drainage for the area be divided into two primary catchment areas, as shown on **Figure 5.1**. Taking into account the alignment of the 32nd Avenue interchange with Highway 99, an estimated 8.0 hectares of the Business Park area will drain north-west and be serviced by the storm sewer on 152nd Street, ultimately discharging directly to the Nicomekl River. The remaining 27.8 hectares of the study area will drain east to Morgan (Titman) Creek.

The conceptual stormwater management servicing for the Business Park area was presented in two earlier reports. Conceptual servicing for the east portion was presented in the "Morgan Creek/Old Logging Ditch Master Drainage Plan", prepared by New East Consulting Services Ltd. in April 1996. Servicing for the west portion was presented in the "Central Rosemary Heights Neighbourhood Concept Plan, Stage Two Plan", prepared by Urban Systems Ltd. in October 1996. During the preparation of these plans little information was available regarding the Business Park proposal and highway interchange alignments. As a result, catchment boundaries, drainage routing and land uses have since been modified.

The stormwater management strategy presented herein is intended to amend the recommended strategies presented for the Business Park area in the previous two Plans.




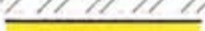


5.1 Riparian Corridors

Riparian corridor setbacks on creeks have been established through the completion of a top-of-bank survey undertaken by Dillon Consultants in 1998. This survey was initiated directly by the City of Surrey and completed independently of this NCP report. The riparian corridors have been shown with a 30 meter setback, in accordance with the ministry requirements for commercial / industrial development.

5.2 Land Uses

The sizing of stormwater infrastructure has been based on commercial / industrial land uses for all developable lands within the NCP boundary.

LEGEND

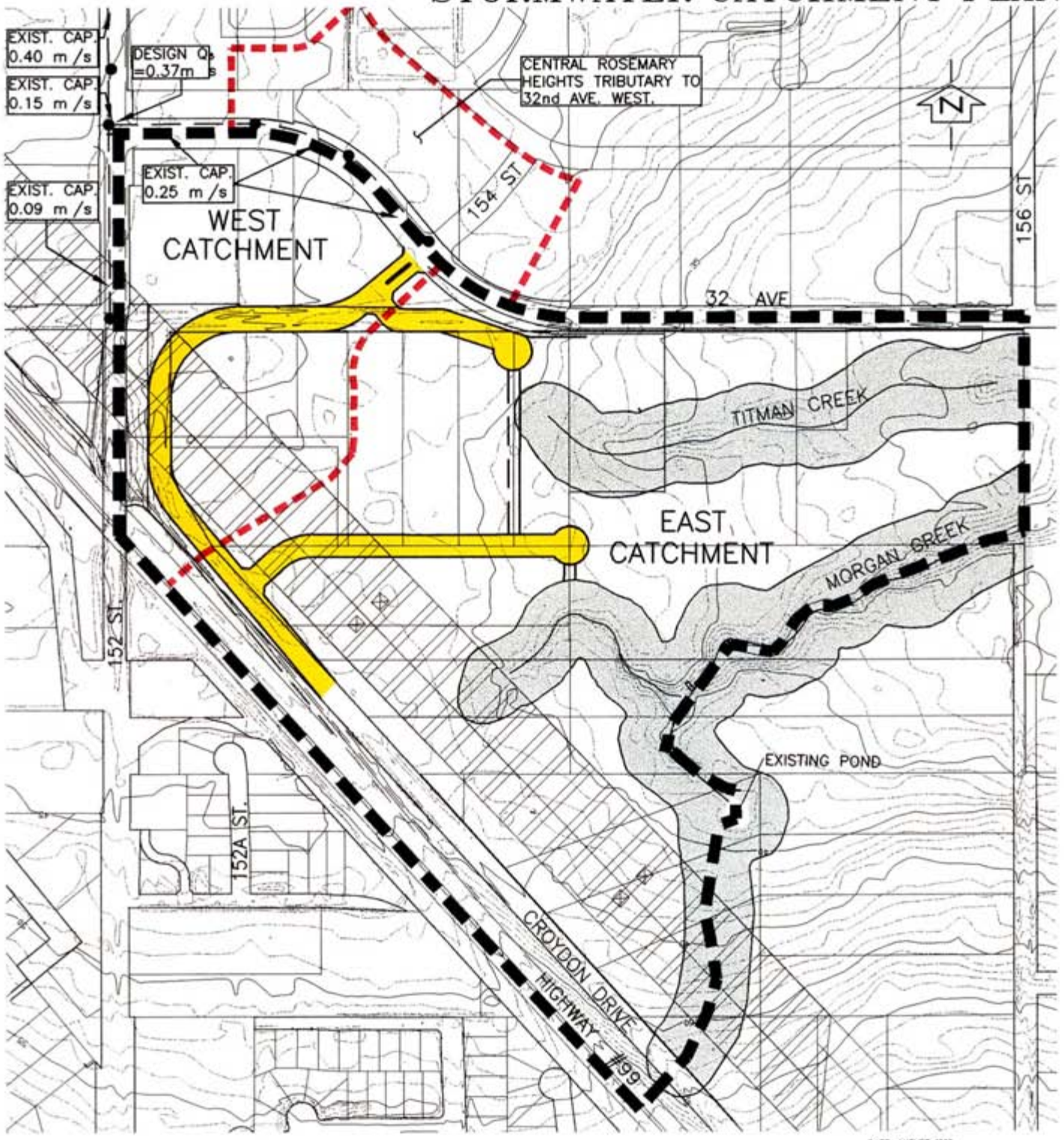
-  ROSEMARY HEIGHTS BUSINESS PARK AREA
-  RIPARIAN SETBACK
-  HYDRO RIGHT OF WAY / GREENWAY
-  PROPOSED ROAD ALIGNMENT
-  CATCHMENT BOUNDARY
-  EXISTING STORM SEWER



CITY OF SURREY

ROSEMARY HEIGHTS BUSINESS PARK

Figure 5.1
BUSINESS PARK
STORMWATER CATCHMENT PLAN



EXIST. CAP.
0.40 m/s
EXIST. CAP.
0.15 m/s

DESIGN Q₁
= 0.37 m³/s

CENTRAL ROSEMARY
HEIGHTS TRIBUTARY TO
32nd AVE. WEST.

EXIST. CAP.
0.09 m/s

EXIST. CAP.
0.25 m/s

WEST
CATCHMENT

154 ST

32 AVE

156 ST

TITMAN CREEK

EAST
CATCHMENT

MORGAN CREEK

EXISTING POND

CROYDON DRIVE
HIGHWAY #99

152A ST

152 ST

0 125 METRES

DATE: AUGUST, 1999

URBANSYSTEMS

ALCAD01: 89/16/99 1845 U:\PROJECTS\8916\737\2\0805\CURRENT\APPROVALS_PARK.DWG PLOT 1x1

Land uses for lands outside of the NCP have been obtained either from the Central Rosemary Heights NCP report, or the current Official Community Plan.

5.3 Hydrology

Hydrologic modelling for this final report has been updated to reflect the revised City of Surrey Engineering Design Criteria released in early 1999. More specifically, the following parameters have been applied along with the Otthymo.89 software package.

Model Parameters

Parameter	Residential	Business Park/Comm.
Percent Imper.	65%	90%
Horton's Fo	25 mm	25mm
Horton's Fc	1.5mm	1.5mm
Horton's K	4.14 hr ⁻¹	4.14 hr ⁻¹

The Horton's values have been selected based on the surficial soils description provided in the Morgan Creek Master Drainage Plan (New East, 1996).

Pre-development design flow rates were estimated using the CN hydrograph method. A combination wooded and grassland condition was assumed using a CN value of 80 (ACM 111).

5.3.1 Design Flows

Applying the modelling parameters listed in the above section, both pre and post-development design flows were developed for the 1:2, 1:5 and 1:100 year storm events. Design flows were determined to be relatively consistent with those previously developed for the Morgan Creek MDP and the Central Rosemary Heights NCP. While the unit flow rate varies slightly with catchment size, a summary of the unit flow rates are shown on the following page. These values represent the peak storm duration. All study areas were considered as "pre-development" for the analysis.

Estimated Design Flow Rates

Return Period	Pre-Development	Business Park /Commercial	Residential
1:2	0.005 m ³ /s/ha	0.025 m ³ /s/ha	0.019 m ³ /s/ha
1:5	0.0072 m ³ /s/ha	0.035 m ³ /s/ha	0.028 m ³ /s/ha
1:100	0.014 m ³ /s/ha	0.065 m ³ /s/ha	0.055 m ³ /s/ha

5.3.2 Stormwater Detention Volumes

Topography and the alignment of the riparian corridors will limit the opportunity to service all development with community detention facilities, therefore, the use of on-site detention will be required in certain areas.

Even for those areas which may be serviceable with a community detention facility, the specific form and location of the detention facility may need to be revisited by the developers. Figure 5.3 shows how each area is serviced by a detention facility. In order to provide the necessary guidance and flexibility in their design, small lot drainage criteria have been developed as follows:

Rosemary Heights Business Park Small Lot Design Criteria

Criteria	Design Value
Design 1:5 year Inflow Rate	0.035 m ³ /s/ha
Permissible 1:5 year Release Rate	0.0072 m ³ /s/ha
Required 1:5 year Detention Volume	260 m ³ /ha

For assessing the critical permissible discharge rate, the 1:5 year pre-development runoff rates were compared to 50% of the 1:2 year post-development flow, as noted in the current City of Surrey design criteria. As indicated in Section 5.3.1, the 1:5 year pre-development condition remains critical. Therefore, all detention volumes presented in this study represent controlling to this level.

5.4 Service Area Requirements

Although overall objectives remain consistent, the nature of the proposed development and various site constraints limit the ability to apply a single "blanket strategy" for stormwater management to all areas of the Business Park.

The study area has been divided into six Service Areas, as shown on **Figure 5.2**, each having some unique infrastructure requirements. Service Area F extends beyond the boundary of the Business Park NCP, and defines a sub-catchment of existing residential and commercial development between Highway #99 and King George Highway which discharges to the south branch of Morgan Creek via a culvert crossing beneath Highway #99.

A graphical summary of the stormwater management strategies for each Service Area is indicated on **Figure 5.3** and supports the discussion presented below.






5.4.1 Service Area A (West Catchment)

Storm sewers currently exist on both 152nd Street and 32nd Avenue. Allowing for a 3.5 hectare portion of the Central Rosemary Heights NCP area to discharge to 32nd Avenue, the existing storm sewer on 32nd Avenue has sufficient capacity to service up to 4.2 hectares of development from the Business Park (1:5 year events). Unless upgrading of the 32nd Avenue system is provided, the remainder of the West catchment will need to be serviced directly to 152nd Street with a dedicated storm sewer system.

The existing sewers on 152nd Street from the original 32nd Avenue alignment to approximately 130 meters north of the 32nd Avenue diversion (a total pipe length of 300 meters) are undersized for providing service to the proposed land uses. The capacity of these existing pipes range between 0.09 and 0.15 m³/s. The required upgrading of this reach depends on the service tie-in location from the Business Park. This will need to be reviewed by the developer at the Subdivision stage.

Stormwater modelling indicates that the peak 1:5 year discharge from the West Catchment will be 0.26 m³/s. When combined with the

LEGEND

-  ROSEMARY HEIGHTS BUSINESS PARK AREA
-  RIPARIAN SETBACK
-  PROPOSED DETENTION POND
-  PROPOSED TRUNK STORM SEWER
-  STORMWATER SERVICE AREA

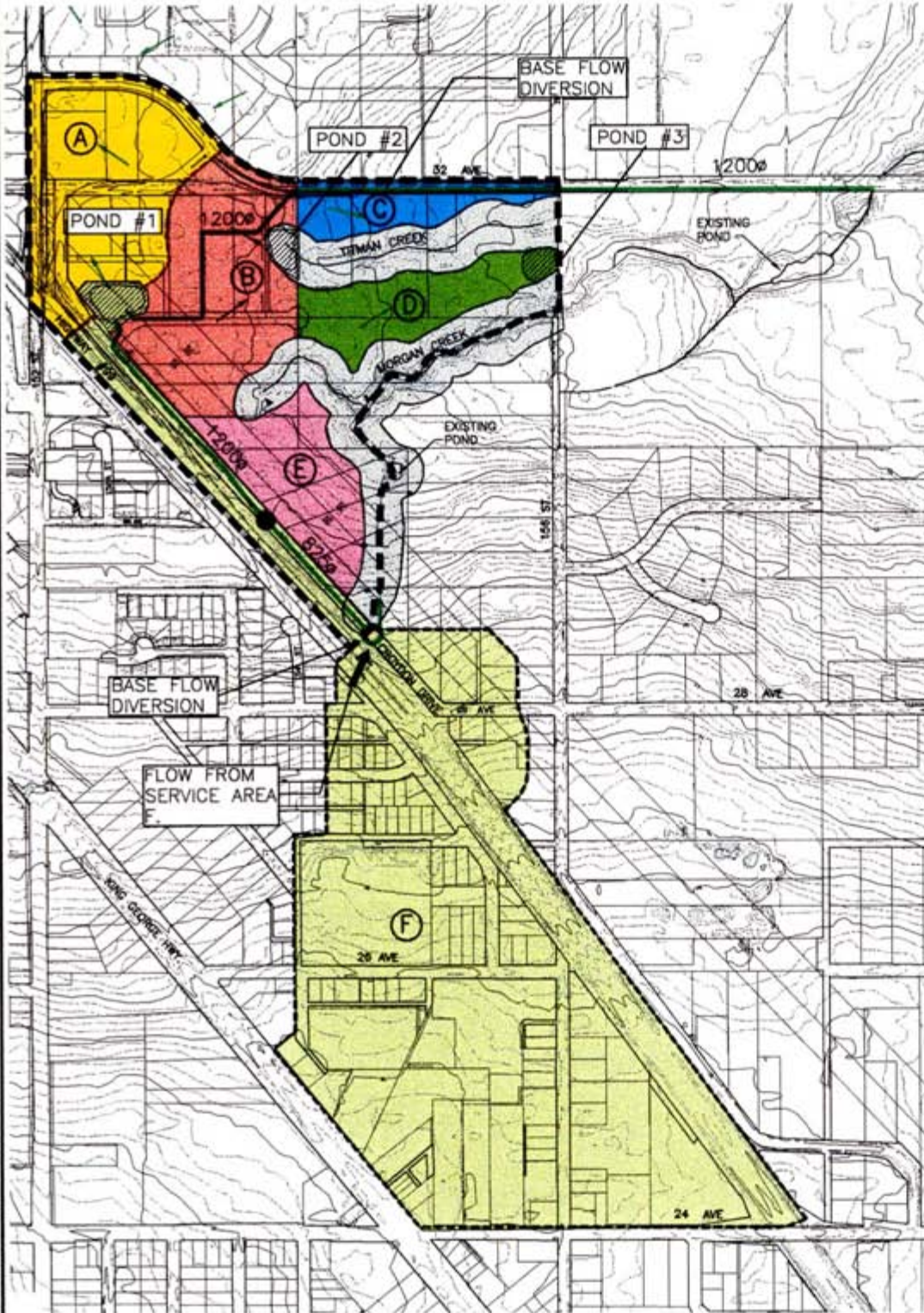


CITY OF SURREY

ROSEMARY HEIGHTS BUSINESS PARK

Figure 5.2

STORMWATER SERVICE AREAS



ALCAD11 09/10/19 10:47 U:\PROJECTS\6107\317\2\0655\CURRENT\URH-STORM-OFF.DWG PLOT 1 of 1

DATE: AUGUST, 1999

URBANSYSTEMS

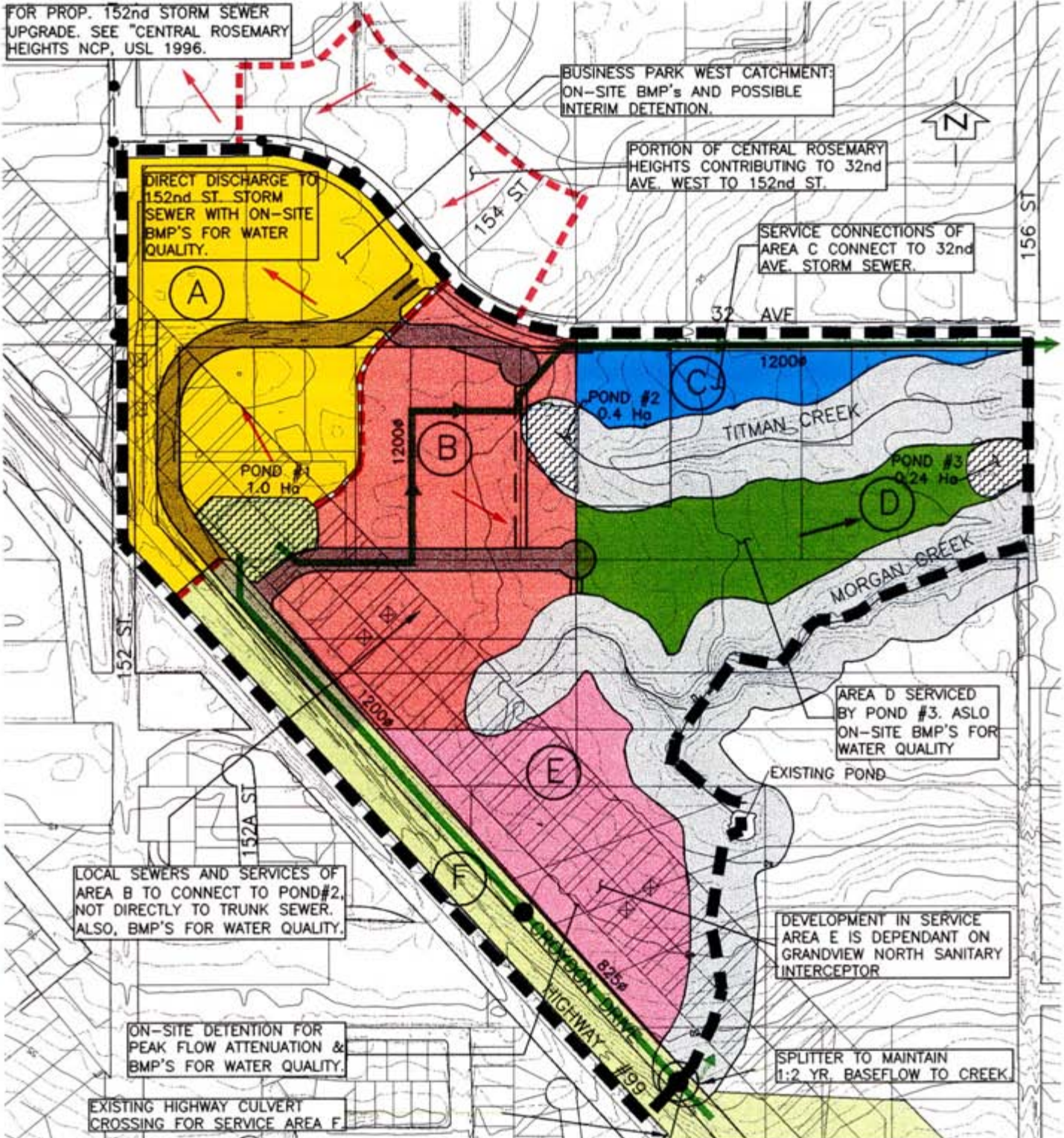


CITY OF SURREY
ROSEMARY HEIGHTS
BUSINESS PARK

Figure 5.3
ON-SITE
STORMWATER
MANAGEMENT

LEGEND

- ROSEMARY HEIGHTS BUSINESS PARK AREA
- RIPARIAN SETBACK
- HYDRO RIGHT OF WAY / GREENWAY
- PROP. ROAD ALIGNMENT
- CATCHMENT BOUNDARY
- TRUNK STORM SEWER
- SERVICE AREA
- PROPOSED DETENTION POND
- OVERLAND DIRECTION OF FLOW



ACAD14 09/28/99 0852 U:\PROJETS\ARB737\TUD\GCS\CURRENT\APPROX\08-51\DWG_PLOT_1.dwg



DATE: AUGUST, 1999

URBANSYSTEMS

contribution from the Central Rosemary Heights NCP area, the total peak 1:5 year flow at the intersection of 152nd Street and the 32nd Avenue diversion is 0.37 m³/s. Downstream of this intersection, the existing 152nd Street storm sewers between 32nd Avenue and 36th Avenue have a capacity range of 0.40 to 0.52 m³/s, which is expected to provide sufficient capacity for future development, provided that servicing of the Central Rosemary Heights NCP is completed in accordance with the NCP strategy.

At 36th Avenue on 152nd Street, a new low flow diversion to Barbara Creek and additional trunk sewer works directly to the Nicomekl River are required in accordance with the Central Rosemary Heights NCP Stage II report. Development of Service Area A without the provision of on-site stormwater detention is predicated on the completion of these downstream works. Provided that the 152nd Street works are complete, there is no requirement for peak flow attenuation within Service Area A. However, Best Management Practices (BMP's) should be applied to provide on-site water quality enhancement. Specific discussion regarding possible BMP's is presented later in this section.

Major flow paths should be provided to 152nd Street and/or 32nd Avenue. The existing storm sewers on these roads are insufficient to convey the 1:100 year design flows, therefore, surcharging and surface flow can be expected.

5.4.2 Service Area B

Service Area B is one of five sub-catchments which make up the East Catchment. This area represents a large portion of the headwater for the north branch of Morgan Creek. In order to maintain baseflow to the creek, the area must continue to discharge to the creek, at least under the frequent storm events.

The timing of the trunk storm sewer through the Business Park for Service Area F is unknown. Service Area B will be serviced with a dedicated collection system and detention pond, indicated as Pond #2 on Figures 5.2 and 5.3. The collection system must allow for the future trunk sewer from Service Area F. Pond #1 cannot be upsized to eliminate Pond #2. Pond #2 or an alternative detention system is required for Service Area B.

Modelling indicates that a storage volume of approximately 2,300 m³ is required to attenuate the 1:5 year flows to pre-development levels

(includes 20% contingency). Assessing an accurate area requirement for Pond #2 will require more detailed topographic information. It is also predicated on whether the pond is situated within the riparian setback or not. However, assuming an average live storage depth of 1 meter with a 0.6 meter freeboard (4:1 side slopes) and a 3 meter wide service path around the perimeter, the estimated area for Pond #2 is 0.33 hectares.

Given the high degree of impervious surface, it is not expected that sufficient surface flows will be available year round to maintain a wet pond, therefore, it is expected that this facility will be in the form of a dry pond unless the business park wishes to enhance flows with groundwater and provide aesthetic features. It is recommended that the invert of the pond be finished with a vegetated base flow channel to allow all runoff to pass through the pond. This will provide added opportunity for the removal of pollutants. In addition, individual developments should include on-site BMP's which may promote groundwater recharge and aid in water quality buffering.

The storm sewer collection system for this area will be a local system and, therefore, has not been shown.

5.4.3 Service Area C

Service Area C includes development fronting directly to 32nd Avenue. Drainage servicing to this area can be provided directly to the proposed storm sewer on 32nd Street which will discharge into Morgan Creek at approximately 160th Avenue. Through earlier discussions with Aplin & Martin Consultants Ltd., and a review of the Stormwater Control Plan, there is sufficient capacity in the Morgan Creek Development stormwater management system to permit Service Area B to discharge uncontrolled. Therefore, no provision for on-site detention is required, however BMP's must be applied to address water quality.

5.4.4 Service Area D

Service Area D is pinched between the north and south branches of Morgan Creek. Topography dictates that this area be serviced by a dedicated system with both minor and major flows discharging to Morgan Creek. Modelling indicates that approximately 1050 m³ of detention storage is required to attenuate the 1:5 year flows to pre-development levels (includes 20% contingency). A single pond, Pond #3, is shown on Figure 5.3 to service this area. Similar to Pond #2, determining the accurate land area requirement will require additional

topographic information. But assuming the same design geometry as described for Pond #2, the area required for Pond #3 is approximately 0.2 hectares. Pond #3 will be a private pond with a right-of-way for City access and possible maintenance.

Also similar to Pond #2, it is proposed that this pond have a vegetated low flow channel to provide additional water quality buffering prior to discharge into the creek. However, on-site BMP's must be provided by the developer to promote recharge and filter runoff.

5.4.5 Service Area E

Development of Service Area E is dependent on the completion of the Grandview North Sanitary Interceptor. Topographic constraints also prevent this area from being able to discharge to the trunk drainage system. Therefore, similar to Service Area D, provisions for a local conveyance and detention system is required prior to discharge into Morgan Creek.

A communal detention pond has not been identified for this area. Given that a large portion of this area is within the BC Hydro right-of-way, the true form and function of this development is not precisely known at this time. Provisions for on-site BMP's will also be required.

5.4.6 Service Area F

Service Area F is a 41.7 hectare catchment located to the south of the Business Park NCP between Highway #99 and King George Highway. This area has been largely developed. The majority of the area is zoned residential, but approximately 7 hectares is designated commercial in the Official Community Plan. Runoff from Area F is conveyed to the south branch of Morgan Creek via a culvert crossing Highway #99 and Croydon Drive. The capacity and condition of the Highway #99 crossing for Service Area F has not been reviewed in detail for this study, but a visual inspection indicates that the inlet condition of the crossing may not be sufficient to convey the design flows of the catchment.

Concerns exist over the sensitivity of Morgan Creek to erosion, as well as flooding potential through the Gardens of Gethsemani Cemetery under less frequent storm events. Given the limited opportunity to complete channel improvements through these reaches, the Morgan Creek MDP proposed that a trunk storm sewer be implemented for this

A Report to
CITY OF SURREY

**Rosemary
Heights Business
Park**

Engineering
Servicing Plan

Final Report

catchment through the Business Park area. This approach has been repeated in this study, as shown in Figures 5.2 and 5.3. Further details for this requirements of this sewer is presented in the following section.

A base flow diversion is required at the Highway crossing to maintain 1:2 year base flows ($Q = 0.2 \text{ m}^3/\text{s}$) into the south branch of Morgan Creek, but flows beyond the base flow level will be conveyed to 32nd Avenue via the trunk storm sewer.

Also in accordance with the Morgan Creek Master Drainage Plan, stormwater detention is also recommended for this area to attenuate the 1:5 year post-development flows. However, to reflect the current position of the Ministry of Environment on the protection of the riparian corridor, the proposed location of the pond has been relocated, as represented by Pond #1 shown in Figure 5.3. A detention volume of approximately $10,300 \text{ m}^3$ is required to attenuate the 1:5 year post-development flows to pre-development conditions for Service Area F (includes a 20% contingency). Although currently developed, pre-development conditions represents the original woodlot and grassland condition. Similar to the other ponds, although more topographic information is required to confirm land area requirements, it is estimated that an average storage depth in the range of 2 meters may be achieved in this pond. This assumption, along with assuming 4:1 side slopes and a 3 meter maintenance path, results in a land area requirement of 0.62 hectares for Pond #1.

With base flows being diverted directly to the Creek, there will be insufficient low flows to maintain Pond #1 as a wet pond. Therefore, it is expected that a dry pond off-line of the trunk sewer will be constructed. This may permit the opportunity to utilize the pond area for active park uses.

Given the current level of development in Service Area F, it will be economically difficult and inefficient to retrofit sufficient on-site BMP's. It is recommended that a constructed biofiltration marsh be developed adjacent to Croydon Drive at the point of diversion to provide pre-treatment of the base flow before discharge into the Creek.

5.4.7 Trunk Storm Sewer

As indicated above, the inlet capacity of the Highway #99 crossing for Service Area F is in question. A detailed review and analysis of this crossing is required at the pre-design stage for the trunk storm sewer and

URBANSYSTEMS

October 1999
6107237.2

990628fs final report.doc

A Report to
CITY OF SURREY

**Rosemary
Heights Business
Park**

Engineering
Servicing Plan

Final Report

Pond #1. Unless the capacity of this crossing is confirmed to be suitable for the major flow from Service Area F, the proposed trunk storm sewer and Pond #1 will be over designed.

Primarily because of concerns for flooding in the Gardens of Gethsemani Cemetery, it is proposed that the trunk sewer be sized for the 1:100 year event. The routing of the sewer in relation to the natural topography will result in a very flat pipe slope through much of the length. The required invert of Pond #1 also contributes to the flattening and lowering of the storm sewer. It is estimated that the majority of the trunk sewer will require a slope in the order of 0.35 percent. As a result, a 1200 mm diameter trunk sewer is required to convey the design 1:100 year peak flow of 2.0 m³/s (i.e. Total design flow of 2.2 m³/s less 0.2 m³/s baseflow diverted directly to creek). The size of the pipe should be revisited at the pre-design stage following a detailed review of a hydraulic grade line profile. However, for financial budgeting, a 1200 mm diameter pipe should be considered at this time.

Not only will the trunk sewer require a flat grade, but between Pond #1 and 32nd Avenue, the trench depth is expected to reach 4 meters. The proposed discharge point for the sewer is at the Morgan Creek crossing on 32nd Avenue, resulting in a total trunk sewer length of 2,000 meters.

A local storm sewer is currently being planned and designed for the north side of 32nd Avenue as part of the road widening required for the Central Rosemary Heights NCP. Because the timing of this work is expected to precede the proposed trunk sewer, it is anticipated that the north sewer will be completed independently of the trunk.

5.5 Best Management Practices

The specific businesses within the park are not yet known, but it is predicted that sediments, heavy metal and oils and greases characteristic of parking areas will be of concern. Biofiltration and granular trenches should be provided to promote ground water infiltration and treat stormwater runoff prior to discharge into the collection systems. These facilities can be integrated as a landscape feature in the development. Oil-water separators, catchbasin sumps with debris hoods should also be incorporated into the collection system.

Other methods such as compost biofilters, porous pavements and grassed swales should be considered for application into the on-site

A Report to
CITY OF SURREY

**Rosemary
Heights Business
Park**

Engineering
Servicing Plan

Final Report

drainage systems. The pavement surface within the development is expected to be high, therefore, a regular pavement sweeping and catch basin cleaning program would also provide significant control of pollutants washed from the site.

While the soils conditions in the area may not be conducive to rapid infiltration, the opportunity to provide on-site infiltration trenches or dry wells should be reviewed by the proponent(s) at the development application stage.

URBANSYSTEMS

October 1999

6107237.2

990628fs final report.doc

6. Transportation Considerations

6.1 Traffic Volumes

There are approximately 13.9 acres of land available for development in the Rosemary Heights Business Park. Using ITE trip generation rates for business parks (ITE code 770), it is estimated that the following traffic volumes would be generated by development in the Rosemary Heights Business Park:








	In	Out
AM Peak Hour	240	40
PM Peak Hour	50	200

6.2 Road Network

The road network within the Rosemary Heights Business Park is illustrated in **Figure 6.1**. The key features of the road network include:

- Croydon Drive and Old 32 Avenue would provide access to and through the site. These would be two-lane roadways (with additional turn lanes at the 32 Avenue intersection as required), and would be classified as collector roads in accordance with the Grandview Heights Neighbourhood Community Plan.
- Old 32 Avenue would be realigned to intersect with 32 Avenue at the signalized 154 Street intersection.
- Access to most properties within the business park would be via two internal roadways. Properties in the northwest corner of the site would access Old 32 Avenue directly.

LEGEND

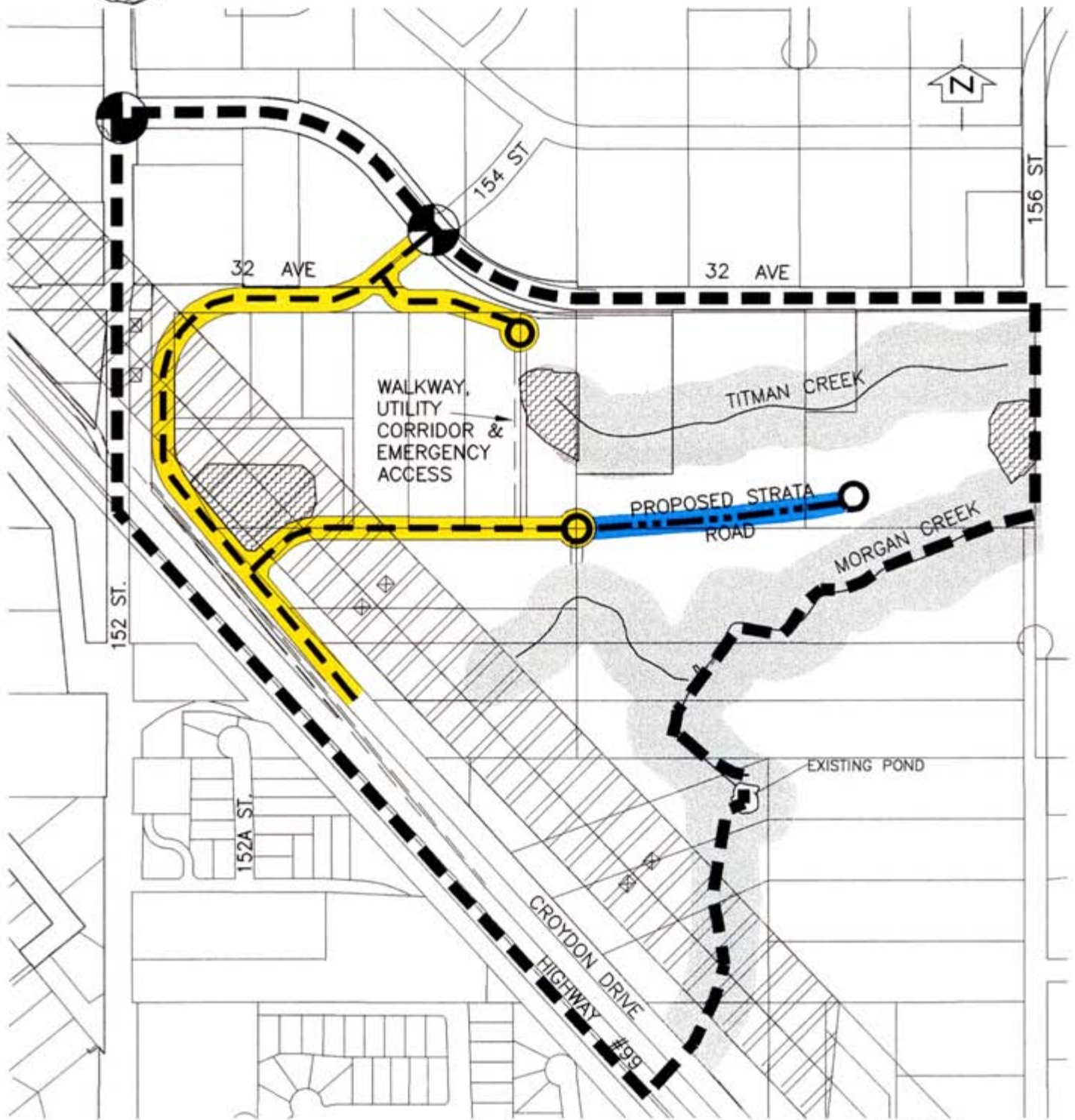
-  ROSEMARY HEIGHTS BUSINESS PARK AREA
-  RIPARIAN SETBACK
-  HYDRO RIGHT OF WAY / GREENWAY
-  PROPOSED ROAD ALIGNMENT
-  PROPOSED STRATA ROAD
-  TRAFFIC SIGNAL
-  DETENTION POND



CITY OF SURREY

ROSEMARY HEIGHTS
BUSINESS PARK

Figure 6.1
ROAD LAYOUT
(ALIGNMENTS ARE APPROXIMATE)



ALADN 09/10/99 10:53 D:\PROJ\ELT\5\41972\3\2\DWG5\CURRENT\APPROD_LAYOUT.DWG PLOT 1x1



DATE: AUGUST, 1999

URBANSYSTEMS

6.3 Traffic Operations

It is important to recognize that a detailed traffic operations analysis has not been undertaken, and would be required to determine intersection laning, traffic controls and other traffic operations requirements. This analysis cannot be undertaken until an accurate estimate is available of future development within the business park.

Considerations which should be addressed as part of a traffic operations review include:

- Laning at the signalized Old 32 Avenue/154 Street/32 Avenue intersection. In particular, the need for a dual northbound-to-westbound left turn lane should be considered.
- Vehicle storage length requirements at the signalized Old 32 Avenue/154 Street/32 Avenue intersection, and the spacing of the frontage road intersection on Old 32 Avenue.

Other Transportation Modes

Access to the business park by transit would be possible in three ways:

- The proposed Park-and-Ride, to be located on the west side of 152 Street between Highway 99 and 32 Avenue. The Park-and-Ride facility would be served by local South Surrey and White Rock buses, as well as express buses to Surrey City Centre and destinations along Highway 99 and 91. For much of the business park, the walking distance to/from the park-and-Ride would be less than 500m.
- Transit services operating on 152 Street. Bus stops would be located at 32 Avenue, as well as at the Park-and-Ride facility.
- Possible transit service operating through the business park via Croydon Drive and 28 Avenue. This service would likely only be implemented when the South Grandview heights area is redeveloped to an urban density.

Croydon Drive and Old 32 Avenue should be constructed to Surrey's current collector road standards, which incorporate wide curb lanes for cyclists.

A Report to

CITY OF SURREY

**Rosemary
Heights Business
Park**

*Engineering
Servicing Plan*

Final Report

Within the business park, the most important bicycle facilities would be end-of-trip facilities — secure bicycle parking, short-term bicycle parking, showers, lockers and change facilities. These should be provided in accordance with the requirements identified in the City's *Bicycle Blueprint*.

In order to accommodate pedestrians (including transit users walking to/from bus stops), sidewalks should be provided on both sides of Old 32 Avenue and Croydon Drive, and on at least one side of other internal streets.

URBANSYSTEMS

October 1999

6107237.2

990628fs final report.doc

7. Development Phasing

The land use plan which includes both live/work and business park land uses has been presented to the Surrey City Council. The plan has been supported by Council and the Citizen Advisory Committee. Based on this land use plan a development phasing plan has been developed. The phasing is shown on **Figure 7.0**.

Phase I(a) of the plan can develop, from a servicing perspective, without any new major DCC City infrastructure. Phase I(a) will require a significant investment in infrastructure by the development community in local and on-site works. The Phase I(a) can be supported by the existing sanitary sewers developed along 32 Avenue. Water servicing for this area is dependent upon local water mains being built as development occurs. The major water main from the south will be extended in 1999. Stormwater detention and stormwater quality BMP's will be required of development in this area. The ponds identified for this area are not community ponds. The proposed local cul-de-sac and strata road will be built by the development community as the Phase I(a) area develops off Croydon Drive.

Phase I(b) is also ready to develop subject to the construction of sanitary and storm sewers north along 152 Street and a storm sewer diversion at 36 Avenue including the 152 Street outfall to the Nicomekl River. These works are local sewers which the developers will construct. These works are also required for the West and Central Rosemary Heights NCP's. The existing road network can service this area subject to modifications. The proposed traffic light at 154 Street was previously identified in the Central Rosemary Heights NCP.

The proposed community detention pond located in the BC Hydro right-of-way is necessary to service a large catchment outside the boundaries of this business park. The timing of this pond is dependent on the servicing needs of an area south of the business park, outside the NCP.

The area, shown on Figure 7.0, as development dependent on the North Grandview Sanitary Interceptor has been identified for a future role in the business park. This area does not have access to a sanitary sewer which would permit business park development at this time. The area is further constrained by the existing creeks, riparian setbacks and the BC Hydro towers and transmission lines. The general servicing plan contained in this report will service this unique area once the sanitary interceptor sewer is built. The timing of this sewer is not known at this time.












CITY OF SURREY

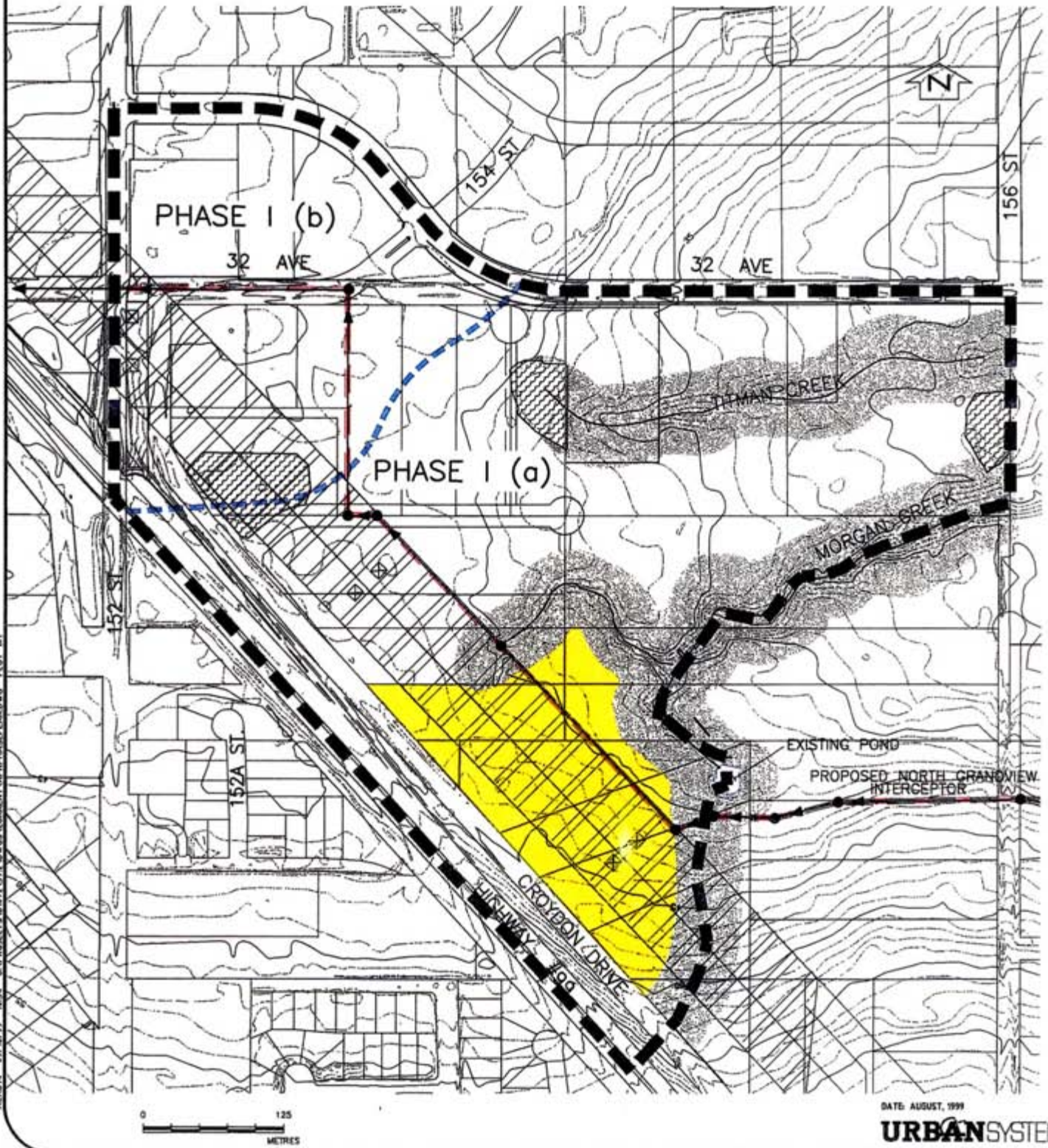
ROSEMARY HEIGHTS BUSINESS PARK

Figure 7.0

DEVELOPMENT PHASING PLAN

LEGEND

-  ROSEMARY HEIGHTS BUSINESS PARK AREA
-  RIPARIAN SETBACK
-  HYDRO RIGHT OF WAY / GREENWAY
-  PROPOSED ROAD ALIGNMENT
-  CATCHMENT DIVIDE
-  DETENTION POND
-  PHASE 1
-  FUTURE DEVELOPMENT DEPENDENT ON GRANDVIEW NORTH SANITARY INTERCEPTOR
-  FUTURE GRANDVIEW INTERCEPTOR



ACAD14 07/30/99 10:54 U:\PROJECTS\98073\37\2\DWG\5\CURRENT\APRPHASE1P.LANDWG PLOT 1:1

DATE: AUGUST, 1999

URBAN SYSTEMS

8. 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 applies to DCC revenues and expenditures within the NCP area. If the NCP's total DCCs are less than the expenditures, the NCP may still go ahead but the costs above the revenues generated through the specific NCP DCCs will only be provided by the City when the works become a City priority.
2. The short term annual DCC revenues and expenditures must also balance or the development community within the NCP must address the short term cash flow problem.
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. In Bill 46, Local Government Statutes Amendment Act (No. 2), 1997, the Provincial Government added section 937.1 regarding development agreements with developers. This section enables the City flexibility to repay developers who build infrastructure under an agreement with the City. Surrey Council has supported this approach.

The major off-site works identified to service the business park are contained within the current 10 year Engineering Servicing Plan or have been previously identified in either the Central Rosemary Heights or Grandview NCPs. The most significant costs include the Grandview North Sanitary Interceptor and the future stormwater detention ponds. The business park does not require any additional DCC infrastructure to support the proposed land use. The necessary infrastructure is local servicing which is the responsibility of the development in the area.

8.1 Local Infrastructure Needs

To support the proposed land use, numerous local engineering services are required. Specifically, local sanitary and storm sewers, water mains and local roads. Also, detention Ponds #2 and #3 are the responsibility of the local developers. The majority of costs for detention Pond #1 will be from DCC, see section 8.2 for details. These works are typically defined during the subdivision stage of development and required by the City through a servicing agreement with the developer. These local works are the responsibility of the developer.

To service the area between Titman Creek and Morgan Creek, a land consolidation of the various properties is required. The owner of the consolidated property will be required to construct a private road with storm, water and sanitary services. The sanitary requirements include a private sanitary pump station and required sewers.

The construction of the proposed cul-de-sac off Croydon Drive and the minor modifications to Croydon Drive will be the responsibility of the local developers in the business park. During the subdivision of properties along Croydon Drive, additional road dedication will be required to ensure that the future Highway 99 off-ramp and Croydon Drive each have adequate space for the necessary travel lanes and road shoulders.

In summary, the servicing needs of the business park are principally the responsibility of the owners of the land in the study area. All off-site works have been identified in previous NCPs in the area. These off-site works are included in Section 8.2 where appropriate.

8.2 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. Density projections are based on the Surrey Planning Department proposed land use plan. A total of 46.8 acres of potential business park/live-work development is proposed and this area has been used in the DCC revenue calculations. The DCC rates are based on the proposed industrial zone land use.

A Report to
CITY OF SURREY

Rosemary
Heights Business
Park

Engineering
Servicing Plan

Final Report

Many DCC's collected in this area will be used to fund off-site DCC works necessary to support the on-site development. These works have been identified in previous studies.

Projected DCC Revenues and Expenditures

	Projected DCC Revenues	Projected DCC Expenditures	Balance
Sanitary Sewer (\$2,680/ac)	\$125,424	0	\$125,424
Water (\$2,870/ac)	\$134,316	0	\$134,316
Major Collector Road (\$3,280/ac)	\$153,504	0	\$153,504
Storm Sewer (\$20,160)	\$943,488	Off-site Works (¹) A portion of the community pond #1 (3.1 ha of the 41.7 ha total catchment) \$104,000	\$839,488
TOTAL	\$1,356,732	\$104,000	\$1,252,732

The projected DCC revenues for arterial roads is estimated at \$630,864 (\$13,480/ac)

URBANSYSTEMS

October 1999
6107237.2

990628fs final report.doc

A Report to

CITY OF SURREY

**Rosemary
Heights Business
Park**

*Engineering
Servicing Plan*

Final Report

References

- North Grandview Heights — General Servicing Plan and NCP, Urban Systems, 1998.
- Central Rosemary Heights Neighbourhood Concept Plan — Stage Two Plan, Urban Systems, October, 1996
- Rosemary Heights West Neighborhood Concept Plan — Final Report, IBI Group, July 1997
- Morgan Creek/Old Logging Ditch Master Drainage Plan — New East Consulting Services Ltd., April 1996
- Rosemary Heights Local Area Plan — City of Surrey, February 1994

URBANSYSTEMS

October 1999

6107237.2

990628fs final report.doc

A Report to

CITY OF SURREY

**Rosemary
Heights Business
Park**

*Engineering
Servicing Plan*

Final Report

Appendix A

Stormwater Infrastructure Necessary for the Rosemary Heights Business Parks and Off-Site Catchment

URBANSYSTEMS

October 1999

6107237.2

990628fs final report.doc

APPENDIX A

STORMWATER INFRASTRUCTURE NECESSARY FOR THE ROSEMARY HEIGHTS BUSINESS PARK AND OFF-SITE CATCHMENT – STORMWATER MANAGEMENT PLAN

Item & Description	Qty ¹	Unit	Unit Cost	Total
SERVICE AREA A:				
Upgrade Storm Sewer on 152nd Street, between 32nd and 34th Ave. to 600mm dia. Pipe ² . (Previously identified in the Central Rosemary Heights NCP.)	240	m	\$ 750.00	\$180,000
SUB-TOTAL				\$180,000
SERVICE AREA B:				
Pond #2 - Construction ³ . (assumed pond will be constructed completely by the Developers in the catchment.)	2300	m ³	\$ 60	\$138,000
Pond #2 - Land Acquisition (assumed land cost of \$300,000/acre)	0.4	ha	\$ 741,000	\$296,400
Trunk Storm Sewer - 1200mm dia. Pipe from Pond #1 to 32nd Avenue. ⁴	460	m	\$ 900	\$414,000
SUB-TOTAL				\$848,400
SERVICE AREA C:				
Trunk Storm Sewer - 1200mm dia. Pipe from Service Area B to Morgan Creek Outfall along 32nd Ave. ⁴	900	m	\$ 1,000	\$900,000
SUB-TOTAL				\$900,000
SERVICE AREA D:				
Pond #3 - Construction ³ . (This area is a strata site. Pond to be built by strata owners.)	1050	m ³	\$ 80	\$84,000
Pond #3 - Land Acquisition (assumed land cost of \$300,000/acre)	0.24	ha	\$ 741,000	\$177,840
SUB-TOTAL				\$261,840
SERVICE AREA F:				
Pond #1 - Construction ³	10300	m ³	\$ 45	\$463,500
Pond #1 - Land Acquisition ⁵ (assumed land cost of \$150,000/acre, land is under major hydro lines)	1.0	ha	\$ 370,500	\$370,500
Trunk Storm Sewer - 825mm dia. Pipe from Morgan Creek/Hwy #99 crossing to MH on Croydon Drive ^{4,6} .	205	m	\$ 600	\$123,000
Trunk Storm Sewer - 1200mm dia. Pipe from MH on Croydon Drive to Pond #1 ⁴	425	m	\$ 900	\$382,500
SUB-TOTAL				\$1,339,500
SUB-TOTAL FOR ALL AREAS				\$3,529,740
CONTINGENCIES (35% for engineering, contingencies and G.S.T.)				\$1,235,409
TOTAL				\$4,765,149

NOTES:

- ¹ All quantities were taken from Figure 5.3 - On-site Stormwater Management from the Rosemary Heights Business Park - Engineering Servicing Plan (September, 1999, USL)
- ² Previously identified in the Central Rosemary Heights NCP. This upgrade only considers the ultimate land use conditions for both the Business Park and the Central Rosemary Heights. It also assumes that the business park will have its own on-site storm system and will connect to the existing system at 152 St. and 32nd Ave. diversion intersection. No upgrades have been assumed for the 32nd Ave. diversion or the 152nd St. pipes south of the 32nd Ave diversion.
- ³ This quantity is based on the live storage volume that is required to detain the 1:5 year flows. The unit cost includes excavation, inlet and outlet structures, modest plantings and gravel path around the perimeter, signage and fencing.
- ⁴ These pipes are necessary for the downstream catchment major flows. This is not an NCP cost.
- ⁵ It was assumed when sizing the pond the Hwy #99 crossing would be sufficient to convey the design flows. At this time, the crossing inlet does not have the capacity to convey the design flows.
- ⁶ The 825mm dia. Pipe was costed out as a 900mm dia. Pipe since the 825mm pipe is no longer a standard size.