SOUTH NEWTON NEIGHBOURHOOD CONCEPT PLAN (NCP)

FINAL REPORT

Approved by Council
June 14, 1999

SOUTH NEWTON NEIGHBOURHOOD CONCEPT PLAN (NCP)

PART A

DEVELOPMENT CONCEPT COMPONENT

A. ADOPTION OF MINUTES

4. Council-in-Committee - June 14, 1999

Recommendations to be ratified for the following:

Item No. C426 South Newton Neighbourhood Concept Plan - Stage 2 Report
File: 2350-009

It was

Moved by Councillor Hunt
Seconded by Councillor Watts
That:

1. Council approve the final and complete Neighbourhood Concept Plan for South Newton (Development Concept Component in Appendix VIII);

2. Council approve the arrangements, terms and conditions specified in the South Newton Neighbourhood Concept Plan - Development Concept Component as a means of managing the development and general provision of amenities and facilities for the South Newton area; and

3. Council authorize staff to draft an amendment to the Zoning By-law 1993, No. 12000, as amended, to include an amenity contribution provision based upon the density bonus concept for the South Newton Neighbourhood Concept Plan and infill areas.

RES.R99-1528 Carried

SURREY
CITY OF PARKS

Corporate Report

NO: C426

COUNCIL DATE: June 14/99

COUNCIL-IN-COMMITTEE

TO:	**Mayor & Council**	DATE:	**May 20, 1999**
FROM:	**General Manager, Planning & Development**	FILE:	**2350-009**
SUBJECT:	**South Newton Neighbourhood Concept Plan Stage 2 Report**		

RECOMMENDATION

The Planning & Development Department recommends that Council:

1. Approve the final and complete Neighbourhood Concept Plan for South Newton (Development Concept Component in Appendix VIII);

2. Approve the arrangements, terms and conditions specified in the South Newton Neighbourhood Concept Plan - Development Concept Component as a means of managing the development and general provision of amenities and facilities for the South Newton area; and

3. Authorize staff to draft an amendment to the Zoning By-law 1993, No. 12000, as amended, to include an amenity contribution provision based upon the density bonus concept for the South Newton Neighbourhood Concept Plan and infill areas.

INTENT

The intent of this report is to provide an overview of the Neighbourhood Concept Plan for South Newton including a summary of:

1. the planning process;
2. the major components of the Plan;
3. outstanding public concerns;
4. an analysis of the amenity requirements for this Neighbourhood Concept Plan area; and
5. implementation measures.

BACKGROUND

Council, on March 4, 1997 gave approval in principle to the proposed Land Use Concept Plan for South Newton (Stage 1 Neighbourhood Concept Plan) (Appendix I) and authorized staff to commence the Stage 2 detailed planning of the NCP identifying the type, size, location and densities of specific land uses, road hierarchy and alignments based on the Stage 1 Land Use Concept Plan. Council also authorized staff to prepare a comprehensive financial plan and to resolve outstanding land use issues as part of the Stage 2 planning.

It is noted that a report from the Manager, Utilities and Construction, Engineering Department on the detailed servicing, funding and phasing plan is to be considered in conjunction with this report.

DISCUSSION

The South Newton Neighbourhood Concept Plan area comprises approximately 485 hectares (1,200 acres) of land and is generally bounded by King George Highway to the west, Highway No. 10 to the south, 152 Street to the east, and 64 Avenue and Hyland Creek to the north. The Plan Area is characterized by small acreages but also includes a number of established suburban and urban subdivisions. It includes a number of significant environmental features including Archibald and Hyland Creeks and groves of mature trees. There are approximately 450 developable properties in South Newton.

The current population of South Newton is approximately 2,000 persons in approximately 685 housing units.

Overview of the Physical Component of the Neighbourhood Concept Plan (Appendix II)

The South Newton Neighbourhood Concept Plan area is designated Urban in the Official Community Plan. The Official Community Plan contains land use strategies and policies on the development of new urban neighbourhoods, the building of complete communities, protection of natural areas, and provision of parks and recreational facilities. These strategies and policies have provided the policy framework for the South Newton Neighbourhood Concept Plan. The Official Community Plan also contains guidelines and requirements for the preparation and content of Neighbourhood Concept Plans for Surrey's emerging urban areas. The Neighbourhood Concept Plan for South Newton complies with the relevant policies of the Official Community Plan.

The proposed Land Use Plan for South Newton features four residential neighbourhoods generally located north and south of 60 Avenue, and east and west of 144 Street, and builds upon the existing community nodes of the Surrey Public Market site at King George Highway and 64 Avenue, Michael's Market at 64 Avenue and 152 Street, Panorama Village at 152 Street and Highway No. 10, and the City Hall/Government Centre at Highway No. 10 and 144 Street.

The highest residential densities are proposed in the form of apartments along Panorama Drive in Panorama Village and along King George Highway south of 62 Avenue. Corridors of higher density in the form of townhouses are also proposed along 64 Avenue and 144 Street. Small (compact) single family lots with rear lane access are provided along 60 Avenue.

Small neighbourhood-commercial-residential centres are provided on 60 Avenue at 148 Street and 62 Avenue west of 142 Street. These neighbourhood centres are intended to provide focal points for the neighbouring residential areas.

A concentration of apartments, townhouses, mixed commercial-residential, and office park uses are organized around a large park site and the City Hall/Government centre. The office park provides a centrally located employment centre and is an extension of the neighbouring City Hall office uses.

Areas containing creeks and ravines are preserved as open spaces in accordance with Ministry of Environment & Parks and Department of Fisheries & Oceans' Guidelines.

Three new joint elementary school/park sites are proposed.

Based on the proposed Land Use Plan, it is estimated that the South Newton Neighbourhood Concept Plan area will accommodate approximately 6,200 new housing units with an estimated population of 17,434 persons at build-out. While single family residential will be the predominant land use in this new urban neighbourhood, the Neighbourhood Concept Plan provides for a significant amount of multiple residential housing in the form of townhouses (Appendix III).

Public Consultation

The planning process for the Stage 2 Land Use Plan followed the extensive public consultation process of the Stage 1 Land Use Concept Plan planning process. A public open house was held on June 24, 1998 to present a more detailed land use plan, as well as the engineering servicing, development phasing and financing plans. A second public open house was held on March 3, 1999 to present revised plans incorporating comments received at the earlier open house. In addition, staff met on numerous occasions with various groups and individuals to resolve local concerns.

As well, the South Newton Citizens' Advisory Committee (CAC) continued in their role of bringing local knowledge and facilitating local discussion and communication. The CAC met on six occasions to discuss, review and provide feedback on the proposed Stage 2 Land Use Plan, engineering plan, development phasing and financial strategies. At its last meeting on February 3, 1999, a clear majority of CAC members (7 out of 10 members or 70%) expressed support of the proposed Stage 2 Land Use Plan. Of those CAC members not fully supporting the Plan, one has a specific concern over a storm water detention pond proposed on his property. Another has a concern over the urban direction of the Neighbourhood Concept Plan and would like to see more land designated as open space and tree preservation areas. The third CAC member not fully supporting

the Plan has concerns over the loss of developable land related to detention ponds and creek setback areas.

Feedback received from the March 3, 1999 open house indicates that the majority of South Newton property owners support the Stage 2 NCP for submission to City Council for approval. Seventy-two property owners submitted comment sheets with 44 or 61% supporting the proposed Stage 2 NCP, 25 or 35% not supporting the NCP, and 3 or 4% undecided. While the percentage of support indicated in the comments sheets may be less than other NCPs approved, a closer review of those who do not support the Plan indicates that their non-support relates to single issues related to their property. The following is a summary of their reasons:

- 9 are concerned that a creek located on the east side of 148 Street north of 60 Avenue has little or no environmental significance and should not be shown as a watercourse in the Land Use Plan.
- 3 are concerned over the location and size of proposed detention ponds.
- 1 is concerned over the proposed phasing strategy.
- 9 have site specific concerns related to maximizing the development potential of their individual properties.
- 5 are concerned that the densities proposed in the Land Use Plan are too high and that the Plan does not include sufficient green space.

These concerns are addressed in greater detail in this report under "Outstanding Public Concerns".

Resolution of Outstanding Land Use Issues Identified in the Stage 1 Report

The Stage 1 Neighbourhood Concept Plan Corporate Report identified a number of outstanding land use issues which were to be further analyzed and resolved during the Stage 2 planning process. These issues have been resolved as follows:

1. Higher Densities Along 152 Street South of Michael's Market

The Stage 1 Land Use Concept Plan proposed townhouses (up to 15 units per acre) along 152 Street south of Michael's Market. The owners of property fronting 152 Street between Michael's Market and 62 Avenue expressed concern that these properties are better suited for garden apartments. They argued that higher density garden apartments would better support the existing commercial centre, and together with Sullivan Park on the east side of 152 Street, would create a more significant node at this location. They further argued that 152 Street is an arterial road, as well as a transit route.

Staff have further evaluated this request and the Land Use Plan has been revised to show stacked townhouses (up to 25 units per acre) in conjunction with conventional townhouses (up to 15 units per acre) at this location. This modification provides for more variety of housing types in South Newton, builds upon the existing commercial node at 64 Avenue and 152 Street, while at the

same time provides an appropriate interface with Sullivan Park and the existing Suburban area on the east side of 152 Street. The owners of property directly affected by this modification have agreed to the stacked townhouse solution.

2. ***Single Family Small Lots On 138 Street South of 64 Avenue***

The Stage 1 Land Use Concept Plan designated the east side of 138 Street south of 64 Avenue as townhouses. In response to concerns that the development of townhouses would require assembly by a developer, and that specific properties may have subdivision potential on their own, Planning & Development agreed that single family lots provided a reasonable alternative for this block. There are two existing single family subdivisions on the west side of 138 Street, as well as a strip of single family on the east side of 138 Street between 64 and 62 Avenues. More recently, comments were received at the last public open house favouring single family over townhouses along this block.

In light of the existing single family uses along this block, together with the desire of local property owners to maintain the existing single family character, the Stage 2 Land Use Plan has been revised to show single family small lots along this block.

3. ***Mixed Commercial-Residential at the North-East Corner of 64 Avenue and 144 Street***

The northeast corner of 64 Avenue and 144 Street was proposed as townhouses in the Stage 1 Land Use Concept. In response to suggestions from the owner of 6418 - 144 Street, the Stage 1 report indicated that commercial or mixed commercial-residential would be further explored as part of the Stage 2 analysis.

While townhouses remain the preferred land use at this location, the Stage 2 Land Use Plan indicates Mixed Commercial-Residential as an alternate land use option for this corner. This corner is located at the intersection of two arterial roads and is bounded by Hyland Creek to the north. The Sullivan Industrial Park is located to the east on 64 Avenue. There is an opportunity to create in this enclave, a comprehensive residential-commercial mixed use centre. The development of this enclave, however, will require consolidation or coordination of all the properties at this location up to Hyland Creek to the north and the future detention pond to the east.

4. ***Open Space Buffer Between Suburban and Proposed Single Family Small Lots, 58 Avenue Between 140 and 142 Streets***

The Stage 1 Land Use Concept Plan proposed a landscape buffer strip between the exiting half-acre subdivision to the south of 58 Avenue between King George Highway and 142 Street and the proposed single family area north of 58 Avenue. In order to minimize the City's maintenance cost of the buffer strip, this buffer will be incorporated into the lots created adjacent to the half-acre area. This arrangement is similar to other buffer areas in other urban/suburban interface

areas. The deletion of the landscape buffer from the Land Use Plan is supported by the affected property owners in this area.

Modifications to the Stage 1 Land Use Concept Plan

While the proposed Stage 2 Land Use Plan is similar to the approved Stage 1 Land Use Concept Plan, it introduces a number of minor changes to reflect localized conditions and constraints and public input received through the Stage 2 planning process. These changes are generally intended to provide better interfaces between different land uses; to better respond to site conditions and neighbourhood context; to provide a wider range of housing choices; and to better respond to existing patterns of subdivision and road layouts. These changes are largely supported by the public and are summarized in Appendix IV.

Outstanding Public Concerns

While the majority of the concerns raised through the public consultation process for the South Newton Neighbourhood Concept Plan have been resolved, there are a number of concerns which this NCP has attempted to address but not able to satisfy all the affected property owners. The major unresolved issue is the size and location of a number of proposed detention ponds. This issue is dealt with in the Engineering Department's companion Corporate Report on engineering servicing, financing and development phasing. Other outstanding planning-related issues are as follows:

1. ***Maintaining the existing suburban character of South Newton***

   A number of local residents remain concerned over the urban densities proposed in this Neighbourhood Concept Plan and feel that the Plan does not go far enough in preserving the existing natural environment of this area. In response to this concern, it is noted that South Newton is designated Urban in the Official Community Plan. Policy A-2.1 of the Official Community Plan promotes complete development in planned urban areas and strives to allocate land use and development opportunities to achieve full and efficient utilization of designated Urban areas, infrastructure services and public amenities, and to provide a broad range of residential and commercial development options. Within this Urban framework, however, the Neighbourhood Concept Plan for South Newton requires riparian setbacks/leave strips from all watercourses in accordance with Ministry of Environment and Department of Fisheries & Oceans guidelines. Moreover, efforts will be made to incorporate significant stands of trees into future development proposals.

2. ***Location of Creeks***

   A number of property owners have expressed concern that the watercourse located on the east side of 148 Street north of 60 Avenue has little or no environmental significance and should not be shown as a watercourse in the Land Use Plan. This creek is identified in the environmental inventory for South Newton prepared by Environwest Environmental Consultants. This creek may be reassessed if the

proponents, through their environmental consultants and with the input of the Ministry of Environment and Department of Fisheries & Oceans, can clearly demonstrate that it is not environmentally significant.

In a similar vein, the owner of property located at 14482 - 60 Avenue has suggested that the creek located on the east side of 144 Street at 60 Avenue is further west than shown on the Land Use Plan. The location of this creek is based on existing information contained within the City's data base. The exact location of the creek needs to be verified by further field work and a legal survey. This work can be undertaken by the proponent as part of a future development application.

3. ***Alignment of 62 Avenue east of 144 Street***

The proposed alignment of 62 Avenue east of 144 Street has been criticized by the owner of two properties on 150 Street as inequitable because it is located between his two properties. This road alignment has been established in the context of the entire South Newton NCP area and is based on the following criteria:

- It generally aligns with the existing 62 Avenue right-of-way on the west side of 144 Street;
- It is halfway between 60 and 64 Avenues;
- It generally follows property lines and contours with a few exceptions;
- It fits into a hierarchy of road systems developed for the area; and
- It facilitates a pattern of land use established in the area.

Ideally, the alignment of 62 Avenue should be a continuous through connection between King George Highway to the west and 152 Street to the east. However, the land acquisition for the secondary school on 144 Street has required a number of curves in this road to match the existing alignment west of 144 Street. Moreover, the road is curved south, east of 150 Street to match a desired intersection with 152 Street.

In support of the concern over the proposed alignment of 62 Avenue, the owner has submitted an alternative road plan prepared by his consultant (Appendix V). While this alternative alignment may have some merits in a smaller area, it alters the land use pattern developed in the NCP that has been generally endorsed by the public and, in particular, the area between 150 Street and 152 Street.

Notwithstanding the above, it is possible to consider an alternate road alignment in the future subject to the proponent obtaining the support of neighbouring property owners affected by the scheme and demonstrating that the alternate alignment does not negatively impact the land use and engineering servicing plans, and the phasing and financial strategies developed for this NCP.

4. Opening of 58 Avenue at King George Highway

The Planning & Development Department is in receipt of a 22-name petition representing 16 properties in the existing subdivision south of 58 Avenue between City Hall and King George Highway, requesting that the unopened intersection of 58 Avenue at King George Highway not be opened as a right-in, right-out, as proposed in the NCP Land Use Plan. The main concern expressed by the residents is that the opening of this intersection will promote short-cutting through the neighbourhood to access City Hall by people not knowing the area.

The Engineering Department, together with the NCP engineering consultant, has reviewed this matter and are recommending that the right-in, right-out intersection be retained, as proposed. The right-in, right-out intersection is intended to relieve some pressure off the 60 Avenue intersection at King George Highway. Any potential short-cutting would only affect 140 Street between 58 Avenue and 60 Avenue. Should this become a problem, Engineering advises that traffic calming measures could be introduced.

5. Property Specific Land Use Concerns

A number of owners have expressed specific concerns pertaining to their individual properties and more specifically, that the proposed Land Use Plan does not maximize the future development potential and value of their properties. These individual concerns are summarized in Appendix VI.

Amenity Requirements

To address the amenity needs associated with new growth in South Newton, new development will be required to make a monetary contribution toward the provision of new police and fire protection services, library materials, and the development of new parks, open space and pathways.

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 Surrey's Neighbourhood Concept Plan areas. The monetary contributions towards park, open space and pathway development are based upon an estimate of the capital costs of these improvements for the South Newton NCP area. The total cost is divided among the anticipated acreage and number of dwelling units to ensure an equitable contribution arrangement.

The park-related amenity contribution will go towards the development of the parks portion of three joint elementary school/park sites; the joint secondary school/park site; linear connections; and neighbourhood parks. The estimated cost of developing park-related amenities is approximately $4,151,470.00.

The applicable amenity contributions (per acre or unit) and the estimated revenue the City can expect to receive from this NCP area is shown in Appendix VII.

Implementation of the South Newton Neighbourhood Concept Plan

1. Park Land Acquisition

The proposed parks in the South Newton Neighbourhood Concept Plan are on the City's priority acquisition list. Development Cost Charge revenues for park land, as well as the 5% cash-in-lieu of park dedication (under the Municipal Act), provide funding sources for the acquisition of the proposed parks. The park land revenue and cost estimates indicate that this NCP will be financially self-sustaining as to the acquisition of land for future park sites.

2. School Site Acquisition

The NCP identifies the need for three new elementary school sites. Site "A", located on 150 Street north of 60 Avenue, is partially owned by the Surrey School District and is recommended for construction in 2003 in the School District's Five Year Capital Plan, 1999 - 2003. The acquisition of Sites "B" and "C", located on 58 Avenue at 148 Street and 142 Street north of 60 Avenue, respectively, are beyond this Five Year Capital Plan.

Funding for the acquisition of school sites is subject to the review and approval of the Ministry of Education. There are no financial commitments from the Ministry of Education at this time for any school-related expenditures.

However, Bill 35 (Education Statutes Amendment Act, 1998) received Third Reading on July 28, 1998 and the Province is in the process of preparing Regulations pertaining to this Bill. If enacted, Bill 35 will allow the School District to collect funds from new residential development for the purpose of acquiring school sites to accommodate new development. The school sites identified in the South Newton Neighbourhood Concept Plan will be part of the overall school site requirement established by the Surrey School District. It is anticipated that the Regulations will be enacted later in 1999.

3. Zoning By-law Amendments

An amendment to the Zoning By-law is required to implement the amenity contribution component of the Neighbourhood Concept Plan, and more specifically, to allow bonus densities in exchange for contributions towards the development of various neighbourhood amenities as identified in the NCP. An amendment by-law will be prepared and forwarded for consideration by Council subject to Council's direction.

CONCLUSION

The South Newton Neighbourhood Concept Plan responds to the planning objectives identified by the community and establishes land uses, densities and a development concept that are in conformity with the Official Community Plan. It incorporates a comprehensive servicing, phasing and financial plan to ensure that the costs to service

this new urban area can be funded by the NCP. The NCP also includes a strategy for funding various amenities required for South Newton. Prepared by a City project team in consultation with a Citizens' Advisory Committee, this NCP has received general support from the majority of property owners and the public.

Should Council approve the recommendations of the Manager, Utilities & Construction, of the Engineering Department with respect to servicing, phasing and financing, it is recommended that Council approve the final and complete South Newton Neighbourhood Concept Plan as the mechanism to manage the development and provision of amenities for this area. It is further recommended that staff be authorized to draft the necessary by-law amendments to implement the Plan.

Murray D. Dinwoodie
General Manager
Planning & Development Department

GTF/bea

APPENDICES

I. Stage 1 Land Use Concept Plan
II. Stage 2 Land Use Plan
III. Land Use Statistics
IV. Land Use Plan Modifications - Stage 1 to Stage 2
V. Alternative Road Alignment Option for 62 Avenue
VI. Property Specific Land Use Concerns
VII. NCP Amenity Contributions
VIII. South Newton Neighbourhood Concept Plan Development Concept Component

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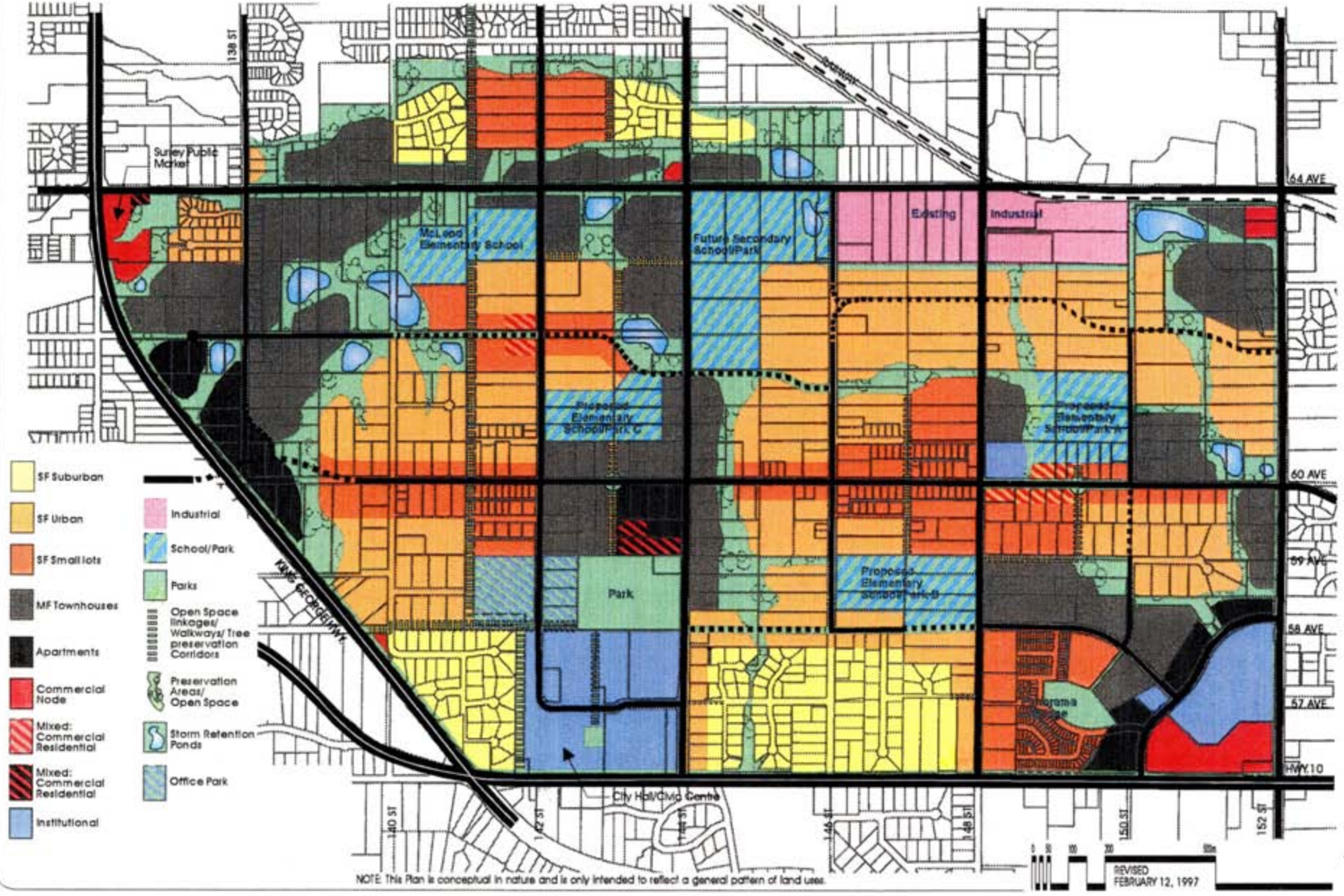
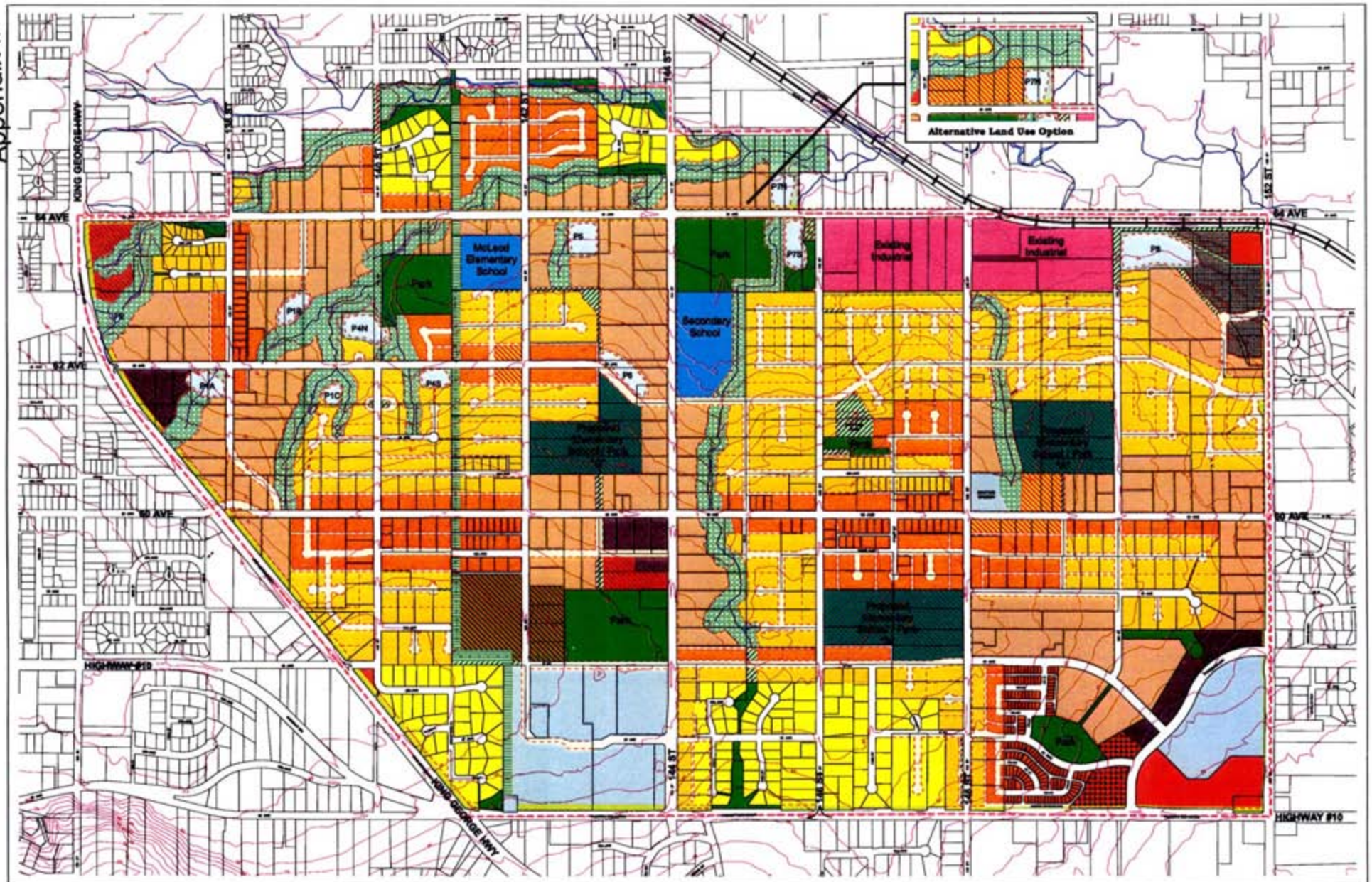
Appendix I

SOUTH NEWTON
NEIGHBOURHOOD CONCEPT PLAN - PROPOSED LAND USE



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

Appendix II



South Newton Neighbourhood Concept Plan 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 uses

Approved By Council
Date: June 14, 1999

- Suburban Residential 1/2 Acre
- Single Family Residential
- Single Family Small Lots
- Townhouses (15 u.p.a. max.)
- Townhouses (25 u.p.a. max.)
- Apartments (45 u.p.a. max.)
- Commercial
- Mixed Com.-Res. (Townhouses)
- Mixed Com.-Res. (Apartments)
- Office Park
- Institutional
- Existing & Future School
- Proposed Schools & Parks
- Creeks & Riparian Set Backs
- Existing & Future Parks
- Proposed Parks & Walkways
- Buffers
- Industrial
- Mixed Commercial-Recreational
- Detention Ponds (precise shape, size,& location subject to further analysis)
- Utility R/W / Greenway
- Proposed Roads
- Railway Line
- Right In / Right Out Only

APPENDIX III

SOUTH NEWTON NEIGHBOURHOOD CONCEPT PLAN LAND USE STATISTICS

Land Use	Area In Hectares (acres)	Projected Number of New Dwelling Units	Projected Floor Area (Commercial in sq. m.) (sq. ft.)
Suburban	32.6 (80.6)	12	N/A
Single Family	87.47 (216.16)	1,210	N/A
Single Family Small Lot	51.66 (127.67)	871	N/A
Townhouses (15 upa max)	84.39 (208.53)	3,070	N/A
Townhouses (25 upa max)	4.04 (10)	250	N/A
Apartments	6.15 (15.2)	684	N/A
Commercial	5.9 (14.7)	N/A	13,758.49 (148,100)
Office Park	5.4 (13.41)	N/A	32,559.87 (350,483)
Commercial-Recreational	1.8 (4.5)	N/A	5,574 (60,000)
Mixed Use	3.6 (9.1)	67	12,151 (130,800)
Industrial	14.55 (35.97)	N/A	N/A
Institutional	23.71 (58.6)	N/A	N/A
Schools	14.6 (36.1)	N/A	N/A
Detention Ponds	5.6 (13.93)	N/A	N/A
Parks and Open Space	26.35 (65.13)	N/A	N/A
Riparian leave strips	37.98 (93.87)	N/A	N/A
TOTALS	406.10 (1,003.47)	6,164	64,043.68 (689,383)

APPENDIX IV

SOUTH NEWTON NEIGHBOURHOOD CONCEPT PLAN LAND USE PLAN MODIFICATIONS STAGE 1 TO STAGE 2

Land Use

1. The proposed Townhouse designation along the north side of 64 Avenue and the west side of 140 Street has been changed to Single Family Small Lots to provide a better interface with the existing neighbouring 1/2 acre subdivision.
2. Redesignation of the Surrey Public Market site from Commercial to Commercial-Residential Mixed Use to better respond to site conditions and neighbourhood context.
3. The size of the Apartment area along King George Highway between 60 Avenue and 62 Avenue has been reduced and replaced with Townhouses in response to Council concerns over density.
4. Redesignation of a small parcel of land on the north side of 64 Avenue east of the B.C. Hydro right-of-way (141 Street alignment) from Townhouses to Single Family Small Lot to address access off 64 Avenue and creek setbacks. This redesignation allows completion of the proposed Small Lot subdivision to the north.
5. The proposed Commercial designation at the north-west corner of 144 Street and 64 Avenue has been modified to Townhouses. Due to the location of a creek which runs through this property, the site has very limited development potential. However, the Townhouse designation could permit the allowable density on this site to be transferred as part of a larger consolidation with the other Townhouse designated properties along 64 Avenue to the west. The Commercial designation, however, is retained as an alternate land use option.
6. The density of the Townhouse designation south of 64 Avenue along the west side of 152 Street has been increased from a maximum of 15 units per acre to 25 units per acre to provide a wider range of housing choices and to strengthen the existing commercial node at this corner.
7. The proposed detention pond at 60 Avenue west of 152 Street has been eliminated following further analysis of downstream sewers and Townhouses have been introduced to complete the abutting Townhouse designation.
8. The proposed Single Family Small Lot designation along 60A Avenue between 146 Street and 148 Street has been changed to Single Family Residential to better respond to the existing pattern of subdivision and neighbourhood concerns over lot size.
9. The proposed Single Family Urban designation of properties located at 5914 and 5932 - 146 Street has been changed to Single Family Small Lot to complete small lot area north of the proposed joint elementary school/park site.
10. A Commercial-Recreational designation has been introduced at the north-west corner of Panorama Drive and Highway No. 10 to accommodate the proposed YMCA facility at this location.
11. Redesignation from Single Family Urban to Single Family Small Lot with rear lanes along the north side of 58 Avenue between 144 and east of 146A Streets as an extension of Panorama Village.
12. Minor expansion of Office Park designation south of 59A Avenue at 142 Street to better reflect existing road layout and lane.

13. Redesignation from Single Family Urban to Single Family Small Lot along the south side of 59A Avenue west of the B.C. Hydro right-of-way to reflect existing lane configuration.
14. Minor increase in the size of the Mixed Commercial-Residential designation on the north side of 60 Avenue east of 148 Street related to the fine-tuning of the size of the joint elementary school/park site to the north.
15. Redesignation from Single Family Small Lot to Townhouses of properties on the north side of 60 Avenue west of 150 Street related to the fine-tuning of the size of the joint elementary school/park site to the north.

Roads

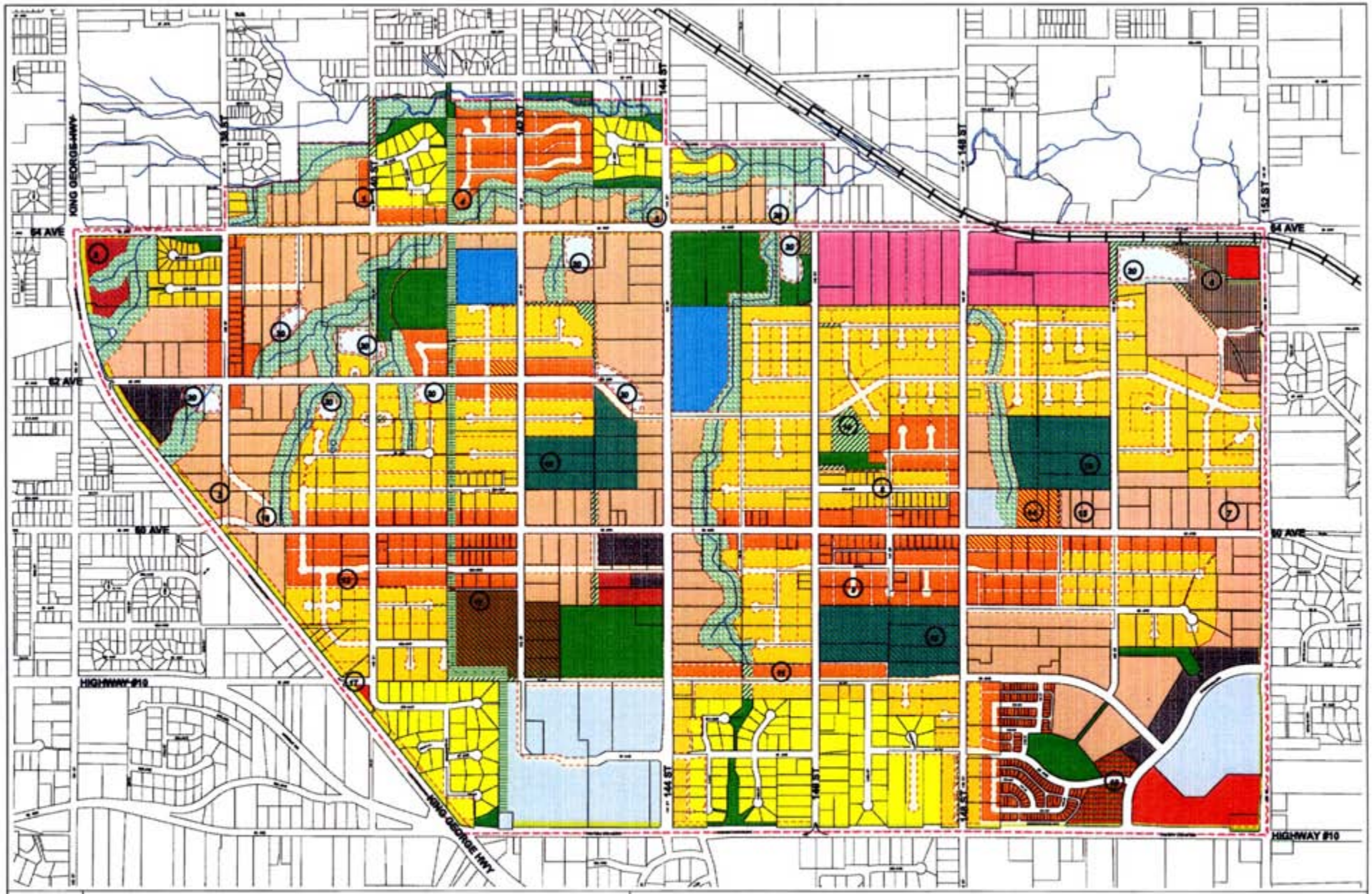
16. 138 Street at 60 Avenue is realigned to respond to Engineering concerns about an awkward angle and proximity to King George Highway. This road alignment affects several properties in this vicinity and together with an existing creek constrains the development potential of these properties. To avoid remnant pieces of land and to ensure compatibility and feasible development areas, these properties will require consolidation and a coordinated approach towards development.
17. 58 Avenue at King George Highway is proposed to be opened as a right-in/right-out to address safety issues related to emergency vehicle access and to take pressure off the intersection of King George Highway and 60 Avenue.

School and Park Sites

18. The size of the three new joint elementary school/park sites has been fine-tuned to reflect the Site Layout and Design Guidelines for the planning of school/neighbourhood park sites (i.e. minimum of 13 acres consisting of 6.5 acres for school component and 6.5 acres for park component).
19. A passive neighbourhood park is proposed east of 146 Street and south of 62 Avenue.

Detention

20. Detention pond sizes have been adjusted to reflect the latest storm water management plan.



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South Newton
Neighbourhood Concept Plan
Land Use Plan
Modifications - Stage 1 to Stage 2

City of Surrey Planning & Development Department

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

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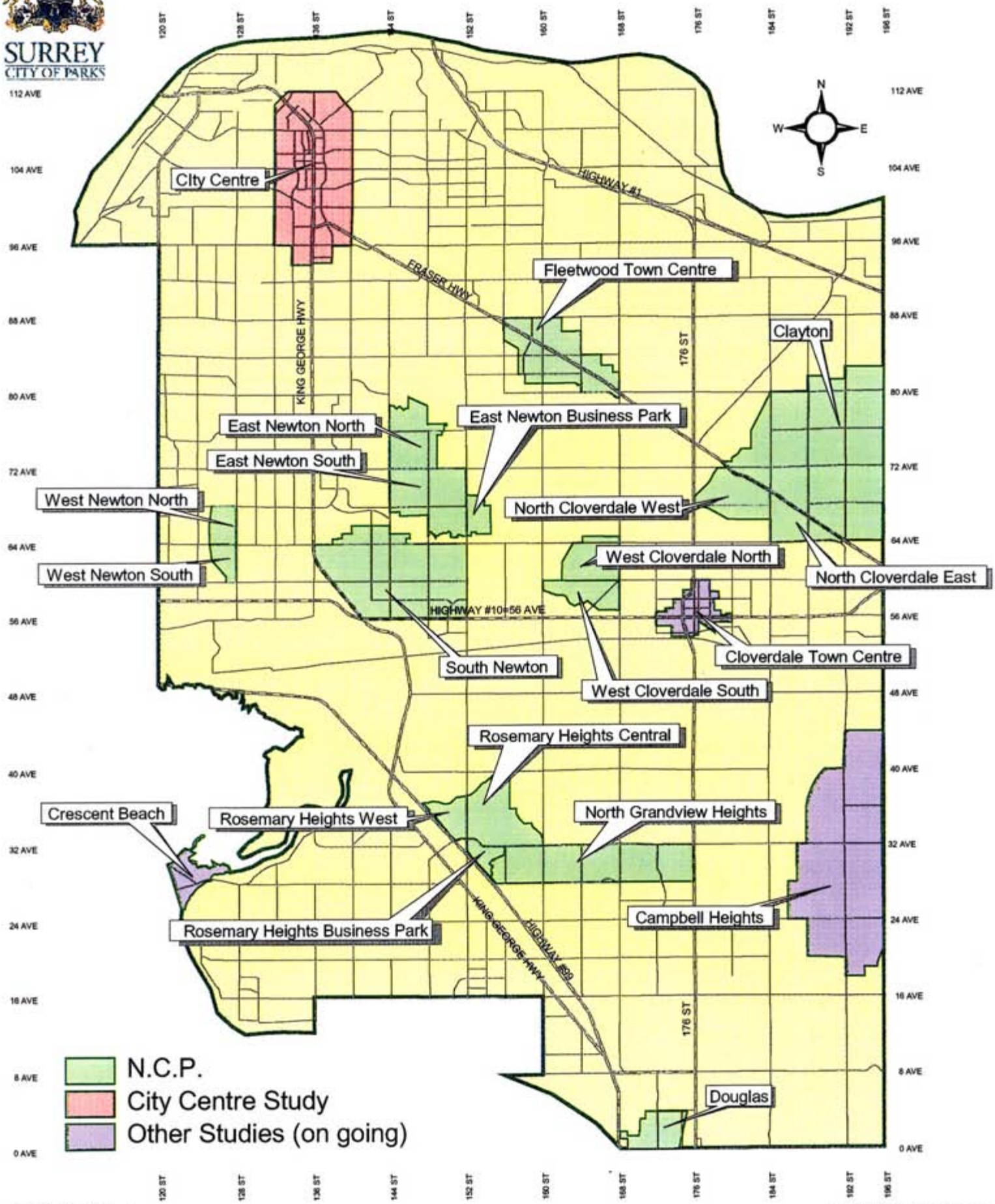
Appendix I

Neighbourhood Concept Plan Areas



Sept. 24th, 1998

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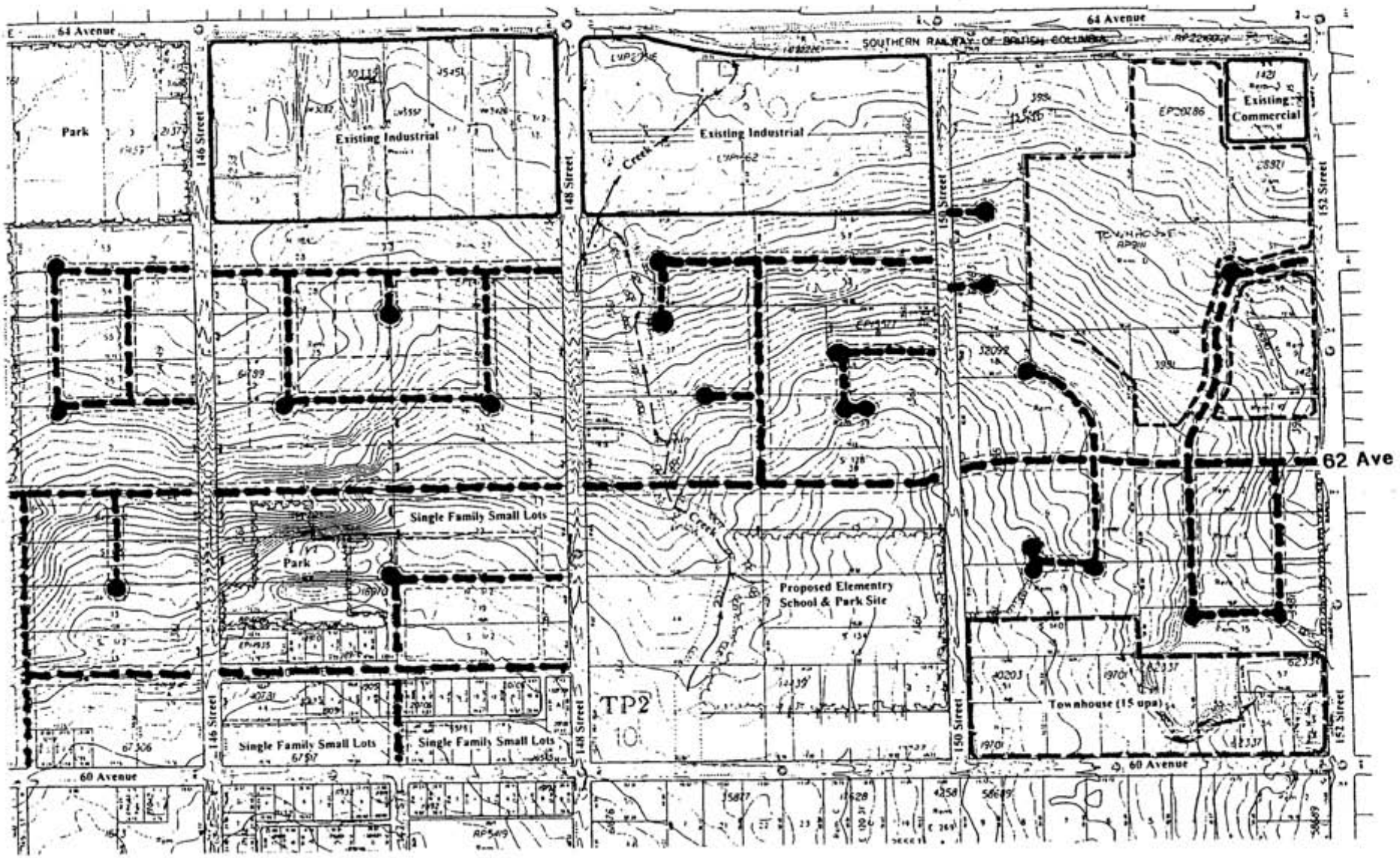

Alternative Road Alignment Option 62 Avenue

Appendix V

APPENDIX VI

SOUTH NEWTON
NEIGHBOURHOOD CONCEPT PLAN
PROPERTY SPECIFIC LAND USE CONCERNS

1. Single Family Residential Designation on the east side of 144 Street south of 58 Avenue

One property owner prefers Townhouses over the Single Family Residential designation of properties on the east side of 144 Street south of 58 Avenue, noting that north of 58 Avenue, the lands on the east side of 144 Street are proposed for Townhouses. The Single Family designation at this location is intended to provide an appropriate interface and density gradient with the existing suburban subdivision to the east. Townhouses at this location would not be compatible with the existing suburban subdivision to the east.

2. Single Family Residential Designation on the west side of 138 Street between 63B and 63A Avenues

With the exception of three lots on the west side of 138 Street which are part of the existing 63A and 63B Avenue subdivisions and designated Single Family Residential, the properties fronting 138 Street between 64 Avenue and south of 62 Avenue are designated Single Family Small Lots in the proposed Land Use Plan. The owner of one of the Single Family Residential designated properties fronting 138 Street and part of the 63A subdivision has enquired why his property is designated differently than the neighbouring Single Family Small Lot properties. The Single Family designation of these properties recognizes and is intended to maintain the character of the existing established subdivision.

3. Townhouse Designation - Southwest Corner of 62 Avenue and 140 Street

The owner of property located at the southwest corner of 62 Avenue and 140 Street has requested that the small portion of this property isolated from the balance of the property by a small stream be redesignated from Townhouses to Single Family Residential. The larger portion of the property lying east of the stream is designated Single Family Residential. The owner argues that development of the small Townhouse portion of the property is contingent upon this site being consolidated with neigbhouring properties to the west and as such, the development of this area is beyond his control. As an alternative, this owner suggests that this portion of the site may be subdivided into two compact lots without the cooperation of the neighbouring owner to the west.

While it is acknowledged that the development of this portion of the property for Townhouses will require consolidation with the neighbouring property to the west, one of the major elements of the Plan is the use of major natural features as a transition between different land uses. In this particular case, the existing creek provides the transition between Townhouses to the west and Single Family to the east. From a development perspective, the allowable density on this small portion of land may be transferred to the neighbouring property to the west. Any future reconsideration of land uses for this property will need to be reviewed within the context of the larger area (i.e. both the north and south sides of 62 Avenue to 138 Street to the west).

APPENDIX VII

SOUTH NEWTON NEIGHBOURHOOD CONCEPT PLAN AMENITY CONTRIBUTIONS AND ANTICIPATED REVENUES

	Residential (per dwelling unit)	Non-Residential (per acre)	Anticipated Revenues
Parks Related Public Amenities	$700.00	N/A	$4,314,800.00
Library Materials	$114.08	N/A	$703,189.00
Fire Protection	$219.04	$876.16	$1,376,446.00
Police Protection	$50.70	$202.80	$318,598.00
Total Amenity Contribution	$1,083.92	$1,078.96	$6,713,033.00

The contributions towards park-related amenities will pay for:

- the development of three joint elementary school/park sites;
- the development of the joint secondary school/park site;
- linear connections; and
- the development of neighbourhood parks.

Contributions for library, fire and police will go toward capital improvements and equipment to serve the new population in this neighbourhood.

Contributions are payable at rezoning for single family and at the building permit stage for multiple residential and non-residential.

SURREY
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SOUTH NEWTON NEIGHBOURHOOD CONCEPT PLAN

Development Concept Component

April, 1999

SOUTH NEWTON
NEIGHBOURHOOD CONCEPT PLAN

DEVELOPMENT CONCEPT COMPONENT

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SOUTH NEWTON
NEIGHBOURHOOD CONCEPT PLAN

DEVELOPMENT CONCEPT COMPONENT

1. INTRODUCTION

The South Newton Neighbourhood Concept Plan responds to the planning objectives identified by the community and establishes land uses, densities and a development concept that are in conformity with the Official Community Plan. It incorporates a comprehensive servicing, phasing and financial plan to ensure that the costs to service this new urban area can be funded by the NCP. The NCP also includes a strategy for funding various amenities required for South Newton.

Prepared by a City project team in consultation with a Citizens' Advisory Committee, this NCP has received general support from the majority of property owners and the public.

2. PLAN AREA CHARACTERISTICS

The South Newton Neighbourhood Concept Plan area comprises approximately 1,200 acres of land and is generally bounded by King George Highway to the west, Highway No. 10 to the south, 152 Street to the east, and 64 Avenue and Hyland Creek to the north (Appendix I) The Plan Area is characterized by small acreages but also includes a number of established suburban and urban subdivisions. It includes a number of significant environmental features including Archibald and Hyland Creeks and groves of mature trees.

The Plan Area has a number of existing community activity centres/nodes including the City Hall/Government complex at 144 Street and Highway No. 10, the Panorama Village mixed use residential/commercial/institutional/recreational centre at 152 Street and Highway No. 10, the Michael's Market commercial node at 152 Street and 64 Avenue, and the former site of the Surrey Public Market at 64 Avenue and King George Highway

The current population of South Newton is approximately 2,000 persons in approximately 685 housing units.

3. POLICY FRAMEWORK - SURREY'S OFFICIAL COMMUNITY PLAN

The South Newton Neighbourhood Concept Plan area is designated Urban in the Official Community Plan. The Official Community Plan contains land use strategies and policies on the development of new urban neighbourhoods, the building of complete communities, protection of natural areas, and provision of parks and recreational facilities. These strategies and policies have provided the policy framework for the South Newton NCP. The OCP also contains guidelines and requirements for the preparation and content of Neighbourhood Concept Plans for Surrey's emerging urban areas. The Neighbourhood Concept Plan for South Newton complies with the relevant policies of the Official Community Plan.

4. PLAN PREPARATION PROCESS

The Neighbourhood Concept Plan for South Newton has been prepared by a City project team consisting of representatives of the Planning & Development, Engineering, and Parks & Recreation Departments. The engineering component of the Plan including detailed servicing, financing and development phasing was undertaken by Reid Crowther Partners Limited under the direction of the City Engineering Department. The preparation of this Plan has also involved the participation of the Surrey School District, Ministry of Environment & Parks, Department of Fisheries & Oceans, and the Ministry of Transportation & Highways.

The preparation of the NCP followed a two-stage process. Stage 1 involved the preparation of a generalized conceptual land use plan and servicing concept and was approved by Council in March, 1997. The Stage 2 process involved the preparation of the detailed land use plan identifying the type, size, location and densities of specific land uses and road alignments based on the Stage 1 land use concept plan. The Stage 2 process also included the preparation of a detailed engineering servicing plan, development phasing strategy, and financial plan.

The preparation of the South Newton NCP has involved extensive public consultation. A total of four public open houses were held to receive community input on the evolution of the Plan. A Citizens' Advisory Committee consisting of local property owners assisted City staff throughout the preparation of the Plan. The main role of the CAC has been to bring local knowledge to the plan preparation process and to facilitate local discussion and communication. The CAC met on 12 occasions to discuss, review and provide feedback on the land use plan, engineering plan, development phasing and financial strategies. In addition, staff met on numerous occasions with various groups and individuals to resolve local concerns.

5. GOALS AND OBJECTIVES

The following broad goals and objectives are intended to provide direction for future development in South Newton:

- Ensure that the types of and densities of land uses in South Newton are in keeping with the hierarchy of urban centres promoted in the Official Community Plan.
- Identify, preserve and enhance, where possible, the natural environment including creeks and ravines, and significant stands of vegetation.
- Manage storm water run-off to mitigate the adverse impacts of development on watercourses and fish habitat.
- Recognize and protect development patterns and character of existing single family urban and suburban subdivisions in planning for future land uses.
- Provide a mix of housing densities and types ranging from small lot, compact single family lots to well designed townhouses and multi-storey apartments, to accommodate a range of needs.
- Create opportunities for neighbourhood centres that could be a focus for shopping, recreation, and entertainment.
- Create pedestrian-friendly, walkable neighbourhoods.
- Ensure the provision of cost-efficient and effective engineering services to meet the needs of the area without undue financial burden on the City.

- Provide for public amenities, schools and parks which are appropriate to meet the needs of present and future area residents.

6. THE PLAN

6.1 Land Use Plan Overview (Appendix II)

The Land Use Plan for South Newton features four residential neighbourhoods generally located north and south of 60 Avenue, and east and west of 144 Street, and builds upon the existing community nodes of the Surrey Public Market site at King George Highway and 64 Avenue, Michael's Market at 64 Avenue and 152 Street, Panorama Village at 152 Street and Highway No. 10, and the City Hall/Government Centre at Highway No. 10 and 144 Street The highest residential densities are proposed in the form of apartments along Panorama Drive in Panorama Village and along King George Highway south of 62 Avenue.

The overall structure of the Land Use Plan is based on a modified grid pattern. This grid pattern provides for inter-connectivity within the street system, and improves traffic distribution and pedestrian movement through the Plan Area.

The Land Use Plan provides for approximately 6,100 new housing units with an estimated population of roughly 19,300 persons at build-out. While single family housing will be the predominant land use in this new urban neighbourhood, the predominant housing form will be townhouses followed by single family housing, and apartments (Appendix III).

Areas containing creeks and ravines are preserved as open spaces in accordance with Ministry of Environment and Parks and Department of Fisheries & Oceans' guidelines.

The Land Use Plan proposes three new joint elementary school/park sites to meet the education needs of the future population. There is currently one elementary school in South Newton (McLeod Road). As well, a new secondary school is slated to be open in September, 2000.

In addition to the above land uses, the Land Use Plan also shows the approximate size and location of community storm water detention ponds. These ponds will be needed to manage storm water run-off stemming from future development.

6.2 Residential

The Land Use Plan for South Newton features a variety of residential densities ranging from suburban half-acre lots to medium density apartments. The areas of highest densities are focused around existing or proposed community activity centres/nodes or major intersections. As well, higher densities in the form of townhouses and apartments are located along transit routes and major roads. Pockets of single family housing are interspersed between the higher density nodes. Approximately 660 acres of this NCP's land area is proposed for future residential use.

6.2.1 Suburban Residential 1/2 Acre

While the thrust of this NCP is for the future urban development of South Newton, the Land Use Plan maintains the existing half-acre suburban subdivisions located south of 58 Avenue between King George Highway and 142 Street, and south of 58 Avenue between 144 Street and 148 Street. As well, the Plan maintains two smaller urban pockets located north of 64 Avenue at 140 Street and 144 Street.

Suburban land uses comprise approximately 32 hectares (80 acres).

6.2.2 Single Family Residential

Pockets of conventional single family residential lots at a maximum density of 6 units per acre are interspersed between higher density nodes. Approximately 87 hectares (216 acres) of the Plan Area is designated for future Single Family Residential use.

6.2.3 Single Family Small Lots

In keeping with the community objective of creating a community with a mix of housing densities and types and based on the planning and design principles established by the existing small lot subdivision in the Panorama Village development, the Land Use Plan features areas of small (compact) single family lots with a density range of 3 to 4 units per hectare (8 to 10 units per acre). These small lot areas are generally located along both sides of King George Highway between King George Highway and 152 Street; north of 64 Avenue between two established suburban half-acre subdivisions; along 62 Avenue generally between 140 Street and 144 Street. Another pocket of small lots is located on the west side of 148 Street generally between 60 Avenue and 62 Avenue.

Single Family Small Lots comprise approximately 52 hectares (128 acres) of land within the Plan Area.

6.2.4 Multiple Residential Land Uses

The Land Use Plan provides for a number of multiple residential areas in the form of townhouses and apartments. The largest area of multi-family housing is located between King George Highway and Archibald Creek south of 60 Avenue. With its proximity to the former Surrey Public Market site and location of a major transit route, this area provides an ideal location for higher residential densities. In addition, it provides an opportunity to preserve Archibald Creek by concentrating density away from this fish-bearing watercourse.

The City Hall/Government complex and neighbouring future park site to the north provides another existing node to build upon for higher density housing. Townhouses are also proposed along both the east and west sides of 144 Street. Similarly, townhouses are proposed on both the north and south sides of 64 Avenue between King George Highway and 144 Street.

The existing Michael's Market commercial centre at 64 Avenue and 152 Street and the Panorama Village development at 152 Street and Highway No. 10 provide other nodes which the Land Use Plan builds upon for higher density housing in the form of townhouses and apartments.

The maximum density for Apartments is 18.21 units per hectare (45 units per acre) and the maximum density for Townhouses is 6 units per hectare (15 units per acre) with the exception of the south-west corner of 152 Street and 64 Avenue where the maximum density shall not 10.11 units per hectare (25 units per acre).

Townhouses compromise approximately 88 hectares (218 acres) and Apartments compromise approximately 6 hectares (15 acres).

6.2.5 Affordable Housing

Several of the townhouse and apartment sites described above may be suitable locations for affordable housing. The two main locational criteria for family affordable housing are the site be located within walking distance to an elementary school and a neighbourhood commercial area. Townhouse sites north of 60 Avenue on the east side of 148 Street, on the north side of 60 Avenue between 144 Street and 142 Street, and on the south side of 64 Avenue east of McLeod School on 142 Street may be suitable for family-oriented affordable housing. The Apartment sites on King George Highway south of 62 Avenue, and in the Panorama Village development may be suitable for seniors' affordable housing.

6.3 COMMERCIAL

6.3.1 Mixed Commercial-Residential

Small neighbourhood-oriented, mixed commercial-residential centres are proposed at 62 Avenue west of 142 Street, and 60 Avenue between 148 Street and 150 Street. These two centres are intended to provide focal points for the neighbouring residential areas and are intended to serve the daily shopping needs of adjacent residents. These neighbourhood centres are intended to be accessed primarily by walking and cycling. A third commercial-residential centre is located south of 60 Avenue west of 144 Street. With its location close to the City Hall/Government complex, this centre is intended to offer a wider range of services than the other two neighbourhood centres.

In addition to the above, the Land Use Plan indicates Mixed Commercial-Residential as an alternate land use option for the north-east corner of 64 Avenue and 144 Street. This corner is located at the intersection of two arterial roads, the Sullivan Industrial Park is located to the east on 64 Avenue, and there is an opportunity to create a well-designed comprehensive centre. The development of this corner for a mixed commercial-residential project, however, will require consolidation of all the properties at this location up to Hyland Creek to the north and the future detention pond to the east.

Approximately 3.6 hectares (9 acres) of land is designated Mixed Commercial-Residential in the Land Use Plan.

6.3.2 Office Park

A 5.26 hectare (13 acre) site comprising five properties north of 58 Avenue along 142 Street is proposed as an Office Park. With its proximity to the City Hall/Government centre, this site is well suited to other complementary office uses. The intent of the NCP is to create a comprehensively designed office complex in a park-like setting.

6.4 INDUSTRIAL

The Sullivan Industrial Park on 64 Avenue between 146 and 150 Streets is located in the South Newton NCP area. This industrial area includes a variety of light industrial uses and comprises roughly 14.55 hectares (36 acres).

The land use plan does not propose any expansion of the existing industrial area nor any additional lands for industrial use. Some of the existing industrial lands in this area, however, are underutilized and future intensification of uses is possible. It is important that any future expansion of industrial uses provides an appropriate interface with neighbouring residential land uses.

6.5 SCHOOLS AND PARKS

The Land Use Plan includes three new joint elementary school/park sites comprising approximately 42 acres of land. These sites are in addition to the existing McLeod Road Elementary School located at 6325 - 142 Street. A new secondary school located south of 64 Avenue on the east side of 144 Street is intended to open in September, 2000. This site is 4.1 hectares (10.2 acres) in size.

A 5.2 hectare (13 acre) site owned by the City of Surrey located on the west side of 144 Street and north of the City Hall/Government centre, is reserved as a future park In addition, a 1.6 hectare (4 acre) site located south of 62 Avenue and east of 146 Street is reserved as a future passive park.

6.6 INSTITUTIONAL

Two major institutional centres are located in South Newton. The City Hall/Government centre houses a number of government offices including Surrey City Hall, the Surrey School District administrative offices, the Health Unit, Surrey Remand Centre, RCMP, and Provincial Courthouse. This centre comprises approximately 15.8 hectares (39 acres).

The Panorama Village development includes a 6 hectare (15 acre) site owned by the Greater Vancouver Regional Hospital District and is intended for a future hospital.

While the Land Use Plan does not propose any additional lands for institutional uses, such uses may be considered on a case-by-case basis based on the Official Community Plan and other Council policy.

6.7 PRESERVATION AREAS/OPEN SPACE

The Land Use Plan identifies areas containing creeks, ravines, and other significant natural features as Environmental Preservation Areas. Included in this designation are setback areas adjacent to streams and vegetative communities contiguous with watercourse corridors where there may be opportunities for habitat protection. These areas are largely undevelopable because of their environmental sensitivity.

The Land Use Plan requires riparian setbacks/leave strips from watercourses to be in accordance with Ministry of Environment & Parks and Department of Fisheries & Oceans guidelines, i.e. 15 metres (50 feet) from top of bank for residential developments with a density of 2.4 units per hectare (6.0 units per acre) or less and 30 metres (100 feet) from top of bank for residential developments with a density greater than 2.4 units per hectare (6.0 units per acre) as well as all commercial and industrial development.

The location and significance of watercourses shown in the Land Use Plan are based upon the City of Surrey Fisheries Watercourse Classification map and supplemented by an environmental assessment of South Newton prepared by Environwest Environmental Consultants. Where there may be disagreement as to the precise location and significance of a watercourse, it will be up to individual property owners to undertake supplemental field surveys including top of bank surveys, to refine the presence and exact location of watercourses.

7.0 LAND DEVELOPMENT

To ensure compatibility and feasible development areas, and to avoid remnant pieces of land, certain groups of properties in the Plan Area will need to be developed together through consolidation of larger land assemblies or coordinated development. These include situations where several properties may be affected by a proposed road; divided by a watercourse or some other significant natural feature; or affected by access restrictions due to their location on a major road. Several such areas are identified in Appendix IV. The properties within these areas will require consolidation and a coordinated approach towards development.

8.0 ENGINEERING SERVICES, FINANCING AND PHASING

An engineering servicing and financial plan has been prepared as an integral part of the South Newton Neighbourhood Concept Plan. Prepared by Reid Crowther Partners Limited, this report deals with major engineering infrastructure elements which could be added to the City's Development Cost Charge (DCC) program. A comprehensive storm water study is also included as part of the engineering study. The engineering report also addresses development phasing as well as a comprehensive financial analysis. The financial analysis indicates that projected DCC revenues are sufficient to fund the major DCC works to service the NCP area.

9.0 AMENITY REQUIREMENTS

To address the amenity needs associated with new growth in South Newton, new development will be required to make a monetary contribution toward the provision of new police and fire protection services, library materials, and the development of new parks, open space and pathways.

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 Surrey's Neighbourhood Concept Plan areas. The monetary contributions towards park, open space and pathway development are based upon an estimate of the capital costs of these improvements for the South Newton NCP area. The total cost is divided among the anticipated acreage and number of dwelling units to ensure an equitable contribution arrangement.

The park-related amenity contribution will go towards the development of three joint elementary school/park sites; the joint secondary school/park site; linear connections; and neighbourhood parks. The estimated cost of developing park-related amenities is approximately $4,151,470.00.

The applicable amenity contributions (per acre or unit) and the estimated revenue the City can expect to receive from this NCP area is shown in Appendix V.

10.0 DESIGN GUIDELINES

A set of design guidelines has been developed to guide the future development of South Newton. These guidelines complement the Development Permit Guidelines contained in the Official Community Plan and are intended to achieve the overall development objectives defined in this Plan (Appendix VI). Key principles of these guidelines include the following:

- Development of pedestrian-friendly streets with sidewalks shaded by trees and streetscapes not dominated by garages and cars parked in front yards.
- Development of an aesthetically pleasing community by integrating existing residential areas and preserving natural features, where possible.
- Development of an identifiable community composed of several interconnected compact, walkable neighbourhoods to live, work, shop and play within walking distance of home.

11.0 IMPLEMENTATION

11.1 Park Land Acquisition

It is estimated that at today's value, the proposed parks in the South Newton NCP will cost approximately $5,951,690 (22.63 acres at $263,000 per acre). These parks are on the City's priority acquisition list. Development Cost Charge revenue for park land as well as the 5% cash-in-lieu of park dedication (under the Municipal Act) provide funding sources for the acquisition of the proposed parks.

It is estimated that this NCP will generate approximately $17,400,000 in park land development cost charges. While these monies will be used to acquire park land on a City-wide basis, the park land revenue and cost estimates indicate that this NCP will be financially self-sustaining as to the acquisition of land for future park sites. In addition, to development cost charge revenues, it is estimated that the 5% cash-in-lieu of park dedication will generate an additional $3,900,000.

11.2 Zoning By-law Amendments

An amendment to the Zoning By-law is required to implement the amenity contribution component of the Neighbourhood Concept Plan, and more specifically, to allow bonus densities in exchange for contributions towards the development of various neighbourhood amenities as identified in the NCP

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SURREY
CITY OF PARKS

SOUTH NEWTON NEIGHBOURHOOD CONCEPT PLAN

Design Guidelines

April, 1999

SOUTH NEWTON
NEIGHBOURHOOD CONCEPT PLAN

Design Guidelines

The following design guidelines will apply to developments within the South Newton Neighbourhood Concept Plan area. These guidelines are intended to complement the Development Permit Guidelines contained in Surrey's Official Community Plan (OCP)

1. Objectives

1.1 To incorporate sustainable development principles.
- *Homes that present a friendly face to the public streets.*
- *Different dwelling types in the same neighbourhood to accommodate people with different income and different stages in their lives.*
- *Interconnectivity within the street system, to reduce travel time and improve distribution of traffic.*
- *Reduced walking distance (+/- 5 minutes) to transit and shops.*
- *Incorporate natural drainage techniques.*

1.2 To encourage the development of a comprehensively designed, aesthetically pleasing community to live, work, shop and play.

1.3 To promote the development of an identifiable community with a high level of visual quality along the public roads.

1.4 To facilitate the co-ordinated development of several interconnected, compact, walkable neighbourhood.

1.5 To integrate existing residential areas.

1.6 To promote and encourage street beautification measures.

1.7 To develop pedestrian friendly streets. Sidewalks shaded by trees. Residential areas not dominated by garages and cars parked in front yards

1.8 To maintain and preserve, as much as possible natural features (topography, creeks, and trees) and in particular, existing trees along public roads.

1.9 To improve the quality of the streetscape and reinforce the street oriented residential character of South Newton.

1.10 To promote high visual quality in the treatment of yards abutting public streets.

2. Design Guidelines for Yards Abutting Public Streets

The following guidelines are aimed at improving the quality of the streetscape and reinforcing the street oriented character of South Newton.

General Guidelines

2.1 To minimise disruption of the existing character of the area, new development should take into consideration mature trees, groups of trees, and water courses, and should be designed to maintain as much of the natural environment as possible and in particular, the preservation of existing trees along public roads.

Guidelines for Front, Side, and Rear Yards

2.2 The yards of single and multiple family developments abutting public spaces should be used to unify the public streetscape.

2.3 A consistently maintained high quality landscape frontage is required for all new developments

2.4 Single family development should consider the location and design of houses so that streetscape is not dominated by garages. The following measures are recommended:

- The exposure of the garage to the street should not exceed 50% of house facade
- It is preferable that garages be located toward the back or side of house in developments without rear lanes.

2.5 To maintain the continuity and quality of the streetscape, yards of multifamily developments along the street should be treated and landscaped similar to front yards of single family lots.

2.6 Multifamily developments should be designed to be accessible by pedestrians from the public sidewalks.

Guidelines for Driveways

2.7 To reinforce the pedestrian dominance of the street, to facilitate continuity of landscaping, and to allow for regularly spaced trees along the boulevard the following guidelines shall be used for all laneless single family residential development:

- Whenever possible, driveways of single family lots should be paired to increase the spacing of sidewalk interruptions. Visual separation between individual parallel driveways shall be achieved with landscaping
- In corner lots, the garage driveway should be provided from the secondary road.
- Sidewalk pavement should be continued across the driveway.

Guidelines for Fences

2.8 In general, solid wood fences along property lines that abut streets are discouraged.

2.9 A solid fence may be permitted along flanking street of a single family corner lot provided that the fence is set back from the property line to permit substantial landscaping along the street side of the fence. Minimum 0.6 meter (2 ft.) recommended.

2.10 Fences along side property lines abutting a flanking street and pedestrian walkways should start at midpoint of the depth of the house. To maintain adequate sight angles at intersections only low landscaping should be planted at the street corner of a site.

2.11 Fences between lots should not start less than 3.6 meter (12 ft.) from the front yard setback.

2.12 Transparent, front yard, low fences in combination with landscaping on both sides of the fence will be acceptable for multi family sites, provided such fences include pedestrian gates to each residential unit abutting the streets.

Guidelines for Gates

2.13 Gates are discouraged in multiple residential development. If special circumstances makes this enclosure justifiable, gates should be located not less than the front yard setback line, consist of swing transparent doors, and adequate space must be provided in front of the gate for queuing and turning around of vehicles.

2.14 Instead of gates, entrances to multifamily sites should consider the use of architectural and or landscaping elements to define the threshold between public and private property. For example, a combination of walls, changes in pavement, landscape medians, treed boulevards, arbours, trellises, pedestrian gatehouses, feature lighting posts, etc.

3. Design Guidelines for Streets

General Guidelines

3.1 New development along King George Highway shall address the recommendations contained in the "Surrey Street Beautification Strategy" report dated December 1994.

3.2 Architectural compatibility in terms of scale and massing between adjoining developments is recommended for multi family development abutting single family areas.

Design Guidelines for Trees Along Streets

3.3 Recommended trees along the neighbourhood streets should be chosen from the list of *Replacement Trees* recommended for boulevards as per "Schedule K" of the Surrey Tree Preservation Bylaw, as amended.

3.4 A double row of alternating trees should be planted to achieve a canopy effect over the public sidewalks

3.5 Tree planting on boulevards should meet the "Boulevard Tree Planting Standards" developed by Surrey Parks & Recreation Department.

3.6 The Parks & Recreation Department should be consulted regarding specific species, planting patterns and spacing.

3.7 Continuity and spacing of street trees should be maintained as much as possible.

3.8 Trees should be planted well onto either private or public property, not on the property line. 0.6 m. (2 ft.) minimum.

3.9 Caliper of 5-6 cm is recommended to increase tree survival rate and to reduce initial maintenance watering costs.

3.10 Flowering trees in front yards are recommended to add colour and texture to the streetscape.

3.11 At least two trees per every dwelling unit should be provided. One of these trees shall be a flowering tree.

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

Landscape Buffers Along Highways and Arterial Roads

3.13 A 15 meter (50 ft.) wide landscape buffer is recommended along Highway #10 and King George Highway.

3.14 A combination of a mound and landscaping is recommended for the perimeter buffers along these highways. A minimum 4.0 meter (13 ft.) setback from the buffer is recommended for all buildings along these roads.

3.15 A +/-5 metre-(16 ft.) wide buffer is recommended along 64 Avenue and 152 Street.

3.16 Existing trees within these buffer zones shall be preserved, wherever possible.

3.17 Alternatively these buffer zones shall be planted with high quality landscaping material.

3.18 Specific planting material must be co-ordinated with the Surrey Parks & Recreation Department.

3.19 Any solid wood fence or similar noise barrier along these roads shall be placed along the inside edge of required buffer to permit the establishment of landscaping along the public facade

4. Design Guidelines for Buildings

General Guidelines

4.1 Architectural compatibility in terms of scale and massing between adjoining developments is recommended.

4.2 To provide visual landmarks and to promote a sense of enclosure, the principal building of corner properties should be located so as to anchor the corner and be designed to be visually attractive from both abutting streets.

Design Guidelines for Commercial, Institutional, Industrial Areas

4.3 Architectural compatibility in terms of scale, massing, finishing materials between buildings is highly recommended.

4.4 Buildings along arterial roads should be designed to include glazing as a major component.

4.5 Loading bays/overhead garage doors should not face arterial roads.

4.6 To enhance the neighbourhood residential character of South Newton, free-standing signs are strongly discouraged along arterial road frontages.

4.7 Fascia signs facing the street may be permitted provided they are integrated and/or co-ordinated with the architecture of the buildings.

Design Guidelines for Residential Areas

4.8 Single family development should consider location and design of the houses so that streetscape is not dominated by garages.

4.9 To retain some of the existing semi-rural character of the area it is recommended that the design of residential units along public roads incorporate dominant gables, roof lines with slopes of not less than 8/12, porches, verandas, and strong overhangs / eaves projections.

4.10 Multifamily developments should be designed to be pedestrian accessible from the public sidewalks.

4.11 Multi-family developments should provide a variety of forms, scale and details that relates to single family character.

4.12 The design of clusters along the street should not be repetitive and avoid a mirror image effect.

4.13 Where multifamily development abuts and / or front single family residential areas, the quality of materials and overall design should be compatible with the single family units.

4.14 Multi-family buildings abutting single family residences should be designed to provide a smooth height and massing transition along the edges. In this regard, it is recommended that the end units of multi-family blocks interfacing with single family areas be stepped down to achieve building heights similar to the abutting single family residences.

4.15 Housing units exposed to side views should provide similar detailing to the side and street fronting elevations.

Mixed Commercial / Residential

4.16 The use of glass and high quality finishing materials is recommended for all mixed used buildings

4.17 Signage should be architecturally co-ordinated with the overall design of the building

4.18 Compatibility of the building design with the architecture of adjacent buildings must be considered.

4.19 CEPTD principles should be followed.

4.20 To encourage pedestrian activity, commercial development should be brought close to the street, in particular along local streets, (59A, 60, and 62 Avenues) and be pedestrian accessible from the public sidewalk. It is recommended that the second level above the street be setback from the ground level to allow for balconies and more interesting streetscapes.

5. Guidelines for Storm Detention Ponds (Bio-filtration facilities)

5.1 The public edge (street frontage) of storm detention ponds should be developed to provide for passive amenity space for the enjoyment of the residents. This could include benches, picnic tables, small children playgrounds , etc.

5.2 Specific designs are to be co-ordinated the Parks & Recreation and Engineering Departments.

6. Guidelines for Street Lighting

6.1 For consistency from development to development, the type , height, intensity, spacing, etc. of street lights is to be co-ordinated by the Engineering Department through the servicing agreement process.

6.2 Pedestrian-scale lighting is recommended for sidewalks along Mixed Use Commercial /Residential areas.

7. Gateway Features

7.1 Gateway features are recommended at the following locations:

- 60 Avenue and King George Highway (North and South East corners).
- 60 Avenue and 144 Street (all four corners).
- 60 Avenue and 152 Avenue (North and South west corners).
- 144 Street and 64 Avenue (South East and West corners).

7.2 These gateways should be developed as part of development proposals, with high quality soft and hard landscaping and include distinctive paving materials to facilitate pedestrian crossing. They should incorporate unique and pedestrian scale lighting.

7.3 Main entry signs could be incorporated in these gateways. If signs are incorporated they should be of high quality, durable material, co-ordinated with the architecture of the surrounding area.

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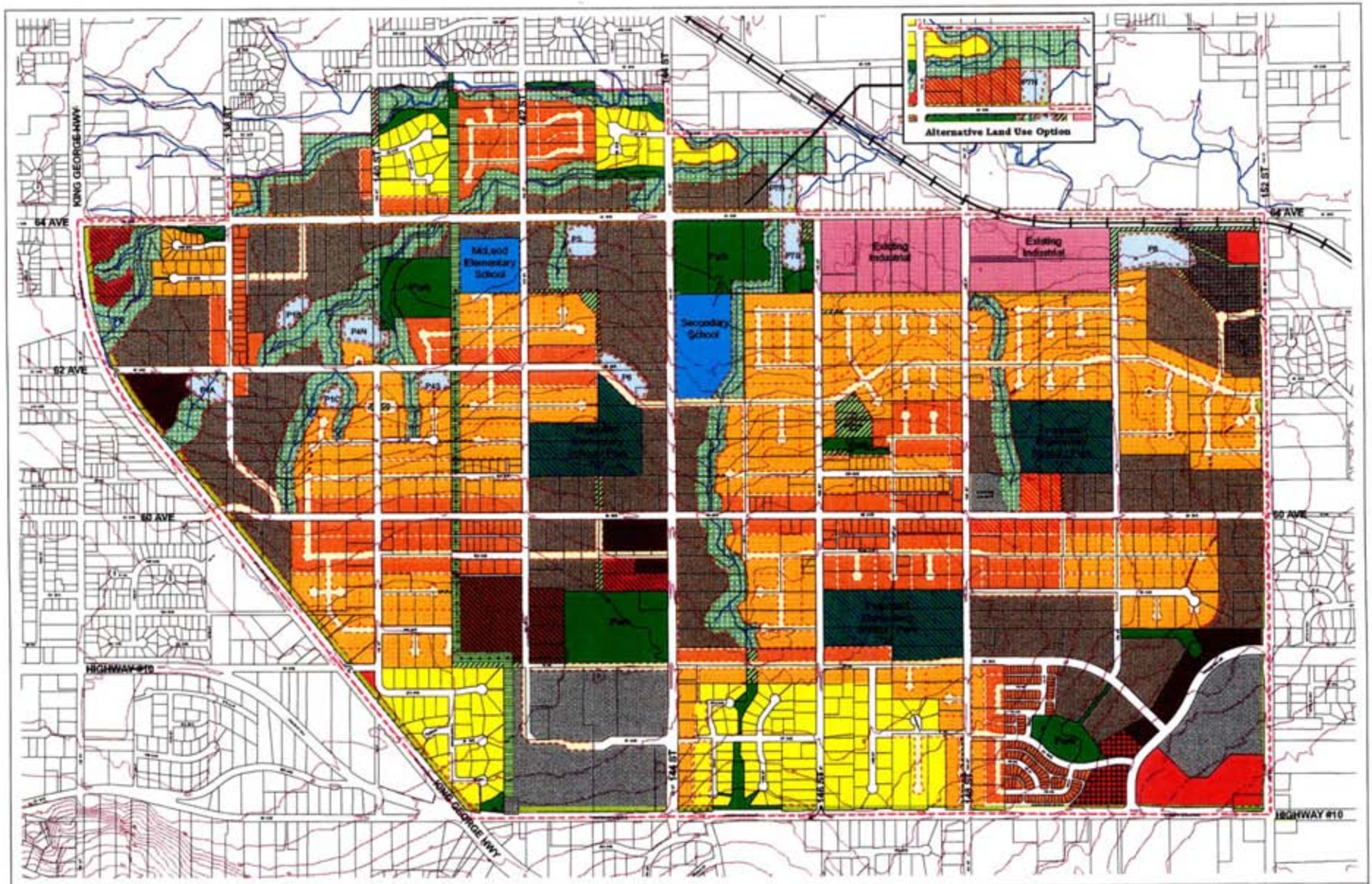
Appendix II



N

South Newton Neighbourhood Concept Plan 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 uses

Approved By Council
Date: June 14, 1999

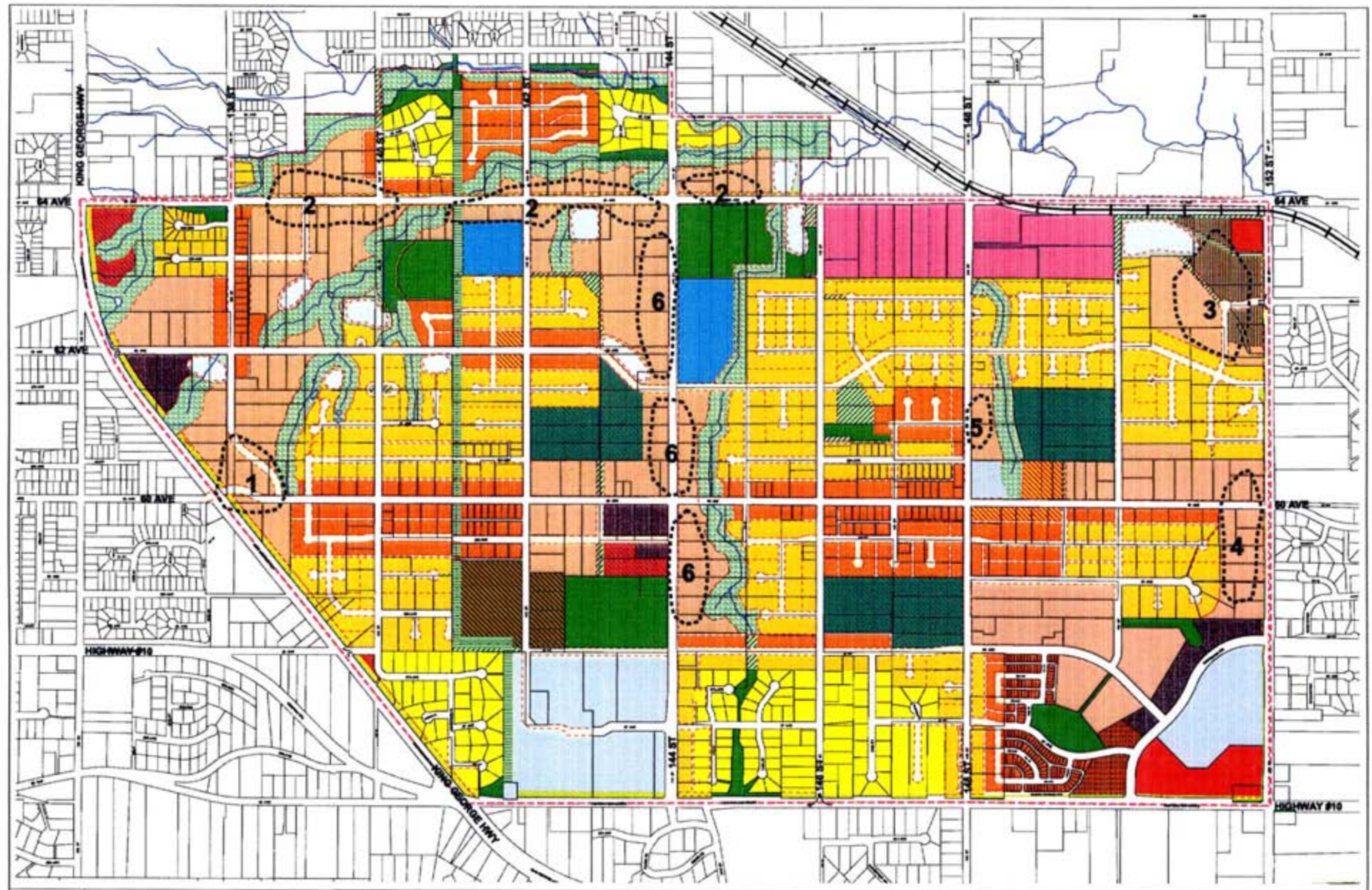
- Suburban Residential 1/2 Acre
- Single Family Residential
- Single Family Small Lots
- Townhouses (15 u.p.a. max.)
- Townhouses (25 u.p.a. max.)
- Apartments (45 u.p.a. max.)
- Commercial
- Mixed Com.-Res. (Townhouses)
- Mixed Com.-Res. (Apartments)
- Office Park
- Institutional
- Existing & Future School
- Proposed Schools & Parks
- Creeks & Riparian Set Backs
- Existing & Future Parks
- Proposed Parks & Walkways
- Buffers
- Industrial
- Mixed Commercial-Recreational
- Detention Ponds (precise shape, size,& location subject to further analysis)
- Utility R/W / Greenway
- Proposed Roads
- Railway Line
- Right In / Right Out Only

APPENDIX III

SOUTH NEWTON NEIGHBOURHOOD CONCEPT PLAN LAND USE STATISTICS

Land Use	Area In Hectares (acres)	Projected Number of New Dwelling Units	Projected Floor Area (Commercial in sq. m.) (Commercial) (sq. ft.)
Suburban	32.6 (80.6)	12	N/A
Single Family	87.47 (216.16)	1,210	N/A
Single Family Small Lot	51.66 (127.67)	871	N/A
Townhouses (15 upa max)	84.39 (208.53)	3,070	N/A
Townhouses (25 upa max)	4.04 (10)	250	N/A
Apartments	6.15 (15.2)	684	N/A
Commercial	5.9 (14.7)	N/A	13,758.49 (148,100)
Office Park	5.4 (13.41)	N/A	32,559.87 (350,483)
Commercial-Recreational	1.8 (4.5)	N/A	5,574 (60,000)
Mixed Use	3.6 (9.1)	67	12,151 (130,800)
Industrial	14.55 (35.97)	N/A	N/A
Institutional	23.71 (58.6)	N/A	N/A
Schools	14.6 (36.1)	N/A	N/A
Detention Ponds	5.6 (13.93)	N/A	N/A
Parks and Open Space	26.35 (65.13)	N/A	N/A
Riparian leave strips	37.98 (93.87)	N/A	N/A
TOTALS	406.10 (1,003.47)	6,164	64,043.68 (689,383)

Appendix IV



N

South Newton
Neighbourhood Concept Plan
Land Use Plan
Properties Requiring Joint Development

City of Surrey Planning & Development Department

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

Approved By Council
Date: June 14, 1999

- Suburban Residential 1/2 Acre
- Single Family Residential
- Single Family Small Lots
- Townhouses (15 u.p.a. max.)
- Townhouses (25 u.p.a. max.)
- Apartments (45 u.p.a. max.)
- Commercial
- Mixed Com.-Res. (Townhouses)
- Mixed Com.-Res. (Apartments)
- Office Park
- Institutional
- Existing & Future School
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- Existing & Future Parks
- Proposed Parks & Walkways
- Buffers
- Industrial
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- Detention Ponds (precise shape, size,& location subject to further analysis)
- Utility R/W / Greenway
- Proposed Roads
- Railway Line
- Right In / Right Out Only

APPENDIX V

SOUTH NEWTON NEIGHBOURHOOD CONCEPT PLAN AMENITY CONTRIBUTIONS AND ANTICIPATED REVENUES

	Residential (per dwelling unit)	Non-Residential (per acre)	Anticipated Revenues
Parks Related Public Amenities	$700.00	N/A	$4,314,800.00
Library Materials	$114.08	N/A	$703,189.00
Fire Protection	$219.04	$876.16	$1,376,446.00
Police Protection	$50.70	$202.80	$318,598.00
Total Amenity Contribution	$1,083.92	$1,078.96	$6,713,033.00

The contributions towards park-related amenities will pay for:

- the development of three joint elementary school/park sites;
- the development of the joint secondary school/park site;
- linear connections; and
- the development of neighbourhood parks.

Contributions for library, fire and police will go toward capital improvements and equipment to serve the new population in this neighbourhood.

Contributions are payable at rezoning for single family and at the building permit stage for multiple residential and non-residential.

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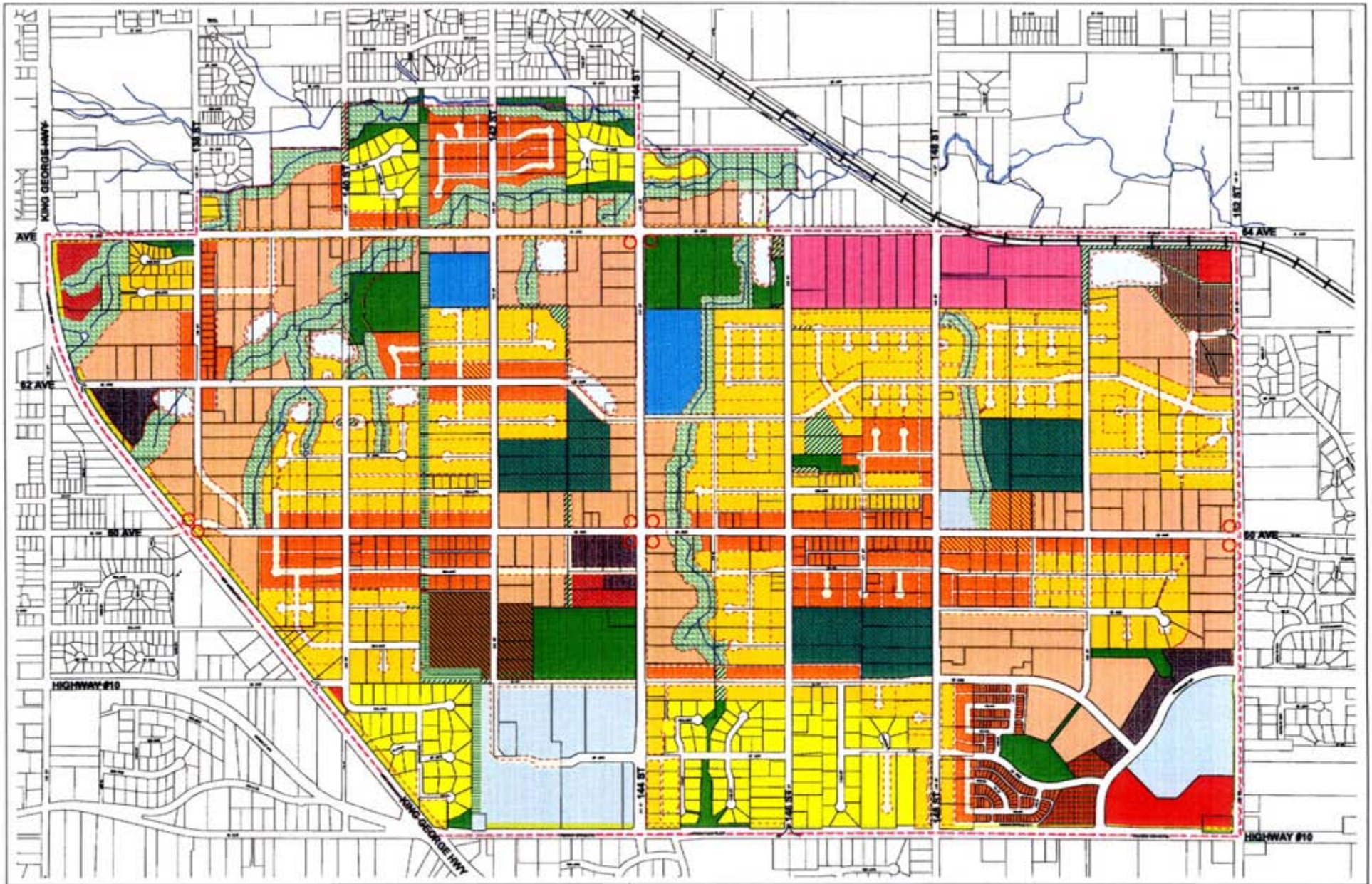

N

South Newton
Neighbourhood Concept Plan
Land Use Plan
Gateways

City of Surrey Planning & Development Department

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

Approved By Council
Date: June 14, 1999

- Suburban Residential 1/2 Acre
- Single Family Residential
- Single Family Small Lots
- Townhouses (15 u.p.a. max.)
- Townhouses (25 u.p.a. max.)
- Apartments (45 u.p.a. max.)
- Commercial
- Mixed Com.-Res. (Townhouses)
- Mixed Com.-Res. (Apartments)
- Gateways
- Office Park
- Institutional
- Existing & Future School
- Proposed Schools & Parks
- Creeks & Riparian Set Backs
- Existing & Future Parks
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- Buffers
- Industrial
- Mixed Commercial-Recreational
- Detention Ponds (precise shape, size, & location subject to further analysis)
- Utility R/W / Greenway
- Proposed Roads
- Railway Line
- Right In / Right Out Only

A. ADOPTION OF MINUTES

4. Council-in-Committee - June 14, 1999

Recommendations to be ratified for the following:

Item No. C427 South Newton Neighbourhood Concept Plan - Stage 2 Report
File: 2350-009

It was Moved by Councillor Hunt
Seconded by Councillor Caissie
That Council adopt the engineering servicing and financial strategies as outlined in this report and as specified in the South Newton Neighbourhood Concept Plan Engineering Report as the means of managing engineering services for this neighbourhood.

RES.R99-1529 Carried with Councillor Eddington against.

Councillor Watts returned to the meeting at 7:14 p.m.

SOUTH NEWTON NEIGHBOURHOOD CONCEPT PLAN (NCP)

PART B

ENGINEERING SERVICING COMPONENT

SURREY
CITY OF PARKS

Corporate Report

CITY MANAGER'S DEPARTMENT
NO: C427
COUNCIL DATE: June 14/99

COUNCIL-IN-COMMITTEE

TO:	**Mayor & Council**	DATE:	**May 6, 1999**
FROM:	**Manager, Utilities & Construction Engineering Department**	FILE:	**2350-009**

SUBJECT: **South Newton Neighbourhood Concept Plan Stage 2 Report**

RECOMMENDATION

That Council adopt the engineering servicing and financial strategies as outlined in this report and as specified in the South Newton Neighbourhood Concept Plan Engineering Report as the means of managing engineering services for this neighbourhood.

INTENT

The purpose of this report is:

1. To provide Council with an overview of the engineering servicing and financial strategy for the South Newton Neighbourhood Concept Plan (NCP) Study Area;
2. To provide Council with the comprehensive engineering study as prepared by Reid Crowther and Partners Limited;
3. To inform Council of the resolution of the significant engineering issues raised during the Stage 1 NCP process.

BACKGROUND

Council approved in principle the Proposed Land Use Concept Plan for the South Newton (Stage 1 NCP) Study Area on March 4, 1997, and authorized staff to proceed with the Stage 2 NCP process. A number of engineering and financial issues were to be resolved as part of the Stage 2 report. The engineering Stage 2 analysis has now been completed based on the land use contined within a separate report with recommendations from the Planning & Development Department, which will be considered by Council concurrently with this report.

DISCUSSION

Reid Crowther and Partners Limited (RCPL) have completed an engineering servicing and financial plan for the South Newton Study Area. This report includes a staging plan and financial analysis and is available in the Engineering Department.

The engineering services discussed in the report relate to major infrastructure. Only those works which could be added to the Development Cost Charge (DCC) program, such as major trunk sewers and water grid mains, major collector and arterial roads and major stormwater management infrastructure (trunk storm sewers and detention ponds) are discussed in detail in the report.. Localized site servicing requirements of individual developments are not analyzed in the report.

Sanitary Sewer

To service the majority of the NCP study area, or the northerly catchment, a trunk sanitary sewer will be required to be extended along 64 Avenue to connect to the existing GVS&DD trunk sewer at 152 Street. This sewer will range in size from 375mm to 900mm near 152 Street. The eastern and southeast pocket can be serviced by an existing 375mm trunk sanitary sewer on 152 Street which connects to the GVS&DD trunk sewer south of Highway 10. Only local sanitary sewers are required for the southwest catchment.

Water

To service the NCP study area, it will be necessary to install a grid and feeder main network as development proceeds. A 300mm diameter water main will be required along 62 Avenue as well as extensions of the grid mains north and south. The two pressure zones within the NCP study area will have to be separated by means of pressure-reducing valves. As growth proceeds in this area, it will become necessary to upgrade the off-site 60 Avenue feeder main as well as the major supply facilities to meet the ultimate demand of the area. This is not expected to be required until beyond 2010.

Transportation

A transportation study was completed as part of the engineering report. The road hierarchy was reviewed with recommendations made for designation of roads as arterials, major collectors, and through locals. In order to ensure safe movements on and off arterial roads, a number of recommendations have been made concerning conditions for access on 64 Avenue, King George Highway, 152 Street, and 148 Street. Pedestrian linkages have been identified in the plan. New traffic signals are proposed at King George Highway at 60 Avenue, 60 Avenue at 144 Street, and Highway 10 at 148 Street.

At the open house session, concern was expressed by local residents about the proposed right-in, right-out access to King George Highway from 58 Avenue. They felt that this would lead to greater traffic entering their streets. Access to and from King George Highway at 58 Avenue will be important to relieve the 60 Avenue access point when the overall neighbourhood develops. Traffic calming measures could be incorporated at this

intersection to discourage traffic from turning into the existing neighbourhood, south of 58 Avenue.

Stormwater

The South Newton NCP includes many tributaries of Hyland and Archibald Creeks, which flow in a northerly and easterly direction. These watercourses are largely on private property at this time and support populations of salmonids, representing a significant and valuable fisheries and wildlife resource in Surrey.

A comprehensive stormwater study was included as part of the engineering study. The study included hydrology, hydraulics, as well as environmental and groundwater components. The boundaries of the study area went beyond the NCP to address the whole stormwater catchment. The details of the findings are included in the engineering report. The study identified the need for nine (9) wet detention ponds and a number of trunk storm sewers to control peak storm runoff to Hyland Creek and its tributaries. These works will help maintain natural flow conditions and protect the downstream water courses from erosion. As per City policy and B.C. Ministry of Environment (MoELP) and Department of Fishery and Oceans (DFO) requirements, creek preservation areas are specified.

Key issues are the acquisition strategy and proposed locations for stormwater detention ponds. In terms of the acquisition strategy, it is important to emphasize that the land requirements for the detention pond must be secured by developers prior to development proceeding. The City cannot alter these requirements without potentially compromising the stormwater management solution for the NCP and the City incurring substantial cost to implement the drainage plan after development has proceeded.

In terms of location, some property owners have disagreed with the locations proposed. The proposed locations represent a cost-effective plan that provides the watercourse protection required, provides attractive facilities that will be community assets, and keep operational costs to a reasonable level. Despite this, some ponds have been identified within areas where property owners have expressed concerns that the location will make it difficult to sell or develop their properties. This applies to ponds P6 and P2 (see Figure 1). We recognize there is some flexibility in the location of detention ponds within constraints imposed by financial, technical and environmental considerations. A proponent can submit a proposal to alter the location of any detention pond identified in this plan for approval, providing they demonstrate that the modified location meets or exceeds the required technical performance standard, is approved by the environmental agencies, and does not negatively impact the financial plan for the NCP. All developments within a given catchment are subject to the same acquisition requirement for the detention pond. This gives some strategic advantage to property owners who have the stormwater detention pond identified on their lands.

The MoELP and DFO are concerned that baseflows, or dry weather flows during late summer, will be reduced by development. A hydrogeological report was completed which indicated that baseflows could be reduced with increased impervious surface and possible redirection of groundwater to the constructed underground services. It is

recommended that source control measures be included at each development to help maintain the same pattern of groundwater flow and provide maximum opportunity for surface water infiltration to the ground. Limited experience with this approach is available; however, they will be investigated as part of a pilot project. The Federal and Provincial government environmental agencies are supportive of trying such an approach.

As will be discussed in the section on financing and staging of development, stormwater drainage presents the greatest servicing challenge and is the most costly trunk service to provide.

Development Phasing

The Engineering servicing report describes three areas within the NCP (as shown on Figure 1), within which development will face different infrastructure and financing requirements. Area A, or the southwest and southeast portions of the NCP Study Area, is already serviced with adequate stormwater, water and sanitary trunk systems. Area B, or the northeast portion, will require the extension of the sanitary trunk sewer along 64 Avenue as well as the provision of stormwater detention ponds. Area C, or the north and east portions of the study area, will face similar requirements as area B, with the exception of having to extend the 64 Avenue sanitary trunk system a further distance from 152 Street.

Concurrent with, or after the development of, area A, it will be possible to begin development within Area B, providing the initial developer agrees to up-front the cost of required infrastructure. For practical reasons, development in area B will precede area C due to the cost of extending the sanitary trunk sewer along 64 Avenue.

In accordance with Council approved practice for NCP areas, development cannot take place in either stage B or C until the land required for the required detention facility is either acquired or secured by developers. The City can agree to enter into a DCC frontenders agreement with the initial developer to assist in recovering costs from DCCs collected from developments in the benefiting area. Providing DCC surplus is available from within the NCP area (for example, Stage A), the City can contribute funds towards reducing the cost of developing areas in stage B. There is the possibility of all nine (9) detention ponds requiring separate DCC frontender agreements. Although the City can commit DCC funding under these agreements, the City will need to delay the timing of DCC payments until prior agreements within the NCP have been fully paid out. This will assist in achieving a reasonable pay-back period for developers willing to up-front the investment to open areas up for development.

Financing

A comprehensive financial analysis is included in the NCP engineering report. The details of all the necessary DCC infrastructure have been identified and the costs are included.

The following table summarizes the projected DCC revenues and construction costs for each engineering service. The revenues are based on the current DCC by-law as well as the growth projections based on the densities proposed in the stage 2 NCP plan.

Projected DCC Revenues and Expenditures at Buildout (1)

	Projected DCC Revenues	Projected DCC Expenditures	Surplus Balance (Deficit Balance)
Sanitary Sewer	$5.659.000	$4.322.000	$1.337.000
Stormwater	$11.241.000	$11.026.000	$215.000
Water	$6.066.000	$3.008.000	$3.058.000
Major Collector Road	$7.171.000	$6.496.000	$675.000

(1) Note: It is recognized that the City of Surrey collects DCC's on a community basis not on a NCP or areas basis. This table is presented only to show that the NCP can be self-financed and does not reflect trunk servicing needs external to the NCP.

As shown in the table above, the projected DCC revenues are sufficient for funding the major DCC works to service the NCP area. Appendix 1 summarizes the proposed changes to the current 10 Year servicing plan.

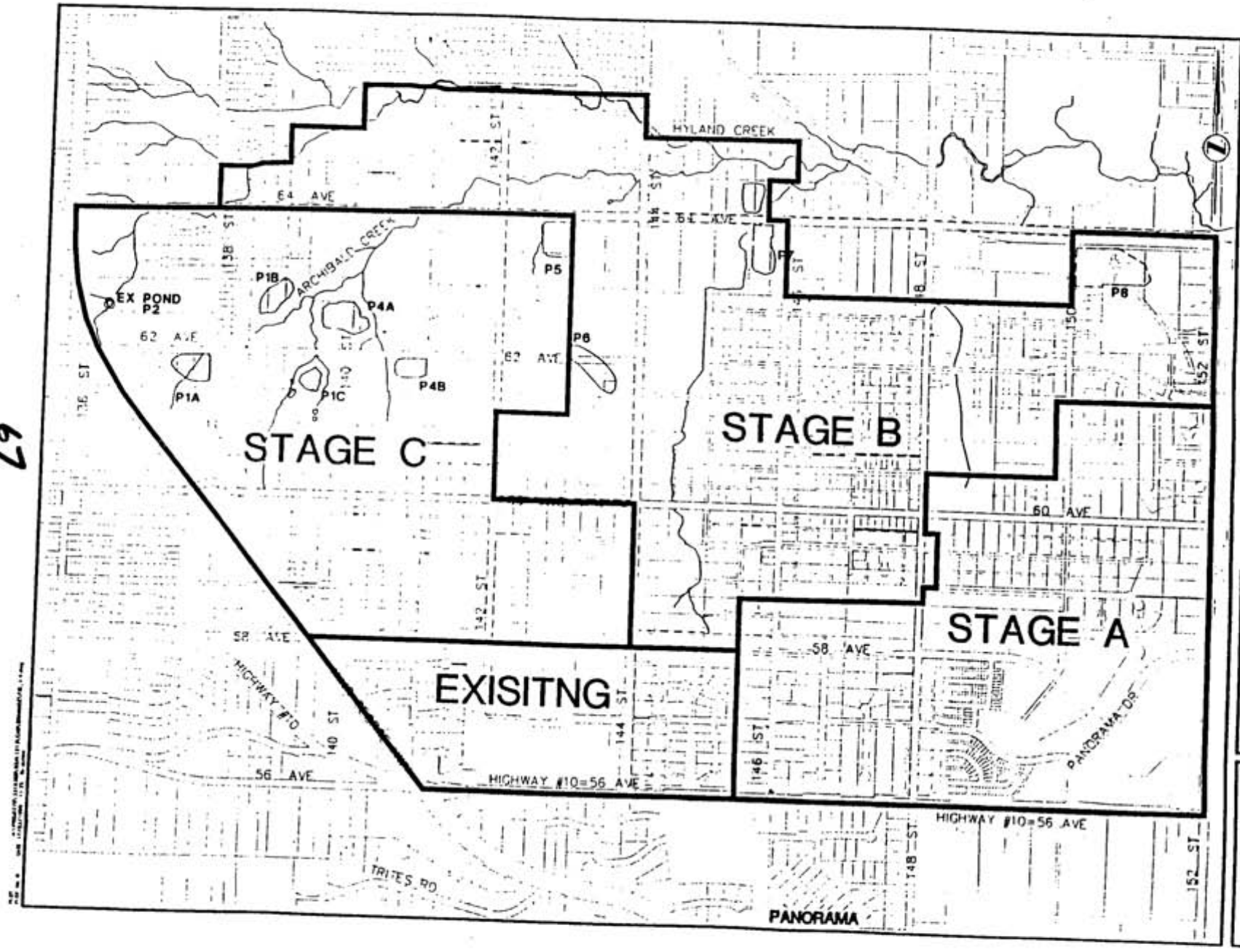
The financial information was presented to the public at the March 3, 1999, Open House and is in accordance with Council's policy respecting the developer-pay principle and requiring each NCP to be financially self-sufficient. The current mechanisms used for collecting such frontended costs include the traditional latecomer agreements and the more recently used development works agreement. These mechanisms will be available for initial development proponents to recover frontended costs from subsequent development.

CONCLUSION

The South Newton Neighbourhood Concept Engineering Plan report provides the comprehensive servicing, phasing and financial plan for the area. The report provides a funding strategy such that the major servicing costs are not borne by the existing taxpayers. The engineering plan has been presented to the public and received general support. Issues related to disagreement on locations for stormwater detention ponds will need to be addressed at the development application stage, where locations may be altered subject to meeting the same financial, technical and environmental constraints and performance standards as the proposed plan. It is important to make sure lands for stormwater detention are secured prior to development to manage impacts as development proceeds.

Paul Ham, P. Eng.
Manager, Utilities & Construction

EE:brb



City of Surrey

South Newton Neighbourhood Concept Plan

NOTES:
1. STAGING BOUNDARIES ARE CONCEPTUAL ONLY.
2. EACH STAGE IS EXPECTED TO TAKE SEVERAL YEARS AND OVERLAP.

SCALE 1:10000

Reid Crowther

City of Surrey

Figure 1

Servicing Plan Stages

Appendix 1
South Newton NCP
Proposed Servicing Plan

Item No.	I.D. No. - 10-Year Plan	Location	Scope (Type & Size of Works)	Notes	Total Cost	DCC Component Cost (1)	Non DCC Component Costs	Required by Year-2006	Projected Phasing Stage	New DCC Item (Y/N)	Funding Type	Part City Funded (Y/N)	Other
1.	13926	62A Ave.: 148 - 152 St.	300mm Main	This main will be an integral part of the main grid system at the NE corner of the study area.	$351,000	$ 140,000	$ 211,000	Y					
2.	13925	62A Ave.: 144 - 148 St.	300mm Main	This main will be an integral part of the main grid system at the NE corner of the study area.	$334,000	$ 134,000	$ 200,000	Y					
3.	2459	148 St.: 60A - 63A Ave	300mm Main	This main will be used to strengthen the 300mm connections between 62 Ave. and 64 Ave. Extension of the Main to 60 Ave. (normally closed) will also serve as an emergency connection between the 90m and 135m pressure zones. Closed valves should be maintained.	$180,000	$ 72,000	$ 108,000	Y					
4.	4814	148 St	100m - 300mm Grid Main	The pressure zone boundary is located at approximately 60A Ave. and the valve on this Main will normally be closed. Extension of the 300mm Grid Main will serve as an emergency connection between the 90m and 135m pressure zones.	$ 43,000	$ 17,000	$ 26,000	Y					
5.	642	144 St.: 60 Ave. to Hyland Rd	300mm Main	300mm dia. at 144 St. to be placed between 60 Ave. and 64 Ave. The proposed pressure boundary runs between 60 Ave. and 62 Ave. and causes the system to be physically separated at that location by using normally closed valves.	$578,000	$(231,000) Total $140,000 Part	$ 347,000	Y					
6.	4820	146 St.: 62 Ave. - 64 Ave.	300mm Main	This Main is not planned to be part of the Main Grid Loop and a 300mm dia. Main will be provided as an emergency connection between the 90m and 135m pressure zones from 60 Ave. to 62 Ave. The Main Grid Loop will consist of 300mm dia. Grid Mains at 62 Ave., 64 Ave., 144 St., and 148 St.	$191,000	$ 29,000	$ 162,000	Y					
7.		150 St.: 58 Ave. - 62 Ave.	300mm Main	Upgrading of the existing Mains is required to strengthen the grid network in the 90m pressure zone.	$387,000	$ 155,000	$ 232,000	Y					
8.		60 Ave.: 148 St. - 152 St.	300mm Main	Upgrading of existing Mains is required to strengthen the Grid Main Network in the 90m pressure zone. Interconnection to 135m zone (with normally closed valve at 159 St.)	$344,000	$ 238,000	$ 206,000	Y					
				TOTALS		$ 925,000	$1,492,000						

Notes (1) usually assumed to be 0.4 of total cost

Table 7.3
10-Year Servicing Plan
Water Distribution Network

Item No.	I.D. No. - 10-Year Plan	Location	Scope (Type & Size of Works)	Notes	Total Cost	DCC Component Cost (1)	Non DCC Component Costs	Required by Year-2006	Projected Phasing Stage	New DCC Item (Y/N)	Funding Type	Part City Funded (Y/N)	Other
1.	13739	138 St. - 142 St.	375/450mm	The proposed 375/450mm diameter trunk is to be constructed. (100% DCC)	$ 1,150,000	$ 1,150,000	$ -	N					
2.	13740	142 St. - 147 St.	450/675mm	The proposed 450/675mm diameter trunk is to be constructed. $(816,000) (Part East of 144 St) (2)	$ 1,350,000	$ 1,350,000	$ -	Part	$(659,000)				
3.	13741	148 St. - Southern Railway	750mm	The required trunk diameter is 750mm since the planned 750mm relief trunk at Hyland Rd (66 Ave. - 64 Ave) will deliver the additional sanitary flow through 64 Ave. trunk. (Built 1998)	$ 113,000	$ 113,000	$ -	Y					
4.	13742	Southern Railway - 149 St.	750mm	The proposed 750mm diameter trunk is to be constructed	$ 213,000	$ 213,000	$ -	Y					
5.	13743	149 St. - 151A St.	750mm	The proposed 750mm diameter trunk is to be constructed.	$ 527,000	$ 211,000	$ 316,000	Y					
6.	13744	151A St. - 152 St.	750mm	The proposed 750mm diameter trunk is to be constructed (100% DCC)	$ 250,000	$ 100,000	$ 150,000	Y					
7.	13766	66 Ave. - 64 Ave.	750mm	The 750mm diameter relief trunk is proposed and will be constructed in 1999, as a part of 66 Ave trunk relief.	$ 810,000	$ 810,000	$ -	N					
8.	4708	142 St.: From 62 Ave. - 64 Ave	250mm	The proposed 250mm diameter trunk is to be constructed.	$ 143,000	$ 57,000	$ 86,000	N			0		
9.	4709	144 St.: From 60 Ave. - 64 Ave	250mm	The proposed 250mm diameter trunk is to be constructed.	$ 286,000	$ 114,000	$ 172,000	Y			0		
10.		62 Ave.: From 138 St. - 140 St	300mm	The proposed 300mm diameter trunk is to be constructed	$ 150,000	$ 60,000	$ 90,000	N		Y	0		
11.		62 Ave /63 Ave.: From 140 St. - 142 St	375/450mm	The proposed 375/450mm diameter trunk is to be constructed.	$ 260,000	$ 104,000	$ 156,000	N		Y	0		
12.		144 St.: From 63 Ave. - 64 Ave.	450mm	The proposed 450mm diameter trunk is to be constructed	$ 99,000	$ 40,000	$ 59,000	N		Y	0		
				TOTAL		$ 4,322,000							

Note: (1) Usually 40% of total cost

(2) East of 144 St required by 2006

Table 7.4
10-Year Servicing Plan
Sanitary Distribution Network

Trunk Item No.	I.D. No. - 10-Year Plan	Location		Scope (Type & Size of Works)	Notes	Total Cost	DCC Component Cost	Non DCC Component Costs	Required by Year	Projected Phasing Stage	New DCC Item (Y/N)	Funding Type	Part City Funded (Y/N)	Other
P8	9807	150 St. - 151 St.: South of 64 Ave.		Creation of Detention Pond (P8)		$ 2,257,000	$2,257,000	$ -	2006	3	N			
P7	9809	64 Ave.: 145 St. - 146 St.		Creation of Detention Pond (P7)		$ 1,485,000	$1,173,000 (1)	$ -	2006	4	N			
P6	11032	63 Ave.: West of 144 St.		Creation of Detention Pond (P6)		$ 942,000	$ 330,000 (1)	$ -	2006	5	N			
1.	9770	144 St.: Ave. - 62 Ave.	60	400m - 600mm		$ 183,000	$ 64,050 (1)	$ -	2006		N			
2.	--	62 Ave.: 143 St. - 145 St.		190m - 600mm		$ 110,000	$ 38,500 (1)	$ -	2006		N			
3.	--	145ASt. - 146 St.: 62 Ave. - 64 Ave.		400m - 600mm		$ 235,000	$ 186,000 (1)	$ -	2006					
4.	--	63 Ave. - 63A Ave.: West of 138 St. to 149 St.		330m - 750mm 236m - 525mm		$ 380,000	$ 380,000	$ -	2006		Y			
5.	--	63A Ave. West of 149 St. to 150 St.		315m - 900mm		$ 300,000	$ 300,000	$ -	2006		Y			
7.	--	151 St.: South of 63 Ave. to Pond P8		65m - 750mm		$ 50,000	$ 50,000	$ -	2006		Y			
8.	--	151 St. to 152 St.: South of 64 Ave. to 64 Ave.		300m - 1500mm		$ 500,000	$ 500,000	$ -	2006		Y			
					TOTAL		$5,278,550							

Notes Land values for ponds assumed at $650,000/Ha

(1) Pro-rata Basin Share of Total in Stage 1 to 5

12

Table 7.5
10-Year Storm Servicing Plan (1997 - 2006)
Stormwater Management System

Trunk Item No.	I.D. No. - 10-Year Plan	Location	Scope (Type & Size of Works)	Notes	Total Cost	DCC Component Cost	Non DCC Component Costs	Required by Year	Projected Phasing Stage	New DCC Item (Y/N)	Funding Type	Part City Funded (Y/N)	Other
P1	9814, 11034	62 Ave.: West of 138 St.	Creation of Detention Ponds P1A, P1B and P1C at 62 Ave. and 137 St. to 139 St.		$ 2,326,000	$ 2,326,000	$ -	2003					
P4	9813, 11033	140 St.: Between 62 Ave. - 63 Ave.	Creation of Detention Ponds P4A and P4B. 61 Ave. to 63 Ave. from 140 St. to 141 St.		$ 939,000	$ 939,000	$ -						
P5	9812	143 St./64 Ave.	Creation of Detention Pond P5 at 64 Ave., West of 143 St.		$ 1,050,000	$ 1,050,000	$ -						
P6	11032	144 St./63 Ave.	Creation of Detention Pond P6 at 63 Ave. & 144 St.		$ 942,000	$ 942,000	$ -	2006					
P7	9809	64 Ave.: 145 St. - 146 St.	Creation of Detention Pond (P7)		$ 1,485,000	$ 1,485,000	$ -	2006					
P8	9807	150 St. - 151 St.: South of 64 Ave.	Creation of Detention Pond (P8)		$ 2,257,000	$ 2,257,000	$ -	2006					
1.	9770	144 St.: Lane North of 62 Ave. to South of 64 Ave.	320m - 600mm on 144 St.		$ 183,000	$ 183,000	$ -	2003					
2.	--	62 Ave.: 143 St. - 145 St.	190m - 600mm		$ 110,000	$ 110,000	$ -						
3.	--	145A St. - 146 St.: 62 Ave. - 64 Ave.	400m - 600mm		$ 235,000	$ 235,000	$ -						
4.	--	West of 148 St. - 149 St. 63 Ave. - 63A Ave.	330m - 750mm 236m - 525mm		$ 380,000	$ 380,000	$ -						
5.	--	63A Ave.: West of 149 St. to 150 St.	315m - 900mm		$ 300,000	$ 300,000	$ -						
7.	--	151 St.: South of 63 Ave. - Pond P8	65m - 750mm		$ 50,000	$ 50,000	$ -						
8.	--	151 St. - 152 St.: South of 64 Ave. - 64 Ave.	300m - 1500mm		$ 500,000	$ 500,000	$ -						
9.	--	142 St.: 62 Ave. to 64 Ave.	320m - 600mm		$ 183,000	$ 183,000	$ -						
10.	9774	South of 62 Ave. to P4 North	150m - 600mm between Ponds P4N and P4S		$ 86,000	$ 86,000	$ -						
				TOTAL		$ 11,026,000							

Costs adjusted for land value from $650,000/ha (February 1999)

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Table 7.5A
Stormwater Infrastructure Elements at Build-Out

Item No.	I.D. No. - 10-Year Plan	Location	Scope (Type & Size of Works)	Notes	Total Cost	DCC Component Cost	Non DCC Component Costs	Required by Year	Projected Phasing Stage	New DCC Item (Y/N)	Funding Type	Part City Funded (Y/N)	Other
1.	1344	60 Ave.: 136 St - 140 St	Interim Major Collector Widening		$ 592,000	$ 592,000	$ -	2006		N			
2.	1348	60 Ave.: 140 St - 144 St	Interim Major Collector Widening		$ 600,000	$ 600,000	$ -	2006		N			
3.	1351	60 Ave.: 144 St - 148 St	Interim Major Collector Widening		$ 600,000	$ 600,000	$ -	2006		N			
4.	1353	60 Ave.: 148 St - 152 St	Interim Major Collector Widening		$ 600,000	$ 600,000	$ -	2006		N			
5.	597	142 St.: 60 Ave - 64 Ave	Interim Major Collector Widening		$ 600,000	$ 600,000	$ -	2006		N			
				SUBTOTAL		$2,992,000							
6.	New	58 Ave 142 St - 144 St	New Major Collector		$ 600,000	$ 600,000	$ -	2016		Y			
7.	New	142 St: 58 Ave. - 60 Ave	Upgrade to Ultimate		$ 260,000	$ 260,000	$ -	2016		Y			
8.	New	142 St.: 60 Ave. - 64 Ave.	Upgrade to Ultimate		$ 511,000	$ 511,000	$ -	2016		Y			
9.	New	60 Ave. at King George Hwy	New Alignment to 40 Ave		$ 600,000	$ 600,000	$ -	2016		Y			
10.	New	60 Ave.: 40 Ave. - 44 Ave.	Upgrade to Ultimate		$ 511,000	$ 511,000	$ -	2016		Y			
11.	New	60 Ave.: 44 Ave. - 48 Ave.	Upgrade to Ultimate		$ 511,000	$ 511,000	$ -	2016		Y			
12.	New	60 Ave.: 48 Ave. - 50 Ave.	Upgrade to Ultimate		$ 511,000	$ 511,000	$ -	2016		Y			
				TOTAL		$6,496,000							

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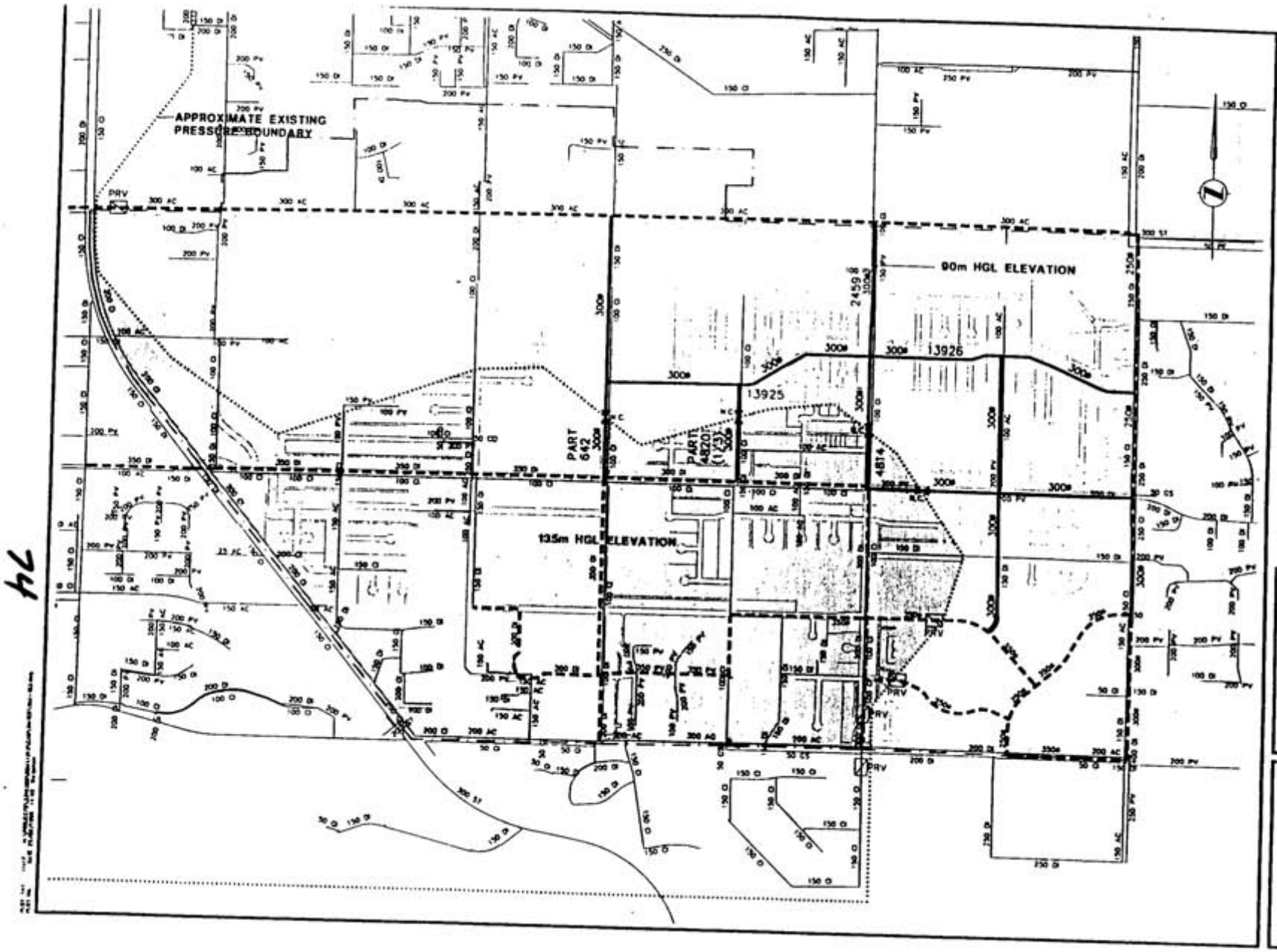
Table 7.6
Servicing Plan
Major Collector Road Requirements'
(2006 and ld-Out)



City of Surrey

South Newton Neighbourhood Concept Plan

LEGEND

- Development Boundary (NCP)
- 150 PV — Existing Water Pipe System
- 300# — Proposed Feeder and Grid Mains
- Approximate Pressure Boundary
- PRV — Proposed Pressure Reducing Valve
- PRV — Existing Pressure Reducing Valve
- N.C. — Proposed Valve Normally Closed
- 300 PV — Existing Feeder and Grid Mains
- 13926 — Project ID
- High Pressure Zone (135m)

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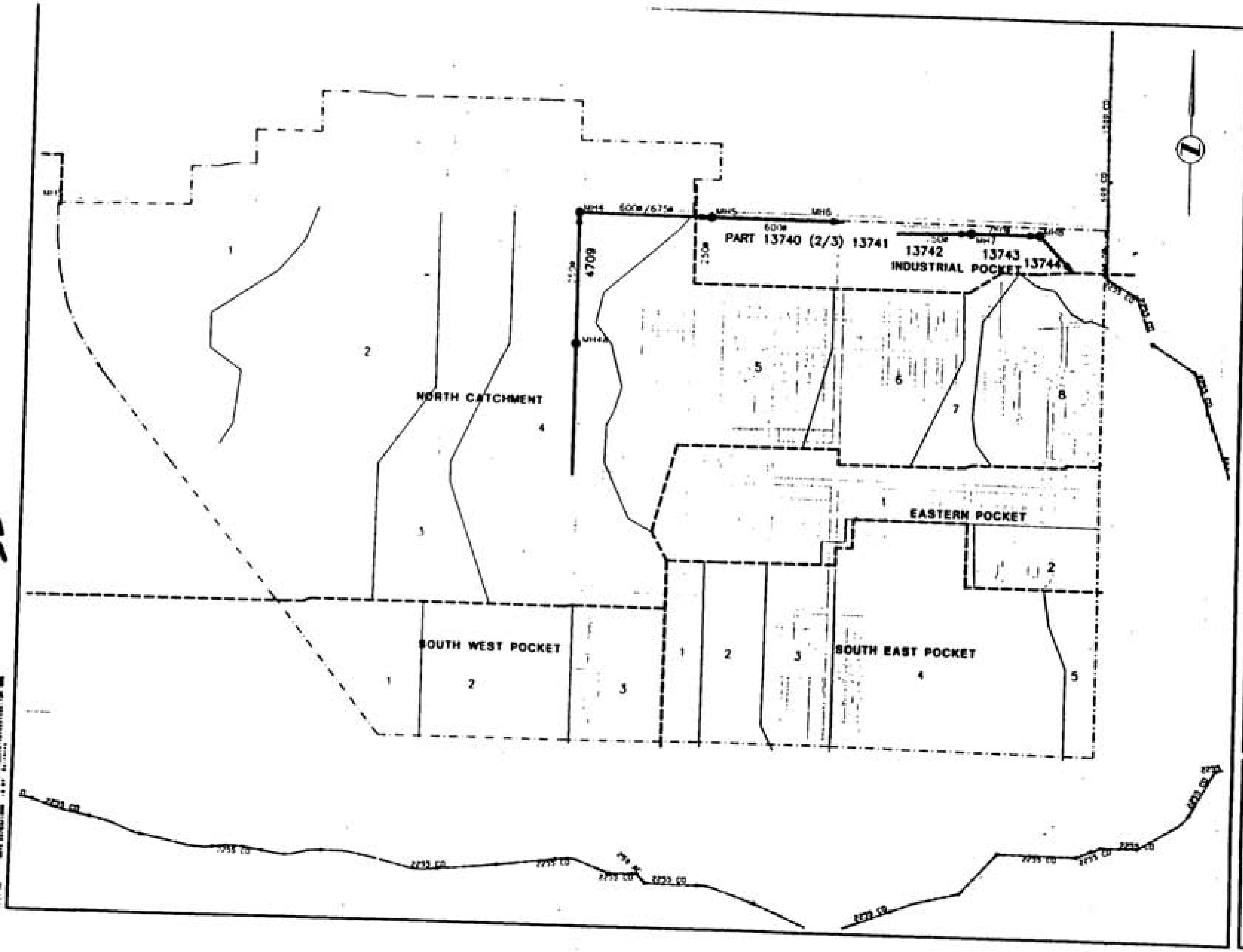
Figure 7.3

Proposed Water DCC Infrastruct. Elements

City of Surrey

South Newton Neighbourhood Concept Plan



LEGEND

- Development Boundary (NCP)
- Subcatchment Boundary
- 2250 CO — Existing GVS&DD Trunk Sewer
- 300 PV — Proposed Sanitary Trunk Sewer (Q=340 l/s)
- 13740 Project ID

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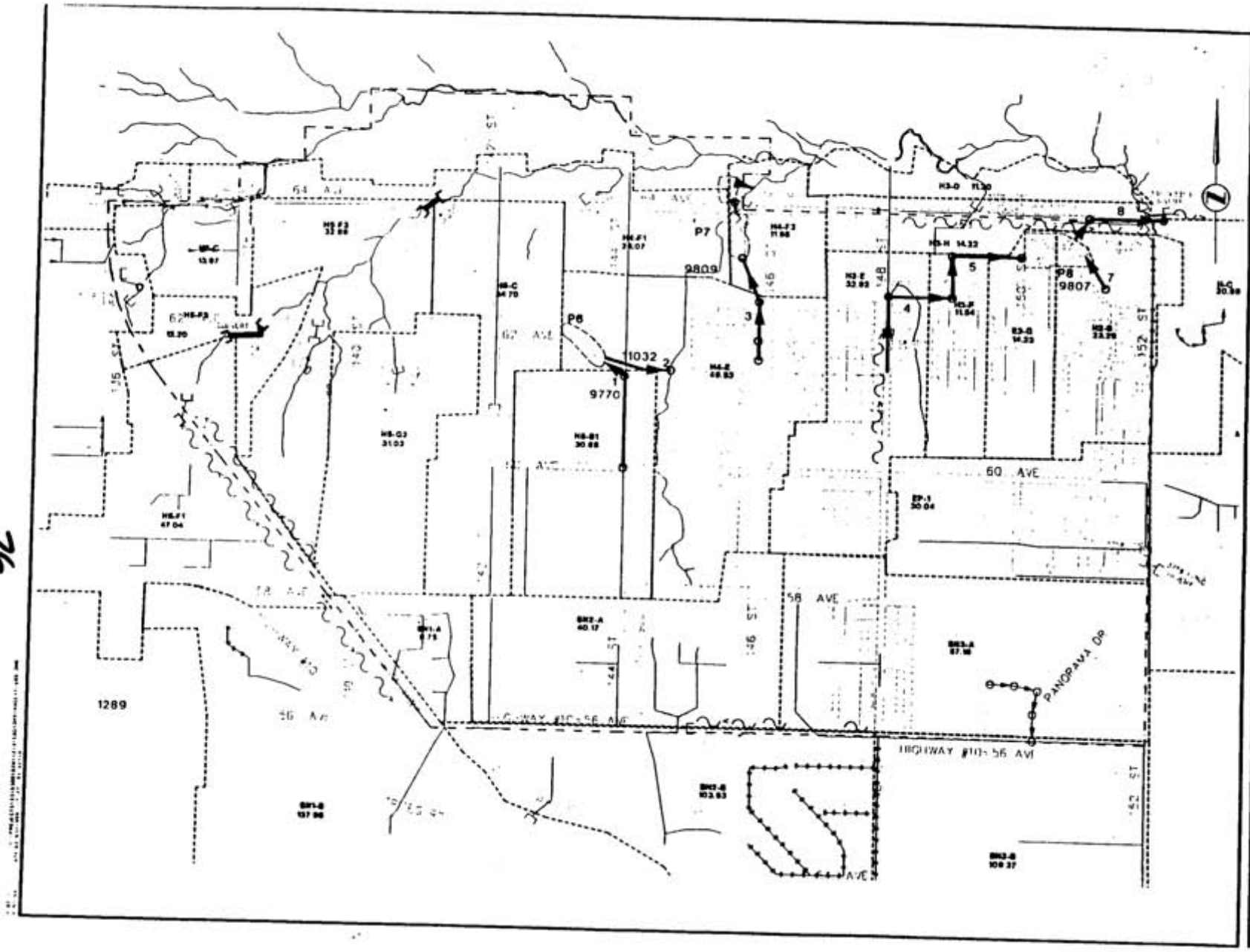
Figure 7.4

Proposed Sanitary DCC Infrastructure Elements



City of Surrey

South Newton Neighbourhood Concept Plan

LEGEND

- PROPOSED TRUNK STORM SEWER
- PROPOSED STORMWATER RETENTION POND
- CULVERT UPGRADE
- 9830 PROJECT ID
- STORM CATCHMENT BOUNDARIES
- H2-B SUBCATCHMENT NAME
- 33.29 SUBCATCHMENT AREA (ha)
- EXISTING STORM SEWER
- EXISTING CULVERT OR INLET/OUTLET
- EXISTING DITCH
- EXISTING WATERCOURSE
- NCP BOUNDARY

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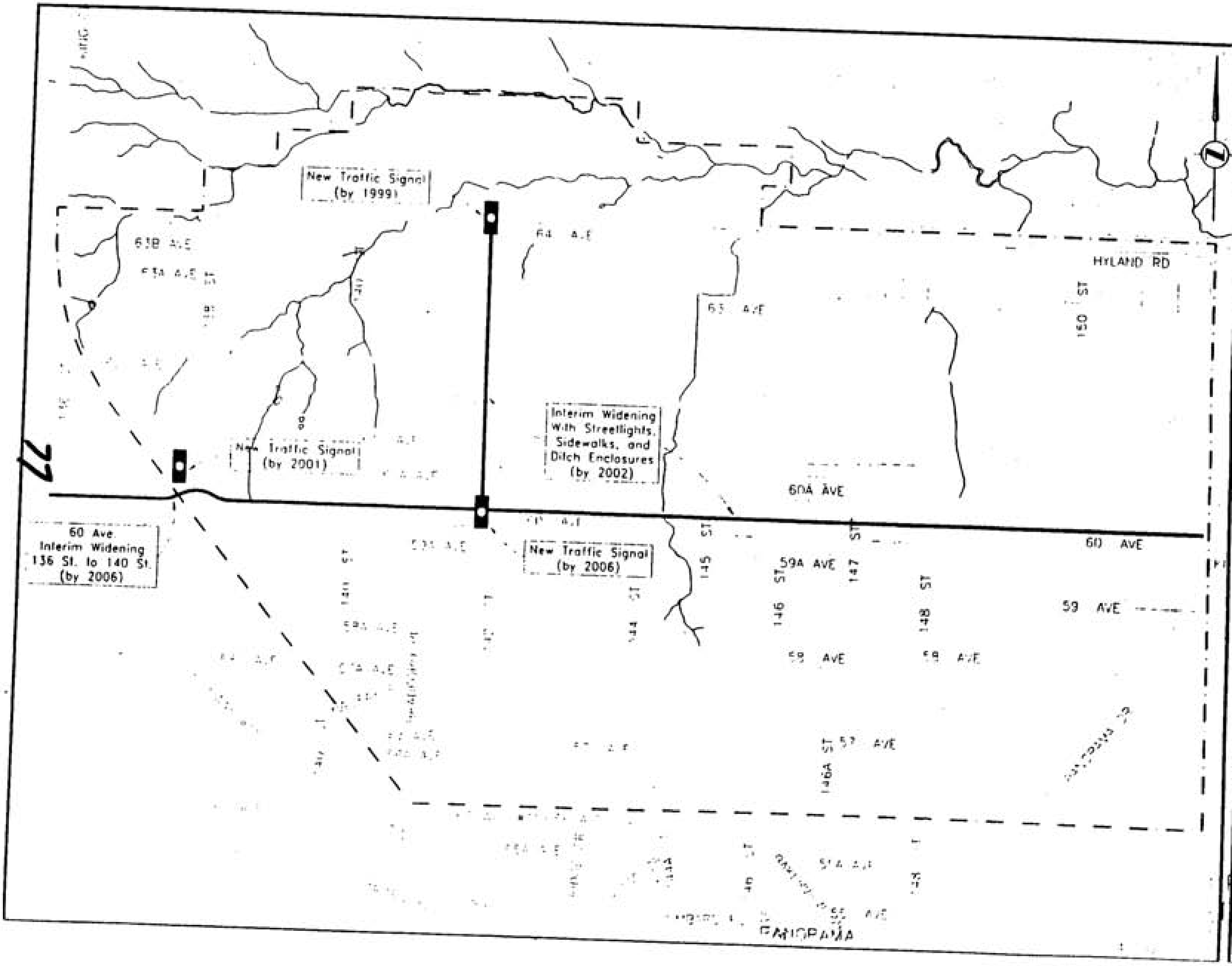
Figure 7.5

Proposed Drainage DCC Infrastructure Elements



City of Surrey
South Newton Neighbourhood Concept Plan

LEGEND
- Arterial Signal Program
- Non-Arterial Widening Program
- NCP Boundary

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Figure 7.6
Proposed Roadwa
DCC Infrastructur
Elements

SURREY
CITY OF PARKS

SOUTH NEWTON
NEIGHBOURHOOD CONCEPT PLAN
PART B
ENGINEERING SERVICING PLAN

Prepared for:

City of Surrey
14245 - 56 Avenue
Surrey, BC V3X 3A2

Prepared by:

Reid Crowther & Partners Ltd.
Consulting Engineering Worldwide
#101, 17618 - 58th Avenue
Surrey, BC V3S 1L3

Phone: (604) 576-4400
Fax: (604) 576-4100

March, 1999

Project No. 33163-03

SURREY
CITY OF PARKS

Corporate Report

CITY MANAGER'S DEPARTMENT
NO: C427
COUNCIL DATE: May 17 99

COUNCIL-IN-COMMITTEE

TO:	**Mayor & Council**	DATE:	**May 6, 1999**
FROM:	**Manager, Utilities & Construction Engineering Department**	FILE:	**2350-009**
SUBJECT:	**South Newton Neighbourhood Concept Plan Stage 2 Report**		

RECOMMENDATION

That Council adopt the engineering servicing and financial strategies as outlined in this report and as specified in the South Newton Neighbourhood Concept Plan Engineering Report as the means of managing engineering services for this neighbourhood.

INTENT

The purpose of this report is:

1. To provide Council with an overview of the engineering servicing and financial strategy for the South Newton Neighbourhood Concept Plan (NCP) Study Area;
2. To provide Council with the comprehensive engineering study as prepared by Reid Crowther and Partners Limited:
3. To inform Council of the resolution of the significant engineering issues raised during the Stage 1 NCP process.

BACKGROUND

Council approved in principle the Proposed Land Use Concept Plan for the South Newton (Stage 1 NCP) Study Area on March 4, 1997, and authorized staff to proceed with the Stage 2 NCP process. A number of engineering and financial issues were to be resolved as part of the Stage 2 report. The engineering Stage 2 analysis has now been completed based on the land use contined within a separate report with recommendations from the Planning & Development Department, which will be considered by Council concurrently with this report.

DISCUSSION

Reid Crowther and Partners Limited (RCPL) have completed an engineering servicing and financial plan for the South Newton Study Area. This report includes a staging plan and financial analysis and is available in the Engineering Department.

The engineering services discussed in the report relate to major infrastructure. Only those works which could be added to the Development Cost Charge (DCC) program, such as major trunk sewers and water grid mains, major collector and arterial roads and major stormwater management infrastructure (trunk storm sewers and detention ponds) are discussed in detail in the report. Localized site servicing requirements of individual developments are not analyzed in the report.

Sanitary Sewer

To service the majority of the NCP study area, or the northerly catchment, a trunk sanitary sewer will be required to be extended along 64 Avenue to connect to the existing GVS&DD trunk sewer at 152 Street. This sewer will range in size from 375mm to 900mm near 152 Street. The eastern and southeast pocket can be serviced by an existing 375mm trunk sanitary sewer on 152 Street which connects to the GVS&DD trunk sewer south of Highway 10. Only local sanitary sewers are required for the southwest catchment.

Water

To service the NCP study area, it will be necessary to install a grid and feeder main network as development proceeds. A 300mm diameter water main will be required along 62 Avenue as well as extensions of the grid mains north and south. The two pressure zones within the NCP study area will have to be separated by means of pressure-reducing valves. As growth proceeds in this area, it will become necessary to upgrade the off-site 60 Avenue feeder main as well as the major supply facilities to meet the ultimate demand of the area. This is not expected to be required until beyond 2010.

Transportation

A transportation study was completed as part of the engineering report. The road hierarchy was reviewed with recommendations made for designation of roads as arterials, major collectors, and through locals. In order to ensure safe movements on and off arterial roads, a number of recommendations have been made concerning conditions for access on 64 Avenue, King George Highway, 152 Street, and 148 Street. Pedestrian linkages have been identified in the plan. New traffic signals are proposed at King George Highway at 60 Avenue, 60 Avenue at 144 Street, and Highway 10 at 148 Street.

At the open house session, concern was expressed by local residents about the proposed right-in, right-out access to King George Highway from 58 Avenue. They felt that this would lead to greater traffic entering their streets. Access to and from King George Highway at 58 Avenue will be important to relieve the 60 Avenue access point when the overall neighbourhood develops. Traffic calming measures could be incorporated at this

intersection to discourage traffic from turning into the existing neighbourhood. south of 58 Avenue.

Stormwater

The South Newton NCP includes many tributaries of Hyland and Archibald Creeks. which flow in a northerly and easterly direction. These watercourses are largely on private property at this time and support populations of salmonids. representing a significant and valuable fisheries and wildlife resource in Surrey.

A comprehensive stormwater study was included as part of the engineering study. The study included hydrology, hydraulics, as well as environmental and groundwater components. The boundaries of the study area went beyond the NCP to address the whole stormwater catchment. The details of the findings are included in the engineering report. The study identified the need for nine (9) wet detention ponds and a number of trunk storm sewers to control peak storm runoff to Hyland Creek and its tributaries. These works will help maintain natural flow conditions and protect the downstream water courses from erosion. As per City policy and B.C. Ministry of Environment (MoELP) and Department of Fishery and Oceans (DFO) requirements. creek preservation areas are specified.

Key issues are the acquisition strategy and proposed locations for stormwater detention ponds. In terms of the acquisition strategy, it is important to emphasize that the land requirements for the detention pond must be secured by developers prior to development proceeding. The City cannot alter these requirements without potentially compromising the stormwater management solution for the NCP and the City incurring substantial cost to implement the drainage plan after development has proceeded.

In terms of location, some property owners have disagreed with the locations proposed. The proposed locations represent a cost-effective plan that provides the watercourse protection required, provides attractive facilities that will be community assets. and keep operational costs to a reasonable level. Despite this, some ponds have been identified within areas where property owners have expressed concerns that the location will make it difficult to sell or develop their properties. This applies to ponds P6 and P2 (see Figure 1). We recognize there is some flexibility in the location of detention ponds within constraints imposed by financial. technical and environmental considerations. A proponent can submit a proposal to alter the location of any detention pond identified in this plan for approval, providing they demonstrate that the modified location meets or exceeds the required technical performance standard, is approved by the environmental agencies, and does not negatively impact the financial plan for the NCP. All developments within a given catchment are subject to the same acquisition requirement for the detention pond. This gives some strategic advantage to property owners who have the stormwater detention pond identified on their lands.

The MoELP and DFO are concerned that baseflows, or dry weather flows during late summer, will be reduced by development. A hydrogeological report was completed which indicated that baseflows could be reduced with increased impervious surface and possible redirection of groundwater to the constructed underground services. It is

recommended that source control measures be included at each development to help maintain the same pattern of groundwater flow and provide maximum opportunity for surface water infiltration to the ground. Limited experience with this approach is available; however, they will be investigated as part of a pilot project. The Federal and Provincial government environmental agencies are supportive of trying such an approach.

As will be discussed in the section on financing and staging of development, stormwater drainage presents the greatest servicing challenge and is the most costly trunk service to provide.

Development Phasing

The Engineering servicing report describes three areas within the NCP (as shown on Figure 1), within which development will face different infrastructure and financing requirements. Area A, or the southwest and southeast portions of the NCP Study Area, is already serviced with adequate stormwater, water and sanitary trunk systems. Area B, or the northeast portion, will require the extension of the sanitary trunk sewer along 64 Avenue as well as the provision of stormwater detention ponds. Area C, or the north and east portions of the study area, will face similar requirements as area B, with the exception of having to extend the 64 Avenue sanitary trunk system a further distance from 152 Street.

Concurrent with, or after the development of, area A, it will be possible to begin development within Area B, providing the initial developer agrees to up-front the cost of required infrastructure. For practical reasons, development in area B will precede area C due to the cost of extending the sanitary trunk sewer along 64 Avenue.

In accordance with Council approved practice for NCP areas, development cannot take place in either stage B or C until the land required for the required detention facility is either acquired or secured by developers. The City can agree to enter into a DCC frontenders agreement with the initial developer to assist in recovering costs from DCCs collected from developments in the benefiting area. Providing DCC surplus is available from within the NCP area (for example, Stage A), the City can contribute funds towards reducing the cost of developing areas in stage B. There is the possibility of all nine (9) detention ponds requiring separate DCC frontender agreements. Although the City can commit DCC funding under these agreements, the City will need to delay the timing of DCC payments until prior agreements within the NCP have been fully paid out. This will assist in achieving a reasonable pay-back period for developers willing to up-front the investment to open areas up for development.

Financing

A comprehensive financial analysis is included in the NCP engineering report. The details of all the necessary DCC infrastructure have been identified and the costs are included.

The following table summarizes the projected DCC revenues and construction costs for each engineering service. The revenues are based on the current DCC by-law as well as the growth projections based on the densities proposed in the stage 2 NCP plan.

Projected DCC Revenues and Expenditures at Buildout (1)

	Projected DCC Revenues	Projected DCC Expenditures	Surplus Balance (Deficit Balance)
Sanitary Sewer	$5,659,000	$4,322,000	$1,337,000
Stormwater	$11,241,000	$11,026,000	$215,000
Water	$6,066,000	$3,008,000	$3,058,000
Major Collector Road	$7,171,000	$6,496,000	$675,000

(1) Note: It is recognized that the City of Surrey collects DCC's on a community basis not on a NCP or areas basis. This table is presented only to show that the NCP can be self-financed and does not reflect trunk servicing needs external to the NCP.

As shown in the table above, the projected DCC revenues are sufficient for funding the major DCC works to service the NCP area. Appendix 1 summarizes the proposed changes to the current 10 Year servicing plan.

The financial information was presented to the public at the March 3, 1999, Open House and is in accordance with Council's policy respecting the developer-pay principle and requiring each NCP to be financially self-sufficient. The current mechanisms used for collecting such frontended costs include the traditional latecomer agreements and the more recently used development works agreement. These mechanisms will be available for initial development proponents to recover frontended costs from subsequent development.

CONCLUSION

The South Newton Neighbourhood Concept Engineering Plan report provides the comprehensive servicing, phasing and financial plan for the area. The report provides a funding strategy such that the major servicing costs are not borne by the existing taxpayers. The engineering plan has been presented to the public and received general support. Issues related to disagreement on locations for stormwater detention ponds will need to be addressed at the development application stage, where locations may be altered subject to meeting the same financial, technical and environmental constraints and performance standards as the proposed plan. It is important to make sure lands for stormwater detention are secured prior to development to manage impacts as development proceeds.

Paul Ham, P. Eng.
Manager, Utilities & Construction

EE:brb

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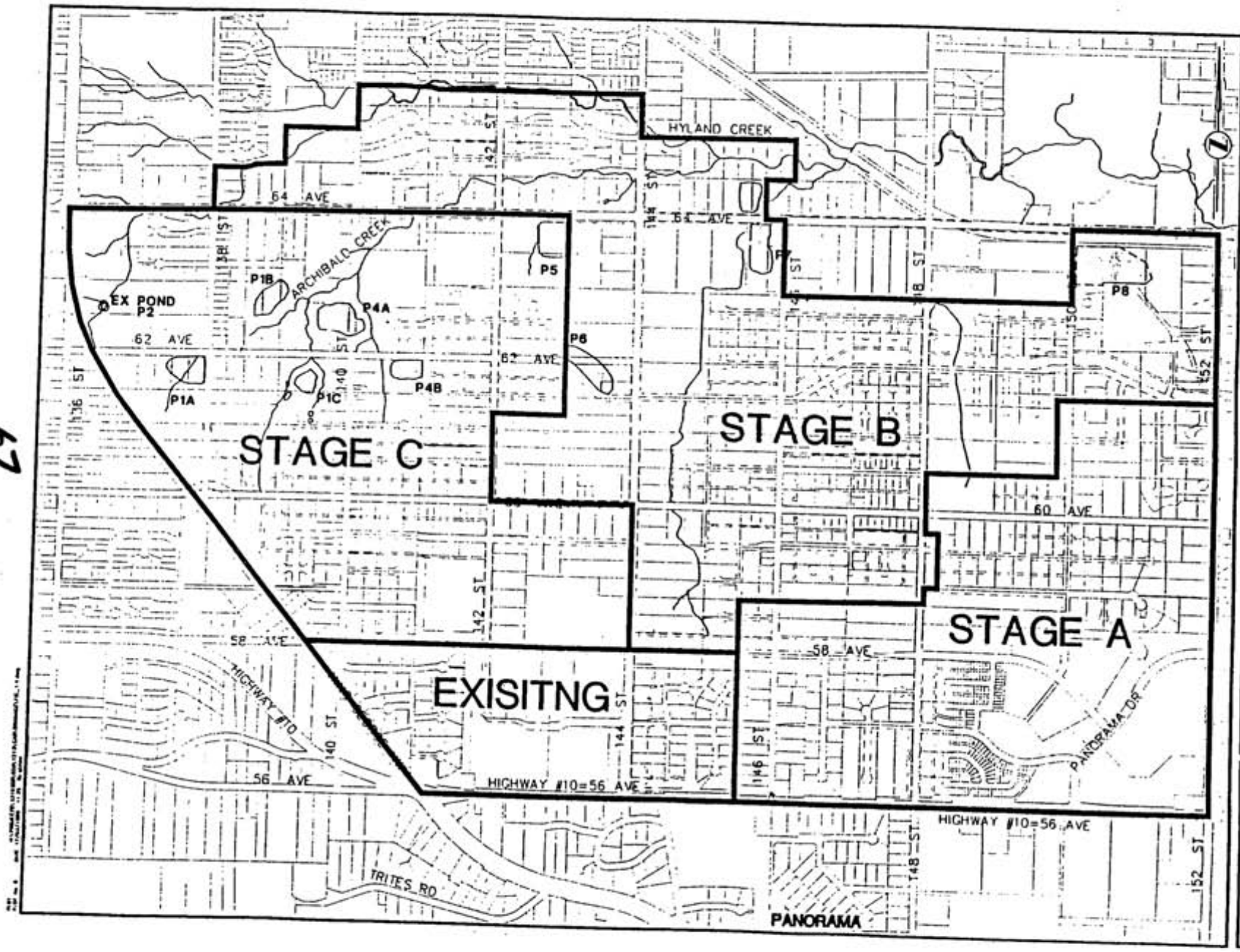

City of Surrey

South Newton Neighbourhood Concept Plan

NOTES:
1. STAGING BOUNDARIES ARE CONCEPTUAL ONLY.
2. EACH STAGE IS EXPECTED TO TAKE SEVERAL YEARS AND OVERLAP.

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Figure 1

Servicing Plan Stages

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Appendix 1
South Newton NCP
Proposed Servicing Plan

Item No.	I.D. No. - 10-Year Plan	Location	Scope (Type & Size of Works)	Notes	Total Cost	DCC Component Cost (1)	Non DCC Component Costs	Required by Year-2006	Projected Phasing Stage	New DCC Item (Y/N)	Funding Type	Part City Funded (Y/N)	Other
1.	13926	62A Ave.: 148 - 152 St.	300mm Main	This main will be an integral part of the main grid system at the NE corner of the study area.	$351,000	$ 140,000	$ 211,000	Y					
2.	13925	62A Ave.: 144 - 148 St.	300mm Main	This main will be an integral part of the main grid system at the NE corner of the study area.	$334,000	$ 134,000	$ 200,000	Y					
3.	2459	148 St.: 60A - 63A Ave.	300mm Main	This main will be used to strengthen the 300mm connections between 62 Ave. and 64 Ave. Extension of the Main to 60 Ave. (normally closed) will also serve as an emergency connection between the 90m and 135m pressure zones. Closed valves should be maintained.	$180,000	$ 72,000	$ 108,000	Y					
4.	4814	148 St.	100m - 300mm Grid Main	The pressure zone boundary is located at approximately 60A Ave. and the valve on this Main will normally be closed. Extension of the 300mm Grid Main will serve as an emergency connection between the 90m and 135m pressure zones.	$ 43,000	$ 17,000	$ 26,000	Y					
5.	642	144 St.: 60 Ave. to Hyland Rd.	300mm Main	300mm dia. at 144 St. to be placed between 60 Ave. and 64 Ave. The proposed pressure boundary runs between 60 Ave. and 62 Ave. and causes the system to be physically separated at that location by using normally closed valves.	$578,000	$(231,000) Total $140,000 Part	$ 347,000	Y					
6.	4820	146 St.: 62 Ave. - 64 Ave.	300mm Main	This Main is not planned to be part of the Main Grid Loop and a 300mm dia. Main will be provided as an emergency connection between the 90m and 135m pressure zones from 60 Ave. to 62 Ave. The Main Grid Loop will consist of 300mm dia. Grid Mains at 62 Ave., 64 Ave., 144 St., and 148 St.	$191,000	$ 29,000	$ 162,000	Y					
7.		150 St.: 58 Ave. - 62 Ave.	300mm Main	Upgrading of the existing Mains is required to strengthen the grid network in the 90m pressure zone.	$387,000	$ 155,000	$ 232,000	Y					
8.		60 Ave.: 148 St. - 152 St.	300mm Main	Upgrading of existing Mains is required to strengthen the Grid Main Network in the 90m pressure zone. Interconnection to 135m zone (with normally closed valve at 159 St.)	$344,000	$ 238,000	$ 206,000	Y					
				TOTALS		$ 925,000	$1,492,000						

Notes: (1) usually assumed to be 0.4 of total cost

Table 7.3
10-Year Servicing Plan
Water Distribution Network

Item No.	I.D. No. - 10-Year Plan	Location	Scope (Type & Size of Works)	Notes	Total Cost	DCC Component Cost (1)	Non DCC Component Costs	Required by Year-2006	Projected Phasing Stage	New DCC Item (Y/N)	Funding Type	Part City Funded (Y/N)	Other
1.	13739	138 St. - 142 St.	375/450mm	The proposed 375/450mm diameter trunk is to be constructed. (100% DCC)	$ 1,150,000	$ 1,150,000	$ -	N					
2.	13740	142 St. - 147 St.	450/675mm	The proposed 450/675mm diameter trunk is to be constructed. $(816,000) (Part East of 144 St.) (2)	$ 1,350,000	$ 1,350,000	$ -	Part	$(659,000)				
3.	13741	148 St. - Southern Railway	750mm	The required trunk diameter is 750mm since the planned 750mm relief trunk at Hyland Rd (66 Ave. - 64 Ave.) will deliver the additional sanitary flow through 64 Ave. trunk. (Built 1998)	$ 113,000	$ 113,000	$ -	Y					
4.	13742	Southern Railway - 149 St.	750mm	The proposed 750mm diameter trunk is to be constructed.	$ 213,000	$ 213,000	$ -	Y					
5.	13743	149 St. - 151A St.	750mm	The proposed 750mm diameter trunk is to be constructed.	$ 527,000	$ 211,000	$ 316,000	Y					
6.	13744	151A St. - 152 St.	750mm	The proposed 750mm diameter trunk is to be constructed. (100% DCC)	$ 250,000	$ 100,000	$ 150,000	Y					
7.	13766	66 Ave. - 64 Ave.	750mm	The 750mm diameter relief trunk is proposed and will be constructed in 1999, as a part of 66 Ave. trunk relief.	$ 810,000	$ 810,000	$ -	N					
8.	4708	142 St.: From 62 Ave. - 64 Ave.	250mm	The proposed 250mm diameter trunk is to be constructed.	$ 143,000	$ 57,000	$ 86,000	N			O		
9.	4709	144 St.: From 60 Ave. - 64 Ave.	250mm	The proposed 250mm diameter trunk is to be constructed.	$ 286,000	$ 114,000	$ 172,000	Y			O		
10.		62 Ave.: From 138 St. - 140 St.	300mm	The proposed 300mm diameter trunk is to be constructed.	$ 150,000	$ 60,000	$ 90,000	N		Y	O		
11.		62 Ave./63 Ave.: From 140 St. - 142 St.	375/450mm	The proposed 375/450mm diameter trunk is to be constructed.	$ 260,000	$ 104,000	$ 156,000	N		Y	O		
12.		144 St.: From 63 Ave. - 64 Ave.	450mm	The proposed 450mm diameter trunk is to be constructed.	$ 99,000	$ 40,000	$ 59,000	N		Y	O		
				TOTAL		$ 4,322,000							

Note: (1) Usually 40% of total cost

(2) East of 144 St. required by 2006

Table 7.4
10-Year Servicing Plan
Sanitary Distribution Network

Trunk Item No.	I.D. No. - 10-Year Plan	Location	Scope (Type & Size of Works)	Notes	Total Cost	DCC Component Cost	Non DCC Component Costs	Required by Year	Projected Phasing Stage	New DCC Item (Y/N)	Funding Type	Part City Funded (Y/N)	Other
P8	9807	150 St. - 151 St.: South of 64 Ave.	Creation of Detention Pond (P8)		$ 2,257,000	$2,257,000	$ -	2006	3	N			
P7	9809	64 Ave.: 145 St. - 146 St.	Creation of Detention Pond (P7)		$ 1,485,000	$1,173,000 (1)	$ -	2006	4	N			
P6	11032	63 Ave.: West of 144 St.	Creation of Detention Pond (P6)		$ 942,000	$ 330,000 (1)	$ -	2006	5	N			
1.	9770	144 St.: 60 Ave. - 62 Ave.	400m - 600mm		$ 183,000	$ 64,050 (1)	$ -	2006		N			
2.	--	62 Ave: 143 St. - 145 St.	190m - 600mm		$ 110,000	$ 38,500 (1)	$ -	2006		N			
3.	--	145ASt. - 146 St.: 62 Ave. - 64 Ave.	400m - 600mm		$ 235,000	$ 186,000 (1)	$ -	2006					
4.	--	63 Ave. - 63A Ave.: West of 148 St. to 149 St.	330m - 750mm + 236m - 525mm		$ 380,000	$ 380,000	$ -	2006		Y			
5.	--	63A Ave.: West of 149 St. to 150 St.	315m - 900mm		$ 300,000	$ 300,000	$ -	2006		Y			
7.	--	151 St.: South of 63 Ave. to Pond P8	65m - 750mm		$ 50,000	$ 50,000	$ -	2006		Y			
8.	--	151 St. to 152 St.: South of 64 Ave. to 64 Ave.	300m - 1500mm		$ 500,000	$ 500,000	$ -	2006		Y			
				TOTAL		$5,278,550							

Notes: Land values for ponds assumed at $650,000/Ha

(1) Pro-rata Basin Share of Total in Stage 1 to 5

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Table 7.5
10-Year Storm Servicing Plan (1997 - 2006)
Stormwater Management System

Trunk Item No.	I.D. No. - 10-Year Plan	Location	Scope (Type & Size of Works)	Notes	Total Cost	DCC Component Cost	Non DCC Component Costs	Required by Year	Projected Phasing Stage	New DCC Item (Y/N)	Funding Type	Part City Funded (Y/N)	Other
P1	9814, 11034	62 Ave.: West of 138 St.	Creation of Detention Ponds P1A, P1B and P1C at 62 Ave. and 137 St. to 139 St.		$ 2,326,000	$ 2,326,000	$ -	2003					
P4	9813, 11033	140 St.: Between 62 Ave. - 63 Ave.	Creation of Detention Ponds P4A and P4B. 61 Ave. to 63 Ave. from 140 St. to 141 St.		$ 939,000	$ 939,000	$ -						
P5	9812	143 St./64 Ave.	Creation of Detention Pond P5 at 64 Ave., West of 143 St.		$ 1,050,000	$ 1,050,000	$ -						
P6	11032	144 St./63 Ave.	Creation of Detention Pond P6 at 63 Ave. & 144 St.		$ 942,000	$ 942,000	$ -	2006					
P7	9809	64 Ave.: 145 St. - 146 St.	Creation of Detention Pond (P7)		$ 1,485,000	$ 1,485,000	$ -	2006					
P8	9807	150 St. - 151 St.: South of 64 Ave.	Creation of Detention Pond (P8)		$ 2,257,000	$ 2,257,000	$ -	2006					
1.	9770	144 St.: Lane North of 62 Ave. to South of 64 Ave.	320m - 600mm on 144 St.		$ 183,000	$ 183,000	$ -	2003					
2.	--	62 Ave.: 143 St. - 145 St.	190m - 600mm		$ 110,000	$ 110,000	$ -						
3.	--	145A St. - 146 St.: 62 Ave. - 64 Ave.	400m - 600mm		$ 235,000	$ 235,000	$ -						
4.	--	West of 148 St. - 149 St.: 63 Ave. - 63A Ave.	330m - 750mm 236m - 525mm		$ 380,000	$ 380,000	$ -						
5.	--	63A Ave.: West of 149 St. to 150 St.	315m - 900mm		$ 300,000	$ 300,000	$ -						
7.	--	151 St.: South of 63 Ave. - Pond P8	65m - 750mm		$ 50,000	$ 50,000	$ -						
8.	--	151 St. - 152 St.: South of 64 Ave. - 64 Ave.	300m - 1500mm		$ 500,000	$ 500,000	$ -						
9.	--	142 St.: 62 Ave. to 64 Ave.	320m - 600mm		$ 183,000	$ 183,000	$ -						
10.	9774	South of 62 Ave. to P4 North	150m - 600mm between Ponds P4N and P4S		$ 86,000	$ 86,000	$ -						
				TOTAL		$ 11,026,000							

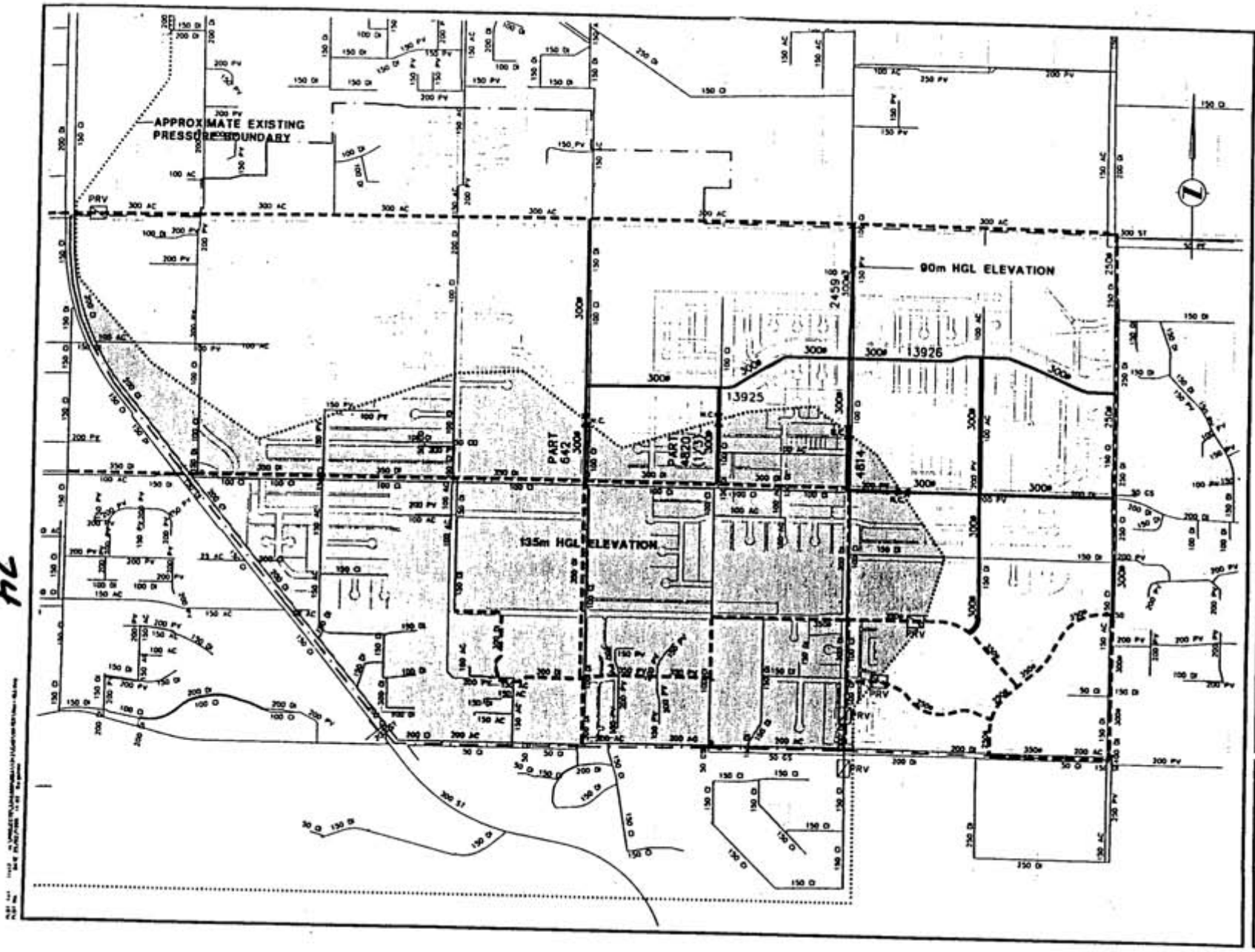
Costs adjusted for land value from $650,000/ha (February 1999)

Table 7.5A
Stormwater Infrastructure Elements at Build-Out

Item No.	I.D. No. - 10-Year Plan	Location	Scope (Type & Size of Works)	Notes	Total Cost	DCC Component Cost	Non DCC Component Costs	Required by Year	Projected Phasing Stage	New DCC Item (Y/N)	Funding Type	Part City Funded (Y/N)	Other
1.	1344	60 Ave.: 136 St. - 140 St.	Interim Major Collector Widening		$ 592,000	$ 592,000	$ -	2006		N			
2.	1348	60 Ave.: 140 St. - 144 St.	Interim Major Collector Widening		$ 600,000	$ 600,000	$ -	2006		N			
3.	1351	60 Ave.: 144 St. - 148 St.	Interim Major Collector Widening		$ 600,000	$ 600,000	$ -	2006		N			
4.	1353	60 Ave.: 148 St. - 152 St.	Interim Major Collector Widening		$ 600,000	$ 600,000	$ -	2006		N			
5.	597	142 St.: 60 Ave. - 64 Ave.	Interim Major Collector Widening		$ 600,000	$ 600,000	$ -	2006		N			
				SUBTOTAL		$2,992,000							
6.	New	58 Ave.: 142 St. - 144 St.	New Major Collector		$ 600,000	$ 600,000	$ -	2016		Y			
7.	New	142 St.: 58 Ave. - 60 Ave.	Upgrade to Ultimate		$ 260,000	$ 260,000	$ -	2016		Y			
8.	New	142 St.: 60 Ave. - 64 Ave.	Upgrade to Ultimate		$ 511,000	$ 511,000	$ -	2016		Y			
9.	New	60 Ave. at King George Hwy	New Alignment to 40 Ave.		$ 600,000	$ 600,000	$ -	2016		Y			
10.	New	60 Ave.: 40 Ave. - 44 Ave.	Upgrade to Ultimate		$ 511,000	$ 511,000	$ -	2016		Y			
11.	New	60 Ave.: 44 Ave. - 48 Ave.	Upgrade to Ultimate		$ 511,000	$ 511,000	$ -	2016		Y			
12.	New	60 Ave.: 48 Ave. - 50 Ave.	Upgrade to Ultimate		$ 511,000	$ 511,000	$ -	2016		Y			
				TOTAL		$6,496,000							

Table 7.6
Servicing Plan
Major Collector Road Requirements
(2006 and Build-Out)

R:\3163\0603\PPANCPdata16_99\Table 7_x.xls



Project:

of Surrey

South Newton Neighbourhood Concept Plan

LEGEND

- Development Boundary (NCP)
- 150 Pv — Existing Water Pipe System
- 300# — Proposed Feeder and Grid Mains
- Approximate Pressure Boundary
- PRV — Proposed Pressure Reducing Valve
- PRV — Existing Pressure Reducing Valve
- N.C. — Proposed Valve Normally Closed
- 300 Pv — Existing Feeder and Grid Mains
- 13926 — Project ID
- High Pressure Zone (135m)

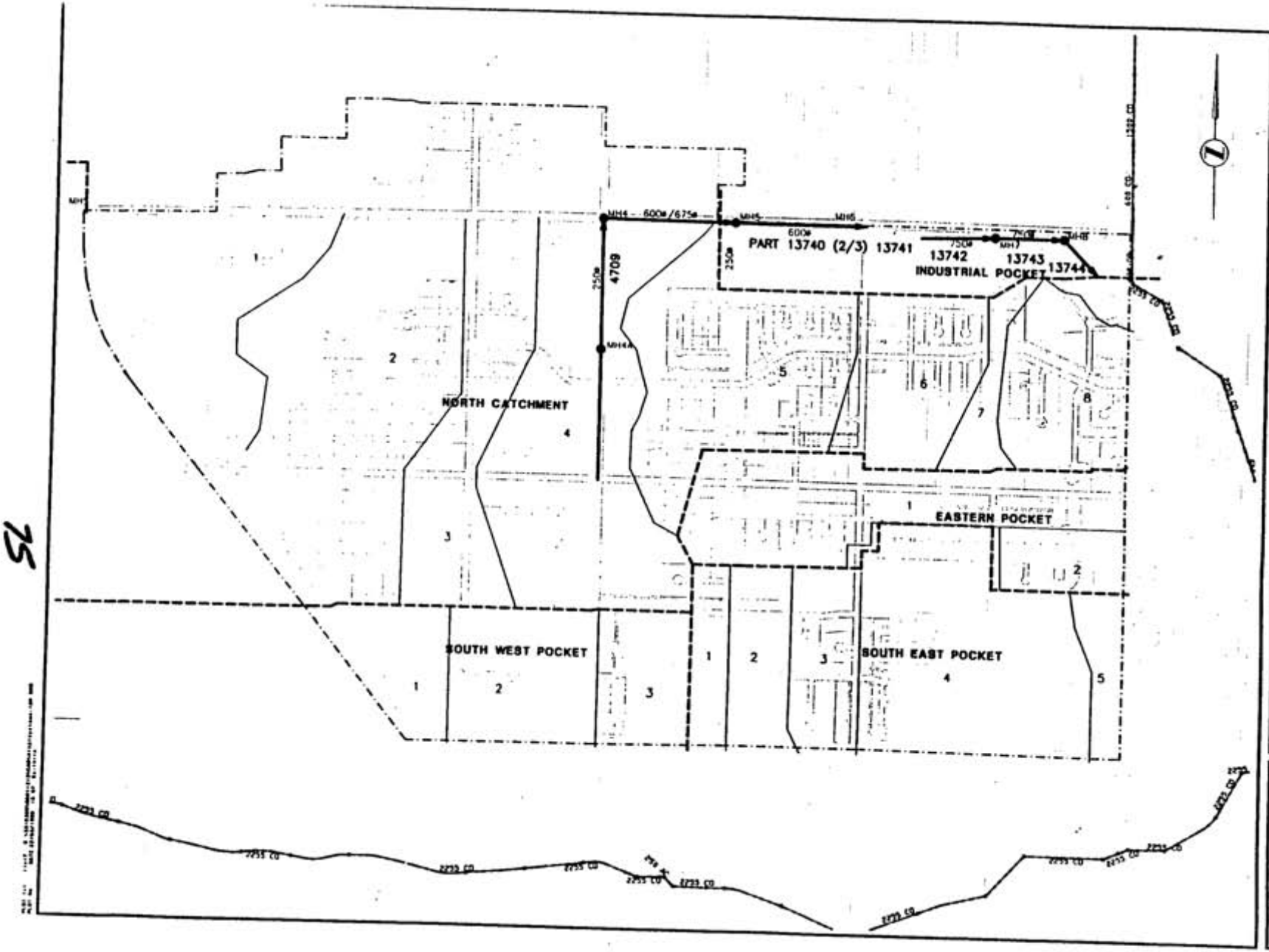
Reid Crowther

Title:

City of Surrey

Figure 7.3

Proposed Water DCC Infrastruct. Elements



City of Surrey

South Newton Neighbourhood Concept Plan

LEGEND

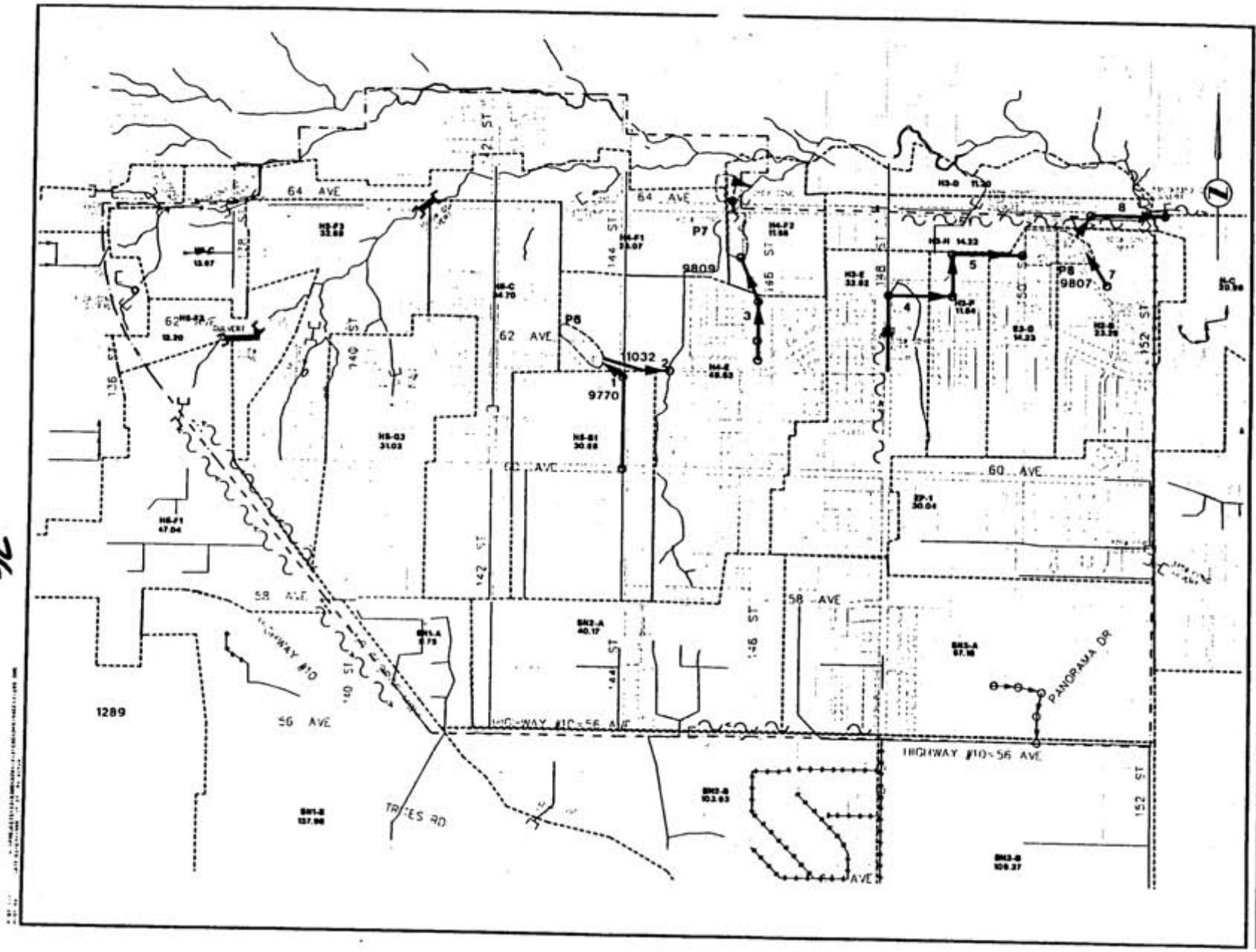
- Development Boundary (NCP)
- Subcatchment Boundary
- 7200 CO Existing GVS&DD Trunk Sewer
- 300 PV Proposed Sanitary Trunk Sewer (Q=>40 l/s)
- 13740 Project ID

Reid Crowther

City of Surrey

Figure 7.4

Proposed Sanitary DCC Infrastructure Elements



of Surrey

South Newton Neighbourhood Concept Plan

LEGEND

- PROPOSED TRUNK STORM SEWER
- PROPOSED STORMWATER RETENTION POND
- CULVERT UPGRADE
- 9830 PROJECT ID
- STORM CATCHMENT BOUNDARIES
- H2-B SUBCATCHMENT NAME
- 23.39 SUBCATCHMENT AREA (ha)
- EXISTING STORM SEWER
- EXISTING CULVERT OR INLET/OUTLET
- EXISTING DITCH
- EXISTING WATERCOURSE
- NCP BOUNDARY

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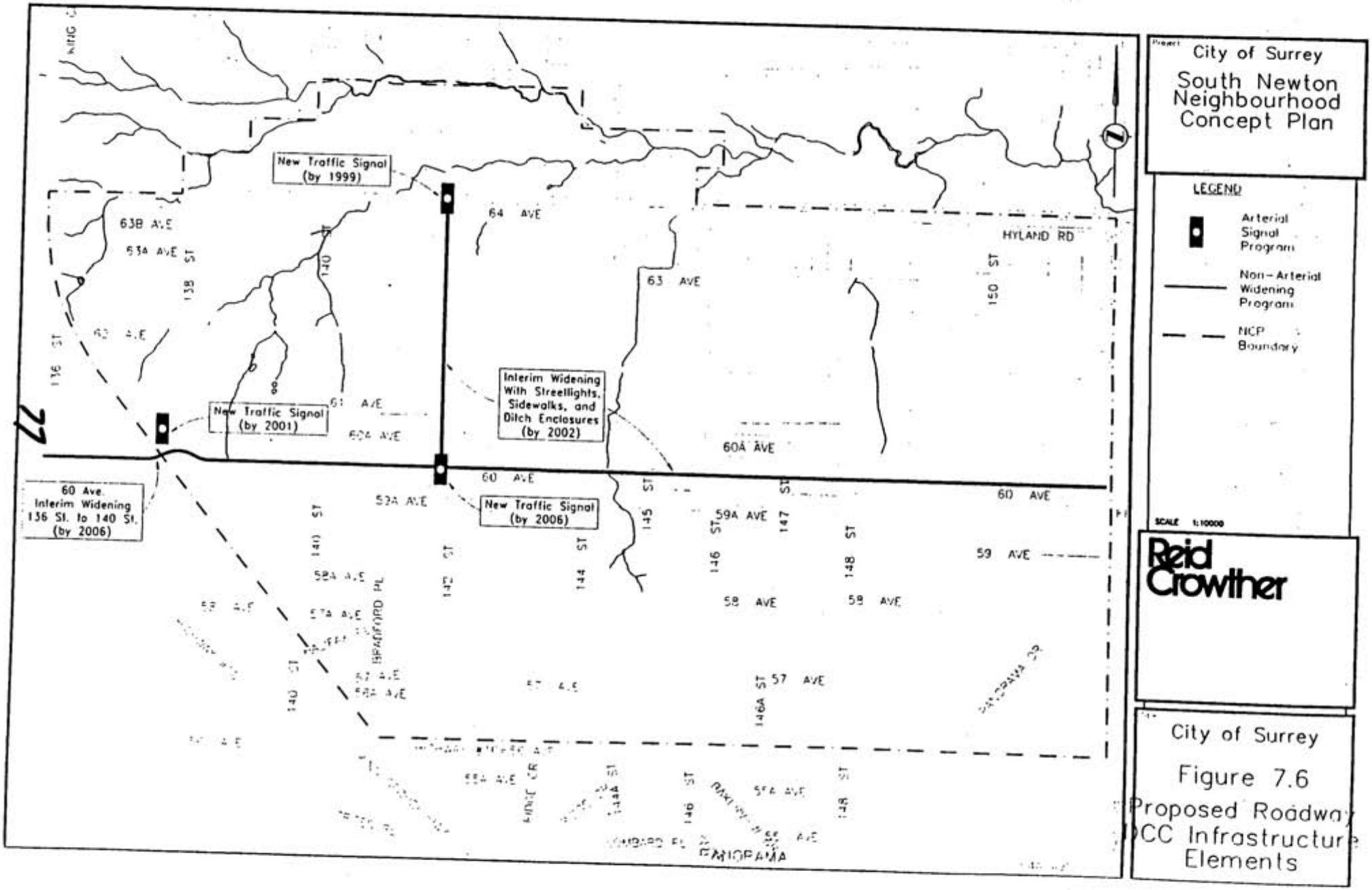
City of Surrey

Figure 7.5

Proposed Drainage DCC Infrastructure Elements



City of Surrey

South Newton Neighbourhood Concept Plan

LEGEND

- Arterial Signal Program
- Non-Arterial Widening Program
- NCP Boundary

SCALE 1:10000

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City of Surrey

Figure 7.6

Proposed Roadway/DCC Infrastructure Elements

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LIST OF FIGURES

SECTION	TITLE	PAGE NO.

LIST OF APPENDICES

EXECUTIVE SUMMARY

This Part B – Engineering Servicing Plan has been prepared to document the Trunk Development Servicing requirements and a phasing and funding strategy for the South Newton Neighbourhood Concept Plan ***Figure 1.1.***

As part of the generalized NCP Plan approved March 1997, the Stage I – Engineering Servicing Plan Report (January 1997) was prepared (***Appendix C*** under separate cover). It documents the Issues, Opportunities and Constraints for the Stage 1 Plan.

The key recommendations from the engineering studies during the Stage II Plan preparation include:

Creek Preservation (*Figure 2.1*) - Due to the particular significance of the Hyland Creek watershed (as it supports a natural Coho salmon population), the riparian corridors of Archibald Creek and other tributaries are to be protected by riparian set back areas. Ravine lands are to be dedicated to the City of Surrey following a top of bank survey confirmed by a professional biologist, a BCLS surveyor and the MoELP during the development application process.

Lands identified as being within the riparian set-back areas for creeks are to be preserved as natural areas consistent with the MoELP/DFO Land Development guidelines.

Sanitary System - As the majority of the NCP Area drains northwards and will be tributary to the proposed 64 Avenue Trunk Sewer, development outside of the existing serviced southern pockets and eastern pockets will be dependent upon extension of this trunk sewer (***Figure 3.3***).

Stormwater Management - We recommend the proposed trunk storm drainage system include the provision of community stormwater detention ponds for each of the major sub-basins tributary to Hyland Creek in accordance with the general locations in ***Figure 4.1***.

Appropriate sites for community detention ponds are identified on the Land Use Plan. Alternative sites abutting those indicated may also meet both Engineering and Planning needs. The detention pond land requirements will have to be acquired before development can proceed in any given catchment area.

Due to the significant cost of the stormwater detention facilities and their importance to control peak storm discharges to the creeks, development shall only proceed when the land required for the detention pond is secured on behalf of the city and stormwater detention constructed.

We recommend Best Management Practices (BMPs) to maximize site infiltration of storm runoff to maintain adequate levels of base flows in the Hyland Creek system.

We recommend that all culvert facilities along Archibald Creek be upgraded to provide for future projected 1:100-year major system requirements, and the Archibald Creek System upgraded as an enhancement project.

Transportation - The recommended Road Network Hierarchy confirms the designation of 144 Street and 148 Street as arterial roads within the Plan. Collector roads include: 142 Street, 58 Avenue west of 144 Street, 60 Avenue, 58 Avenue east of 148 Street, and Panorama Drive (***Figure 5.1***).

Water Distribution – We recommend the existing grid of trunk distribution watermains be extended with particular attention to the interim servicing requirements for Initial Development Phases east of 144 Street (***Figure 6.3***).

Financing – At full build-out of the NCP area, the total revenues from the DCCs will meet or exceed the expenditures for the required trunk infrastructure described in this report. (***Table 7.1***)

Due to the significant cost to provide community stormwater management facilities, it is recommended that the plan area be developed on a staged catchment by catchment basis to accumulate adequate storm drainage development cost charge (DCC) revenues. It is recommended that with each sub-basin, the developers establish a method for the acquisition and funding for the detention ponds required to service their catchment area and provide the funding for the construction of the facility on a timely basis. This approach will allow catchment areas within NCPs that have secured a drainage solution to proceed. These facilities must be secured and provided at the development application stage.

At the initial and subsequent stages of development more expenditures will be required than DCCs available and a deficit will need to be financed until the full benefiting areas build out. To avoid the City carrying the debt burden and financial risk of urban development, the NCP must be self financed by the developers. This can be accomplished through DCC front ender agreements with the City.

The report describes a proposed staging strategy that keeps the financial risk and debt burden to developers to a minimum. Other staging scenarios are possible but will likely result in greater financial risk and higher financing costs to developers.

Implementation – Staging boundaries used in the Financial Analysis are conceptual only, and it is expected that stages will overlap ***Figure 8.1***. Development can be advanced within any stage if appropriate financing and funding is provided by Developers. The City of Surrey has no policy to front end Trunk Municipal Services for Residential Development.

1.0 INTRODUCTION

1.1 Background

Study Area

The South Newton Neighbourhood Concept Plan Area is located in south Central Surrey, bounded by King George Highway to the west, Highway 10 to the South, 152 Street to the east and Hyland Creek to the north (***Figure 1.1***)

Although there are pockets of recent development, the majority of the area has rural services. For each of the engineering services, the study area varies dependent upon the utility catchment area, often extending beyond the limits of the NCP Plan Area.

Engineering Servicing Plans Stages I & II

Together with the phased preparation by the City of Surrey Planning Department and a Generalized Land Use Plan in Stage I, and a Detailed Land Use Plan in Stage II, the Reid Crowther Team has prepared several engineering studies and reports to define servicing requirements (***Appendix C***). The Key Summary report is the January 1997 Engineering Servicing Plan Report for Stage I.

This report summarizes the Engineering Servicing Plan requirements for each utility based on the refined Land Use Plan and Land Use Statistics (***Figure 1.2***) in the Stage II plan.

Approach

The Stage I – Engineering Servicing Plan identified constraints for the Land Use Plan, in addition to conceptual sewer, water, drainage and roadway plans incorporating the findings of the Environmental Study, and the Hydrogeological Study.

The Stage II – Engineering Servicing Plan Report confirms, based on the refined Land Use Plan, the Trunk Utility requirements for each utility, the infrastructure elements eligible for Development Cost Charge (DCC) funding, and a Development Phasing sequence to meet Financing Objectives

This Part B – Engineering Servicing Plan separately addresses the Development Plan in the following seven (7) sections:

Section 2.0 Environmental

Section 3.0 Sanitary Sewer

Section 4.0 Stormwater Management

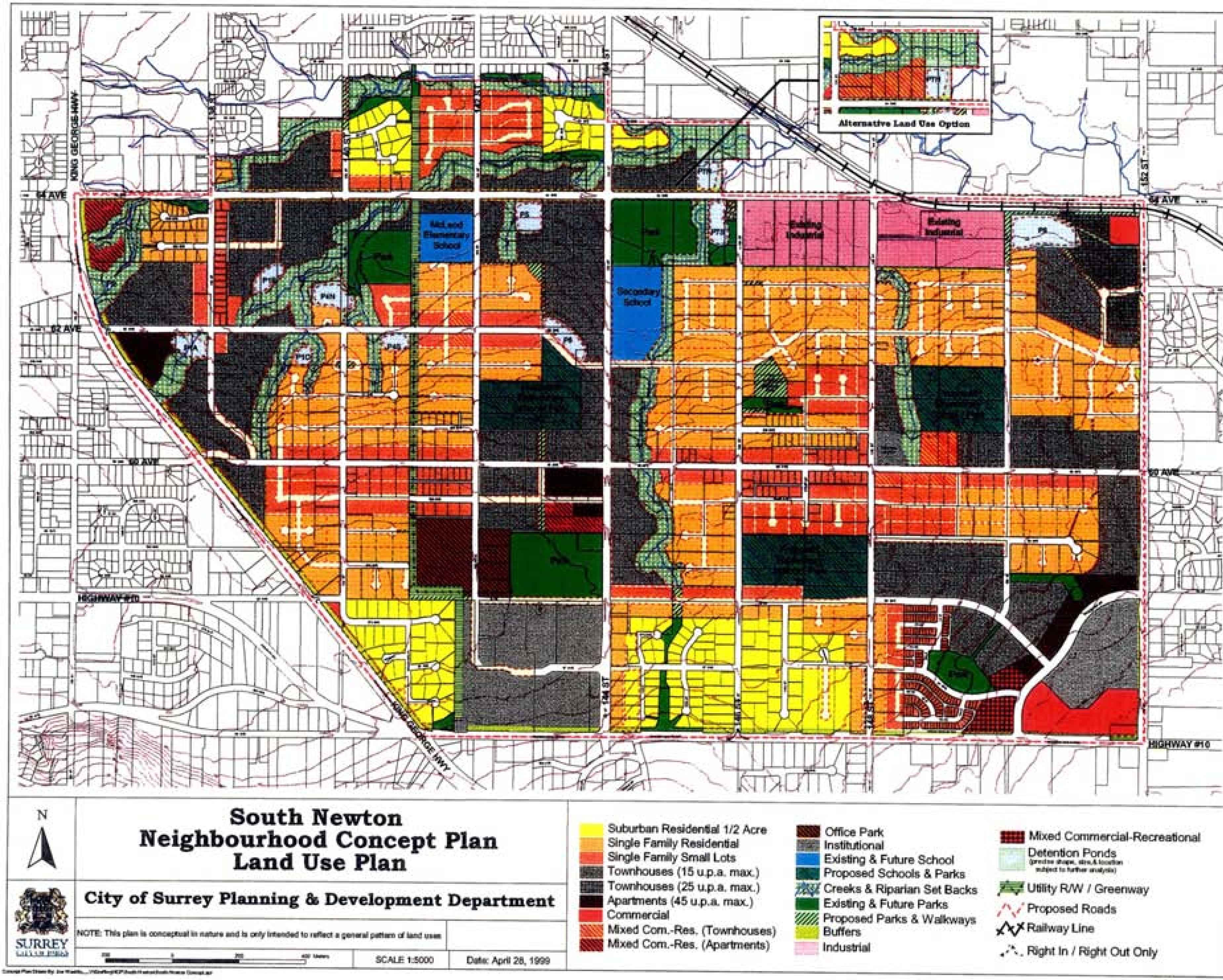
Section 5.0 Transportation

Section 6.0 Water Distribution

Section 7.0 Infrastructure Financing

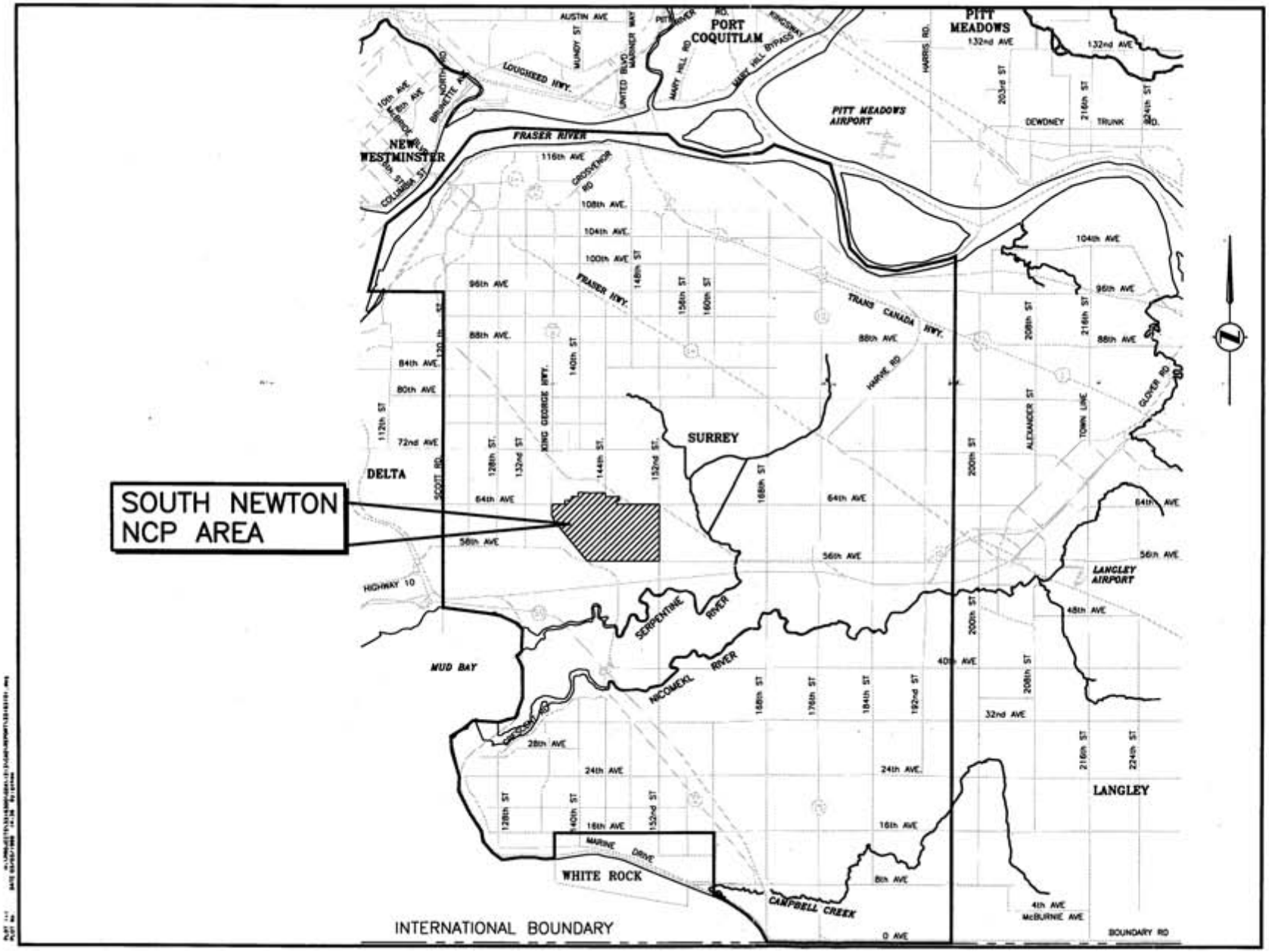
Section 8.0 Development Implementation and Staging

Supporting Technical Documents are appended or identified in ***Appendices A to F***.



KING GEORGE HWY
94 AVE
92 AVE
90 AVE
HIGHWAY #10
144 ST
152 ST
McLeod Elementary School
Secondary School
Park
Existing Industrial
Alternative Land Use Option
N
South Newton
Neighbourhood Concept Plan
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 uses
SCALE 1:5000
Date: April 28, 1999
SURREY
Suburban Residential 1/2 Acre
Single Family Residential
Single Family Small Lots
Townhouses (15 u.p.a. max.)
Townhouses (25 u.p.a. max.)
Apartments (45 u.p.a. max.)
Commercial
Mixed Com.-Res. (Townhouses)
Mixed Com.-Res. (Apartments)
Office Park
Institutional
Existing & Future School
Proposed Schools & Parks
Creeks & Riparian Set Backs
Existing & Future Parks
Proposed Parks & Walkways
Buffers
Industrial
Mixed Commercial-Recreational
Detention Ponds
Utility R/W / Greenway
Proposed Roads
Railway Line
Right In / Right Out Only

Figure 1.2



Project:

City of Surrey

South Newton Neighbourhood Concept Plan

Reid Crowther

Title:

City of Surrey

Figure 1.1

Location Plan

2.0 ENVIRONMENTAL

2.1 Introduction & Objectives

ECL Envirowest Consultants Limited (Envirowest) was retained to undertake the environmental studies. This is a summary of that Assessment Report (April, 1996).

The objective of the environmental assessment is to identify and evaluate environmental features, ensure that significant features are integrated into the plan, and otherwise ensure that adverse environmental impacts are mitigated and/or compensated for.

The study area includes portions or two units identified in the City of Surrey's Environmentally Sensitive Areas (ESA) Study[1]. Hyland Creek (ESA 61) has been rated "high" primarily due to the environmental significance of the creek, its tributaries and associated riparian corridors. A larger portion of the study area lies within the South Newton unit (EAS 62), which has been rated "low".

2.2 Study Methods

Primary components of the environmental inventory included watercourses and drainage, topography, fish and aquatic habitat, wildlife habitat and vegetative communities. Each of these components was assessed by field investigations conducted during the winter of 1995-96, with the exception of stream surveys that had been completed as part of an independent study. Hyland Creek and several of its more significant tributaries were assessed in detail by ECL Envirowest[2] in 1995 in conjunction with the Master Drainage Plan. (Listed in ***Appendix C***).

2.3 Results

Watercourses and Drainage

The most significant watercourse affecting the study area is Hyland Creek. The Hyland Creek main channel is considered sensitive to changes in its hydrologic regime due to urban development.

Significant Hyland Creek tributaries include the following: (***Figures 2.1 and 4.1***)

- unnamed tributary originating from storm sewer drainage at the King George Highway, draining the general vicinity of the Surrey Public Market;

[1] **Abs, S., C. Berris, A. Ferguson and S. Groves.** 1990. Finding the Balance: Environmentally Sensitive Areas in Surrey. Prepared for District of Surrey, Planning & Development Services. 67p.

[2] **ECL Envirowest Consultants Limited.** 1995. Bio-inventory and identification of habitat enhancement opportunities in Hyland Creek, Surrey, BC. Prepared for the City of Surrey. 88p.

- Archibald Creek, generally draining the area west of 142 Street, including areas west of the King George Highway;
- unnamed tributary originating northeast of the civic centre, flowing parallel and east of 144 Street;
- unnamed tributary originating near the intersection of 60 Avenue and 148 Street, flowing parallel to and east of 148 Street. This stream is enclosed in culverts through much of its lower reaches south of 64 Avenue.

Topography and General Geological Conditions

The study area is situated at the eastern limit of Panorama Ridge, which delineates the Surrey (Newton) Upland from the lowlands of the Serpentine and Nicomekl Rivers and Mud Bay. This ridge is bounded (within the study area) by the Hyland Creek valley to the north. Elevations range from about 5 metres above sea level adjacent to Hyland Creek, to approximately 84 metres on the western boundary of the study area.

The geology of the study area has been described by Halstead[3]. The Newton Upland is generally characterized as marine and glaciomarine stoney silty clay, 3 to 30 metres in thickness, overlying a sequence up to 75 metres thick of glacial tills with lenses of stratified glaciofluvial sands and gravels.

Seepage areas are found along the north-facing slope of the ridge, particularly north of 60 Avenue. Halstead reported two flowing artesian wells located along the 61 Avenue alignment (approximately).

Fish and Aquatic Habitats

High flows, lack of woody debris and barriers (particular culverts) are the primary factor limiting fish productivity in the Hyland Creek drainage basin. Habitat enhancement opportunities are numerous within the Hyland Creek drainage. The most significant in terms of potential increases in fish production are specific culvert replacements or modifications to extend the accessible range of salmonid habitat.

[3] **Halstead, E.C.** 1986. Ground Water Supply - Fraser Lowland, British Columbia. National Hydrology Research Institute Paper No. 26. Inland Waters Directorate Series No. 145. Saskatoon, Saskatchewan. 80p.

Wildlife

The raptor/heron nest survey revealed one nest, located north of 58 Avenue near 146A Street. No other raptor nest site were located, although hawks were observed in the general vicinity of 152 Street and 64 Avenue.

Vegetation

The study area was logged early during this century. As such, maximum tree ages tend to be in the 80 to 90 year range. Mixed land uses and various patterns of disturbance have resulted in a wide diversity of vegetation communities.

Public Concerns and Comments

The following is a generalized summary of some of the issues raised by residents of the study area at public meetings.

- preservation of trees, forests, mature vegetation, etc.; especially in road R-O-W;
- preservation and enhancement of streams and fish habitat;
- protection of wildlife;
- development of creek corridors as open space with public access and trails; and
- prevention of increases in noise and degradation of air quality.

2.4 Recommendations

A series of development recommendations is provided below, based on the overall objective of protecting the most significant environmental features, and integrating less significant features into the land use plan to the greatest extent feasible. A guiding principle is the development of a land use plan that fosters environmental awareness and environmental quality.

Watercourses, Drainage and Fish Habitat

The most significant environmental feature in the NCP Plan area is Hyland Creek and its tributaries. Seepage areas occur along the north-facing slope and should be considered hydrologically important, particularly in terms of maintaining summer baseflows in fish-bearing streams. Less significant features include drainages flowing south and east from the NCP area, supporting fish and wildlife resources outside of the study area.

Recommendation 1: Watercourse Protection

All watercourses must be preserved and protected from adverse impacts associated with land development. This is to be accomplished by dedication of the watercourses and appropriate setbacks to Ministry of Environment, Lands and Parks (MoELP) and Department of Fisheries and Oceans (DFO) Guidelines as parkland and/or environmental preserves, in addition to stormwater management to limit erosion.

Recommendation 2: Establishing Watercourse Setbacks

Setbacks be established in accordance with MoELP/DFO guidelines. Setbacks be measured from top-of-bank, and include 15.0 metres adjacent to low density development (Less than 6.0 units per acre) and 30.0 metres adjacent to high-density development.

Recommendation 3: Protection of Watercourse Setback Areas

In order to discourage encroachment of adjacent land uses into watercourse setback areas, the watercourse setbacks be fenced. Access to fenced setback areas be restricted to minimize impacts to watercourses.

Recommendation 4: Trails within Setback Areas

Trails may be permitted within setback areas, subject to careful design and construction to minimize impacts to aquatic habitat. Trails aligned parallel to watercourses be discouraged. Trails crossing streams should avoid sensitive fish habitat (e.g., spawning areas).

Recommendation 5: Protection of Seepage Areas

Seepage areas, where groundwater flows to the surface, be identified at the site development planning stage. Seepage areas be retained as open space. Alternatively, drainage plans ensure that seepage is directed into open watercourses rather than into storm sewer systems (i.e., dedicated drainage systems may be required on a site-specific basis to ensure seepage is directed to an open watercourse or drainage right-of-way).

Recommendation 6: Stormwater Management

A stormwater management plan must be developed to maintain hydrological conditions within a range that prevents degradation of stream channels and fish/wildlife habitats. The preferred approach involves wet detention ponds, due to benefits in terms of water quality, fish and wildlife habitat, and aesthetics.

Recommendation 7: Baseflow and Water Quality Protection

Best Management Practices (BMPs) be incorporated at the site development planning stage to ensure that land development does not significantly diminish either the quantity or quality of streamflow in the identified watercourses. Approaches that are to be implemented include:

- *roof leaders discharging to splash pads or rain barrels, to decrease the rate of runoff during peak rain events and promote infiltration to the groundwater reservoir;*
- *use of infiltration trenches and vegetated swales for minor drainages (again, promoting recharge of the groundwater reservoir);*
- *preservation of topsoil and natural vegetation on building sites to the greatest extent possible;*
- *use of semi-permeable materials for driveways, patios, walkways, maintenance roads, etc.; and*
- *use of biofiltration marshes and ponds as aesthetic features within development areas.*

Recommendation 8: Stream Crossings

New stream crossings will be minimized. All proposed road, bicycle and pedestrian routes crossing watercourses incorporate environmental design standards. Most importantly, crossings ensure passibility of fish and "no net loss" of habitat productivity. Upgraded crossings (culverts under 64 Avenue, for example) are to incorporate environmental design guidelines for fish passage to eliminate existing barriers.

Recommendation 9: Fish Habitat

Enhancement opportunities must be undertaken in conjunction with proposed works within and/or adjacent to watercourses where required for mitigation. Enhancement opportunities are listed in the bio-inventory report. (Under separate cover – see list ***Appendix C***).

Wildlife and Vegetation

The NCP area is comprised of a great diversity of vegetation communities that likely support a diversity of wildlife species. The general approach employed to maintain wildlife within the NCP area is to preserve representative vegetation communities. A habitat protection strategy, based on some of the recommendations that follow, is presented in ***Figure 2.1 (Drawing No. 367-07-03)***.

Recommendation 10: Retention of Vegetation

Each of the general vegetative community types be represented in the final land use plan by preservation of selected representative vegetation areas in their natural, undisturbed state.

Recommendation 11: Vegetation Preservation Principles

In order to maintain the greatest habitat values and, therefore, maximum wildlife usage, preservation of vegetative communities adhere to the following general principles:

- *preserve habitat areas contiguous with watercourse corridors;*
- *preserve relatively large habitat areas (an aggregate habitat area comprised of a small number of large areas is of greater overall habitat value than a large number of small areas);*
- *preserve habitat areas that provide for linear linkages with other habitat areas within and beyond the NCP area boundaries; and*
- *preserve a mix of habitat types in close proximity to each other, thereby preserving "edge" habitats at the transition between vegetative communities. This approach further increases the diversity of habitat retained.*

Recommendation 12: Raptor Nest Protection

Preserve the identified red-tailed hawk's nest, including a permanent setback area defined by a 50 metre radius around the nest tree. An additional "no disturbance" setback, defined by a 100 metre radius around the nest tree, should be adhered to during the breeding/nesting period, April 1 through July 31 of any year.

Recommendation 13: Landclearing during Nesting Season

In order to minimize impacts on breeding/nesting birds; to the greatest extent feasible landclearing be avoided during the period April 1 through July 31 of any year.

Recommendation 14: Tree Retention

In order to protect non-habitat values associated with vegetation, tree preservation be promoted to the greatest extent feasible to buffer noise from traffic and industry, regulate air quality, preserve the visual image of the study area from adjacent areas, and generally maintain the high environmental value of the site associated with its trees. Tree retention and replacement adhere to the City's bylaws.

Recommendation 15: Visual Buffers

Wherever possible, promote the retention of trees in east-west oriented alignments, rather than north-south alignments, to minimize visual impacts.

Recommendation 16: Streetscape Trees

Streetscape trees have been identified and are shown on ***Drawing No. 367-07-03****. Further assessment and consideration be given to retention of these trees in the development of road networks and other components of the land use plan.*

Recommendation 17: Windthrow Assessment

An assessment should be made of tree retention areas prior to landclearing to evaluate the potential for window, or rather adverse impacts of stand edge exposure.

Land Development - General

In addition to the specific recommendations addressing identified environmental features, land development in general should be conducted in a sensitive manner. Sediment control is the most critical aspect of land development.

Recommendation 18: Sediment Control Plans

Sediment control plans be developed and included with the engineering drawings for all development projects within the NCP area.

Recommendation 19: Environmental Monitoring

Development activities proposed in the vicinity of sensitive environmental features such as watercourses be monitored by qualified environmental consultants.

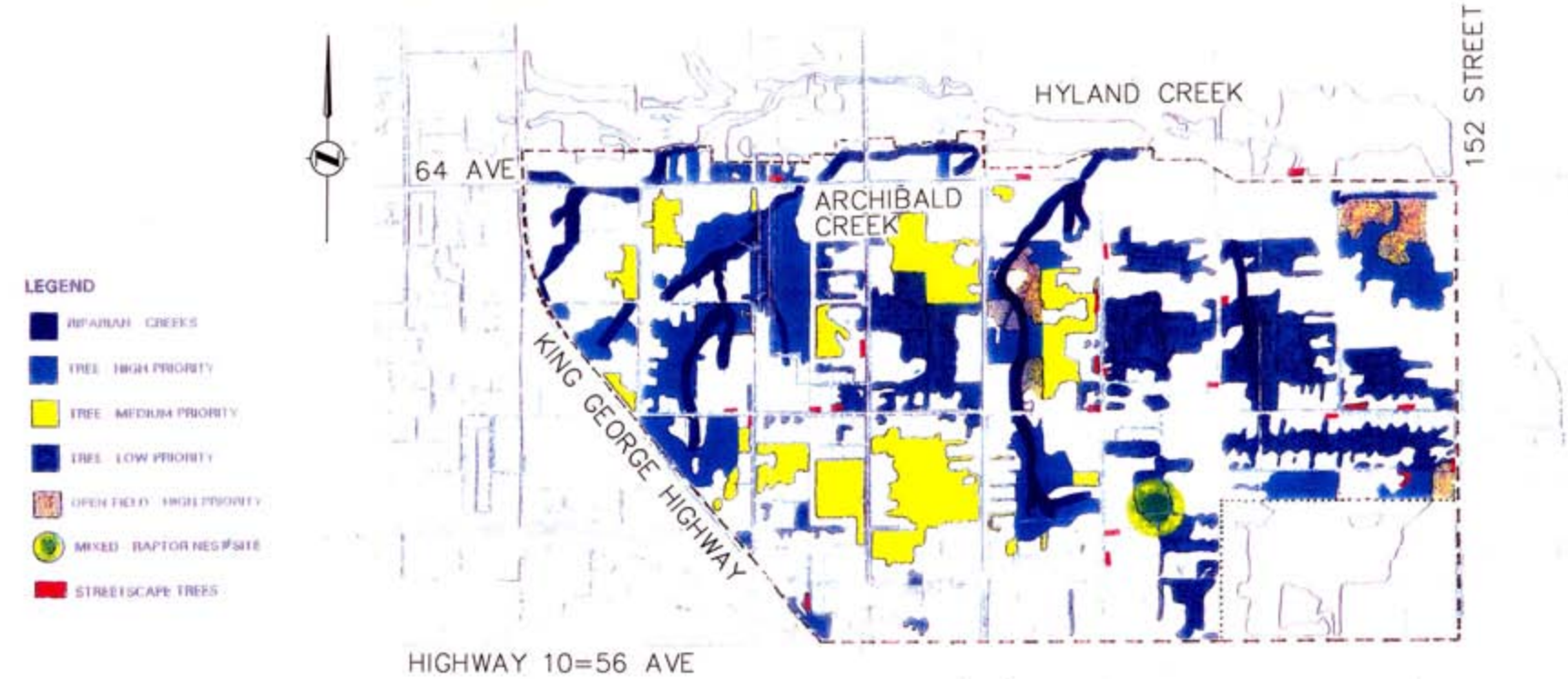


Figure 2.1

PROJECT:	SOUTH NEWTON NEIGHBOURHOOD CONCEPT PLAN
CLIENT:	CITY OF SURREY c/o REID CROWTHER & PARTNERS LTD.

envirowest
ENVIRONMENTAL CONSULTANTS
ECL ENVIROWEST CONSULTANTS LIMITED
Suite 204 - 800 McBride Boulevard, New Westminster, B.C. Canada V3L 2S8
phone (604) 521-8500 fax (604) 521-2508

HABITAT PROTECTION OPPORTUNITIES
South Newton N.C.P.

Scale:	1:7500	Date:	March 1996
Design:	WP/NG	Drwg. No.	367-07-03
Drawn:	NG		

SECTION 3.0
SANITARY SYSTEM

3.0 SANITARY SYSTEM

3.1 Background

This section outlines the sanitary servicing scheme for the recommended South Newton Neighbourhood Concept Plan (NCP).

The South Newton NCP plan area is bounded by Hyland Creek North of 64 Avenue on the north, King George Highway on the west, Highway 10 (56 Avenue) on the south, and 152 Street on the east. The area is separated into five (5) sub-catchments as shown on ***Figure 3.1***. All of the identified catchment areas are tributary to the existing GVS&DD trunk sewer that is located on the low lying lands to the east and south of the study area. Apart from a few areas on 138 Street, around City Hall and the Panorama Project, the catchments are relatively undeveloped and most of the properties are being serviced by individual septic systems.

3.2 System Analysis

The catchment boundaries were used to determine the tributary area for each of the catchment areas. The sanitary sewage flows for ultimate development conditions for each area were estimated using the zoning from the preferred land use concept, the zoning densities in the City of Surrey's Design Criteria Manual and a sewage generation rate of 350 lpcd. Peak flows were determined using the Harmon peaking factor. The slopes of proposed sewers were approximated using the slope of the existing ground. In accordance with the City of Surrey's criteria, all sewers have been sized on the basis of flowing 50% full at the peak flow rate for the ultimate development. Proposed trunk sewers are defined as sewers with a generated peak flow equal to or greater than 40ℓ/s.

Sewers will generally be installed within road right-of-ways. From a servicing perspective downhill cul-de-sacs are discouraged, however, where downhill cul-de-sacs are proposed in the preferred land use concept it may be necessary to provide a walkway to an adjoining street or cul-de-sac to permit sanitary servicing. The detailed requirements for servicing of any proposed downhill cul-de-sac will have to be coordinated with the storm servicing requirements, which will most likely govern.

3.3 Conclusions

a) **North Catchment (293 ha + 110 ha):** This is the largest catchment area in South Newton and sanitary flows will be conveyed north to 64 Avenue and then east along 64 Avenue to 152 Street. A sanitary trunk ranging in size 375 to 750 ϕ is needed along 64 Avenue from 138 Street to 152 Street where it will be connected to the existing

GVS&DD sanitary trunk sewer. There is a 110 hectare sub-basin west of King George Highway that is outside of the South Newton NCP boundary, which is tributary to the North Catchment area, and at the present time flows from this sub-basin are being temporarily diverted to an existing 300 ϕ sewer on King George Highway. This area will ultimately be serviced by the proposed 64 Avenue sanitary trunk. Hence a large diameter sewer is needed through the NCP.

The conceptual layout of the sanitary sewer network that was used in the earlier stages of the NCP for evaluation of all sewers draining north to the proposed 64 Avenue trunk is shown in ***Appendix D***. A second alternative was investigated for servicing the western portion of the North Catchment based on a desire to utilize the existing 200 ϕ sewer on 138 Street as well as a preference to avoid the installation of a trunk sewer within the 140 Street right-of-way north of 62 Avenue because it will involve construction in a creek and buffer area that is intended to accommodate a stormwater pond.

In order to meet these objectives, an updated conceptual sanitary sewer layout was prepared ***(Figure 3.2)*** that reflected (i) diversion of the flows upstream of 138 Street and 62 Avenue east to 142 Street and (ii) elimination of the proposed trunk sewer on 140 Street north of 62 Avenue and diversion of upstream flows east to 142 Street. On the basis of the calculations shown in ***Table 3.1*** the required trunk sewers are shown on ***Figure 3.3***.

The proposed 62 Avenue trunk sewer is intended to be installed within existing and proposed road right-of-ways. The portion of the alignment north of 62 Avenue, between 140 Street and 142 Street will require subdivision of the properties in this area. This section of the alignment has some deeper sections (4-6 m) in the vicinity of 62A Avenue/141A Street (MH2a) and 63 Avenue/142 Street (MH3aa) however these sections can still be installed by conventional open cut techniques. Although the overall length of the required trunk sewers is longer (1,200 m vs. 800 m) it is the preferred alternative for servicing the western portion of the North Catchment area because it eliminates the need to upsize the existing 200 ϕ 138 Street sewer and eliminates the requirement to install a trunk sewer in a creek and buffer area in the 140 Street right-of-way where there is no intended road access.

The sewer system for this area is intended to be installed within the road right-of-ways and the proposed sanitary trunk sewers shown on ***Figure 3.3*** follow the proposed road alignments. The development of the catchment area can proceed as the 64 Avenue trunk sewer is constructed and development will likely proceed in stages from east (downstream) to west (upstream).

The City proposes to ultimately relieve the 66 Avenue trunk by constructing a 750 ϕ relief sewer along Hyland Road north of 64 Avenue, which will connect to the 750 ϕ section of the proposed 64 Avenue trunk sewer. The additional flow into the 64 Avenue trunk sewer from the Hyland Road relief sewer is estimated to be 130ℓ/s. The 750 ϕ downstream section of the 64 Avenue trunk sewer is adequate and there will be no negative financial impacts.

The flow from the areas south of the Industrial Pocket will be conveyed to the proposed 750 ϕ trunk sewer south of 64 Avenue. This area will not be serviced by the existing sewer system on 64 Avenue because that system does not have because the existing sewer system does not have the necessary capacity for servicing areas other than the Industrial Pocket.

Temporary interim sanitary service will be provided for the secondary school site east of 144 Street, by providing a temporary sewer on 144 Street northwards to the existing sanitary sewer at 65 Avenue.

a) **Eastern Pocket Catchment (47 ha.):** This area drains east to 152 Street. It will be serviced by the 375 ϕ sanitary sewer that is being installed along 152 Street as part of the Panorama Lands development project. A further adjustment was made to divert a 3 ha. area along 59 Avenue between 148 Street and 150 Street south to the South East Catchment. The capacity of the proposed 375 ϕ trunk sewers on 56 Avenue and 152 Street were checked and determined to be adequate to convey the additional flow associated with the 20 hectare increase in service area ***(Table 3.2.3 in Appendix D)***. Similar to the South East catchment only additional local sewers are required to complete the sewer servicing for ultimate development conditions.

b) **South West Catchment (43 ha):** This catchment is partially developed and the present sewage flows are conveyed south to the existing GVS&DD trunk via an existing 375 ϕ sewer on 144 Street and an existing 200 ϕ sewer on 144A Street. As shown in ***Table 3.2 in Appendix D***, these sewers have adequate capacity to convey the ultimate development flows from the South West catchment and no new trunk sewers are required. Only additional local sewers will be required to service this area for ultimate development conditions.

c) **South East Catchment (72 ha):** The eastern portion of this catchment area is currently being developed by Intrawest. As a part of the Panorama Lands project 375 ϕ sanitary sewers are being installed along Highway 10 and 152 Street. The 375 ϕ sewer on Highway 10 has adequate capacity to convey ultimate development flows from the western portion of the catchment area ***(Table 3.3)***. The 375 ϕ sewer

on 152 Street has been designed to convey both the ultimate development flow from the eastern portion of the catchment area and the Eastern Pocket catchment area ***(Table 3.4)***. Once the above referenced trunk sewers have been constructed, only local sewers will be required to complete the servicing of this area.

d) **Industrial Pocket Catchment (30 Ha.):** The existing sewer system was constructed to service this area which is lower than the 15 m geodetic design surcharge elevation of the GVS&DD trunk sewer on 152 Street. The GVS&DD trunk sewer crossing of Hyland Creek at 152 Street and 64 Avenue is an inverted siphon and conventional gravity servicing of the Industrial Pocket by the GVS&DD trunk sewer is not possible. In order to service this area, a gravity sewer has been extended to the east across 152 Street to the Bose Road lift station where the flow is collected and pumped back into the GVS&DD trunk sewer. This existing 250/300 ϕ sanitary sewer has the necessary capacity to convey the ultimate development flows from this area based on the design criteria.

3.4 Recommendations

a) Based on our analysis for the ultimate development flows the recommended sanitary trunk sewers (peak flows equal or greater than 40ℓ/s) for the South Newton NCP Land Use Plan are shown on ***Figure 3.3***.

b) The 64 Avenue Trunk Sanitary Sewer should be extended westwards along 64 Avenue by developers, subject to available financing and the timing of road widening.

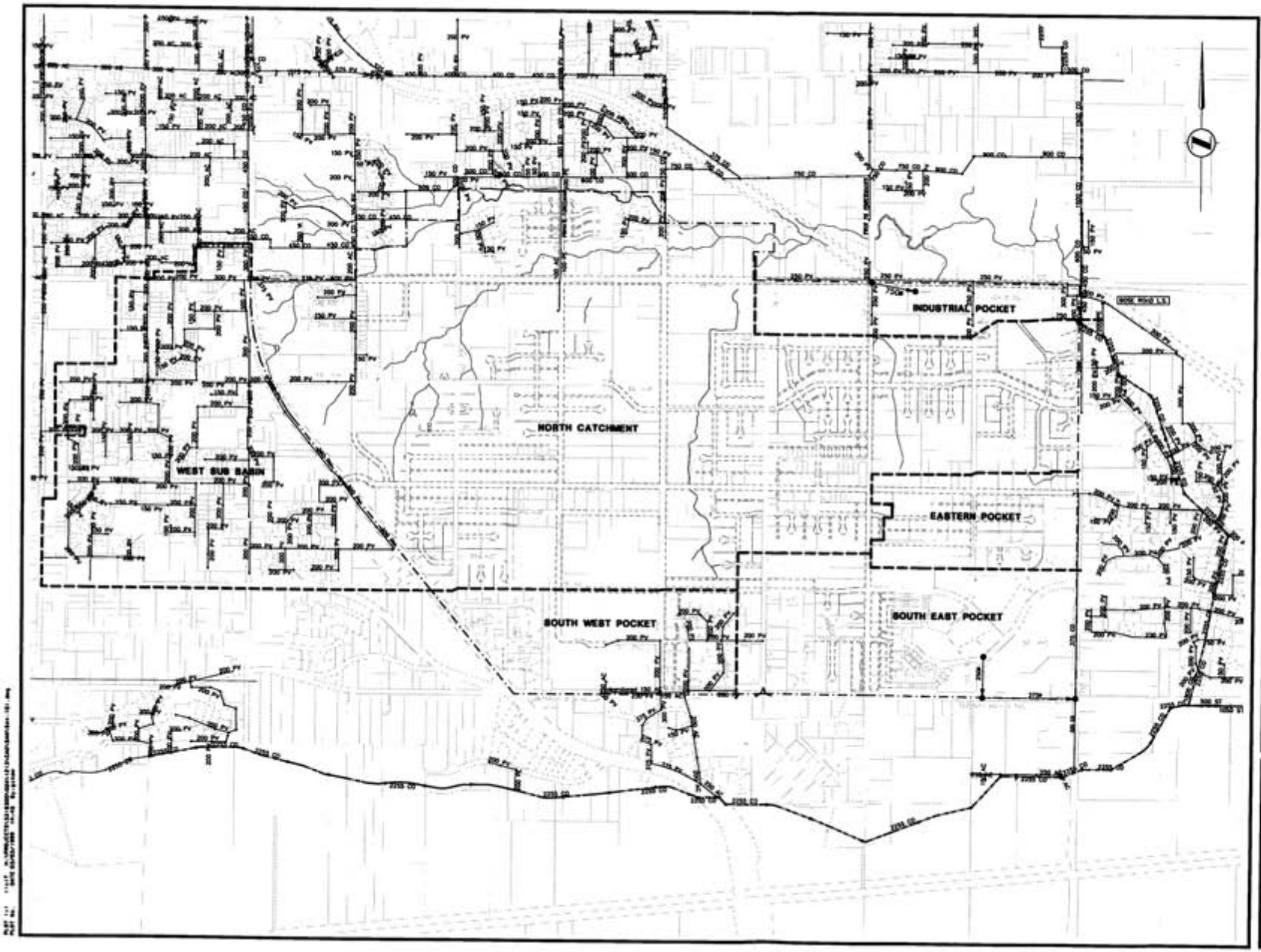
TABLE 3.1 - Sanitary Sewer Design Table (Option 2)

Catchment Name	Area Upstream: Sub Basin Name/Number	Area Type	Area	Total Area	Manhole No. From	To	Population Density	Tributary Population	Average Daily (Ta350 l/capita/day)	Harmon Peaking Factor	Peak Q	Infiltration Rate (Ex0.1 l/s/ha)	Total Q	Slope of Sewer	Required Diameter	1/2 Pipe Capacity	Proposed/ Existing Diameter
A (-)	B (-)	C (-)	D (ha)	E (ha)	F (-)	G (-)	(people/ha)	H (-)	I (l/s)	J (-)	K (l/s)	L (l/s)	M (l/s)	N (m/m)	O (m)	P (l/s)	Q (m)
	West Sub Basin	-	110.25	110.25	-	MH5	-	6536	27.69	3.12	86.30	11.03	97.33		0.300		0.300
	West Sub Basin	-	110.25	110.25	MH5	MH1	-	6536	27.69	3.12	86.30	11.03	97.33	0.044	0.375	183.79	0.375/0.600
	1	T	7.70				114	878	3.56			0.77					
		C	2.10				90	189	0.77			0.21					
	TOTAL			9.80	MH1A	MH1		1067	4.32	3.78	16.34	0.98	17.32	0.02	0.200	23.18	-
	W.S.B.+1	SF	0.60				50	30									
		T	2.70				114	308									
				123.35	MH1	MH2		8241	33.36	3.04	101.40	12.34	113.74	0.017	0.375	114.24	0.375
	W.S.B.+1+2	SF	0.40				50	20									
		T	1.90				114	217									
				125.65	MH2	MH3		8477	34.34	3.03	103.90	12.57	116.47	0.013	0.450	162.45	0.450
	2	SF	2.60				50	130	0.53			0.26		0.05	0.200	39.65	-
		T	13.40				114	1528	6.19			1.34		0.05	0.200	39.65	-
		C/A	0.40				90	36	0.15			0.04		0.05	0.200	39.65	-
		A	1.60					324	1.31			0.16					-
	SUB-TOTAL			18.00	MH2F	MH2E		3018	8.17	3.58	29.29	1.80	31.08	0.005	0.300	34.17	0.200
		SF	37.15				50	1858	7.52			3.72					-
		T	3.90				114	445	1.80			0.39					-
		C/R	0.40				102	41	0.17			0.04					-
	SUB-TOTAL			59.45	MH2E	MH2D		4381	17.66	3.30	58.26	5.95	64.21	0.005	0.375	84.59	0.375
		SF	2.85				50	143	0.58			0.29					
	SUB-TOTAL			62.30	MH2D	MH2C		4503	18.24	3.29	58.96	6.23	65.19	0.011	0.375	91.90	0.375
		SF	2.85				50	143	0.58			0.29					
	SUB-TOTAL			65.15	MH2C	MH2B		4646	18.82	3.27	61.62	6.52	68.14	0.003	0.450	78.04	0.450
		PSO	5.80				-	300	1.22			0.58					
	SUB-TOTAL			70.95	MH2B	MH2A		4946	20.03	3.25	65.10	7.10	72.19	0.012	0.450	142.46	0.450
	TOTAL			70.95	MH2A	MH3AA		4946	20.03	3.25	65.10	7.10	72.19	0.008	0.450	127.44	0.450
N	3	PSO	9.20				-	300	1.22			0.92					
O		SF	9.20				50	460	1.86			0.92					
R																	
T	SUB-TOTAL			18.40		MH3A		760	3.08	3.87	11.93	1.84	13.77	0.030	0.200	28.39	-
H		SF	3.60				50	180	0.73			0.36					
	SUB-TOTAL			22.00	MH3A	MH3AA		940	3.81	3.82	14.54	2.20	16.74	0.055	0.200	38.44	0.200
		T	3.60				114	410	1.66			0.36					
	TOTAL			96.55	MH3AA	MH3		6296	25.50	3.15	80.36	9.66	90.01	0.055	0.450	334.13	0.450
	W.S.B.+1+2+3	SF	0.50				50	25									
		T	2.20				114	251									
				224.90	MH3	MH4		15069	60.96	2.75	169.25	22.49	191.77	0.012	0.525	235.44	0.525
	4	PSO	10.40				-	1100	4.46			1.04					
		SF	1.40				50	70	0.28			0.14					
		T	18.00				114	2052	8.31			1.80					
		A	2.30					420	1.70			0.23					
		C/A	1.40				90	126	0.51			0.14					
	SUB-TOTAL			33.50	MH4B	MH4A		3768	15.26	3.36	51.23	3.35	54.58	0.040	0.250	59.44	0.250
C																	
A		PSO	11.50				-	1100	4.46			1.15					
T		SF	1.40				50	70	0.28			0.14					
C		T	19.20				114	2189	8.87			1.92					
H		A	2.30					420	1.70			0.23					
M		C/A	1.40				90	126	0.51			0.14					
E																	
N	SUB-TOTAL			35.80		MH4A		3905	15.82	3.34	52.87	3.58	56.45	0.040	0.250	59.44	0.250
T		T	7.40				114	844	3.42			0.74					
A		PSO	5.80				-	0	0.00			0.00					
West	TOTAL			48.00	MH4A	MH4		4749	19.24	3.27	62.82	4.32	67.14	0.055	0.250	69.70	0.250
Sub Basin		T	0.90				114	103									
	W.S.B.+1...+4			274.80	MH4	MH5		19900	80.61	2.65	214.00	27.48	241.48	0.004	0.675	265.68	0.675
		SF	26.40				50	1320	5.35			2.64					
	5	PSO	3.90				-	0	0.00			0.00					
	SUB-TOTAL			30.30		MH5A		1320	5.35	3.72	19.89	2.64	22.53	0.040	0.200	32.78	0.200
		SF	5.60				50	280	1.13			0.56					
		PSO	4.30				-	0	0.00			0.00					
	TOTAL			30.30	MH5A	MH5		1600	6.48	3.66	23.72	3.20	26.92	0.034	0.200	30.22	0.200
	W.S.B.+1...+5	IND	7.70				90	693									
				312.80	MH5	MH6		22193	89.96	2.61	234.39	31.28	265.67	0.000	0.675	325.39	0.675
		SF	13.20				50	660	2.67			1.32					
	6	I	0.60				50	30	0.12			0.06					
		T	2.50				114	285	1.15			0.25					
		PSO	2.80				-	0	0.00			0.00					
	TOTAL			19.10	MH5A	MH6		975	3.95	3.81	15.04	1.63	16.67	0.034	0.200	30.22	0.200
	W.S.B.+1...+6	IND	7.10				90	639									
	The assumed peak inflow to the 64 Ave. trunk sewer from the Hyland Rd. trunk sewer is 130 l/s																
				339.00	MH5	MH7		23471	95.08	2.56	375.68	37.90	400.48	0.005	0.900	639.72	0.750
		SF	2.60				50	130	0.53			0.26					
	7	T	2.70				114	308	1.25			0.27					
		PSO	2.40				-	300	1.22			0.24					
	TOTAL			7.70	MH7A	MH7		738	2.99	3.88	11.60	0.77	12.37	0.036	0.200	31.10	0.200
	W.S.B.+1...+7	C	0.70				90	63									
	The assumed peak inflow to the 64 Ave. trunk sewer from the Hyland Rd. trunk sewer is 130 l/s																
				347.40	MH7	MH8		24272	98.32	2.57	382.63	34.74	417.37	0.005	0.900	639.72	0.900
		SF	11.30				50	565	2.29			1.13					
	8	T	7.10				114	809	3.28			0.71					
	TOTAL			18.40	MH8A	MH8		1374	5.57	3.71	20.64	1.84	22.48	0.040	0.200	32.78	0.200

-Shaded pipe reaches are trunk sewers, all others are laterals. Laterals are not shown on Figure 7.2.5.

TOTAL CONTRIBUTING AREA 256 (excludes parks, ponds etc)

Landuse	Population / ha
SFS - Suburban 1/2 acre	19
SF - Single Family	50
T - Townhouse	114
A - Apartment	Based on transportation zoneal forecasts
C - Commercial	90
I - Institutional	50
IND - Industrial	90
R - Residential	114
PSO - Parks/Schools/Office	site specific



Project:

City of Surrey

South Newton Neighbourhood Concept Plan

LEGEND

- Development Boundary (NCP)
- Subcatchment Boundary
- 300 PV Existing Sanitary Sewer
- 2250 CO Existing GVS&DD Trunk Sewer

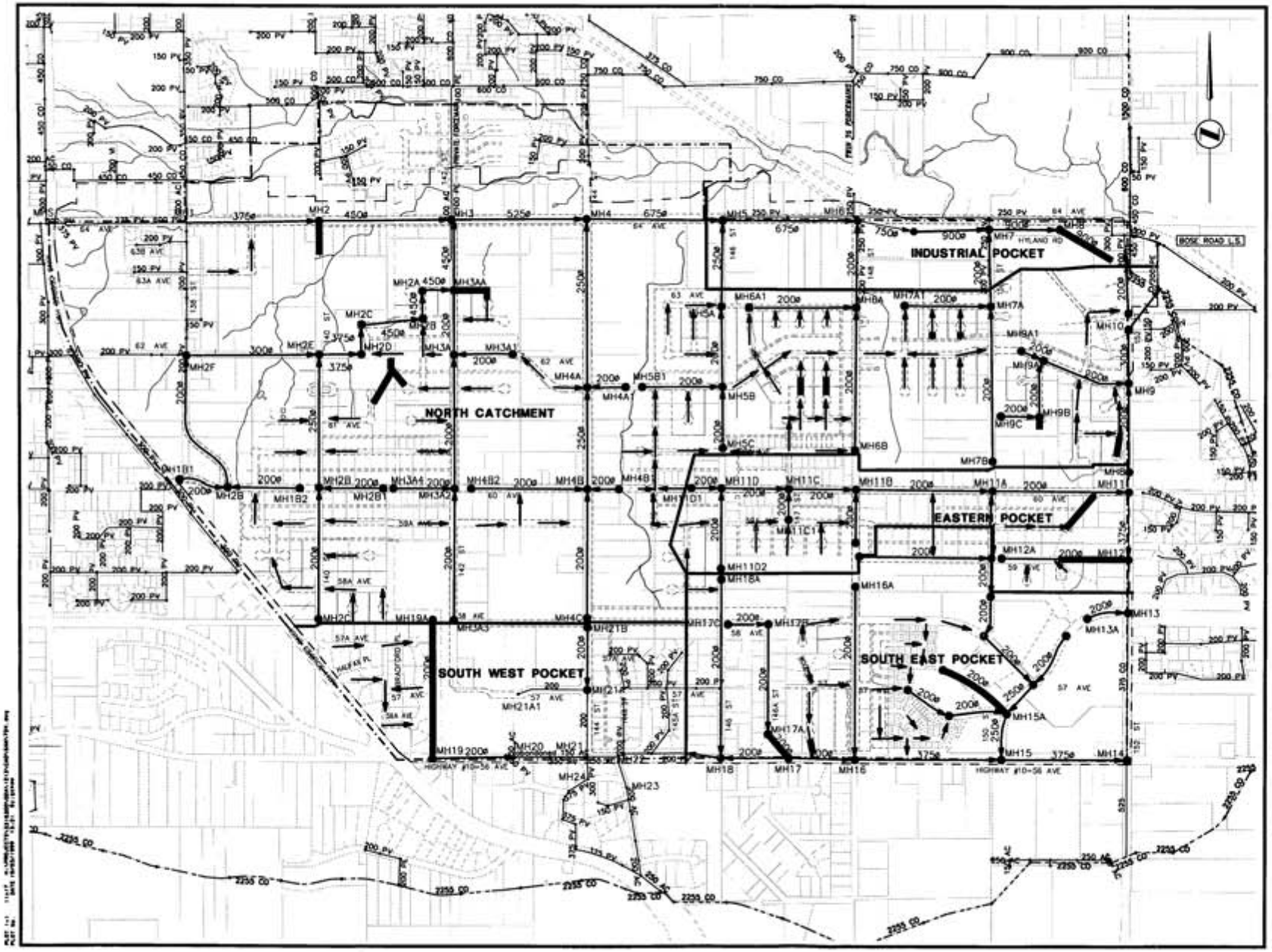
Reid Crowther

Title:

City of Surrey

Figure 3.1

Existing Sanitary Sewers



Project:

City of Surrey

South Newton Neighbourhood Concept Plan

LEGEND

- Development Boundary (NCP)
- Subcatchment Boundary
- 300 PV Existing Sanitary Sewer
- 2250 CO Existing GVS&DD Trunk Sewer
- 300 PV Proposed Sanitary Sewer
- Walkways Required

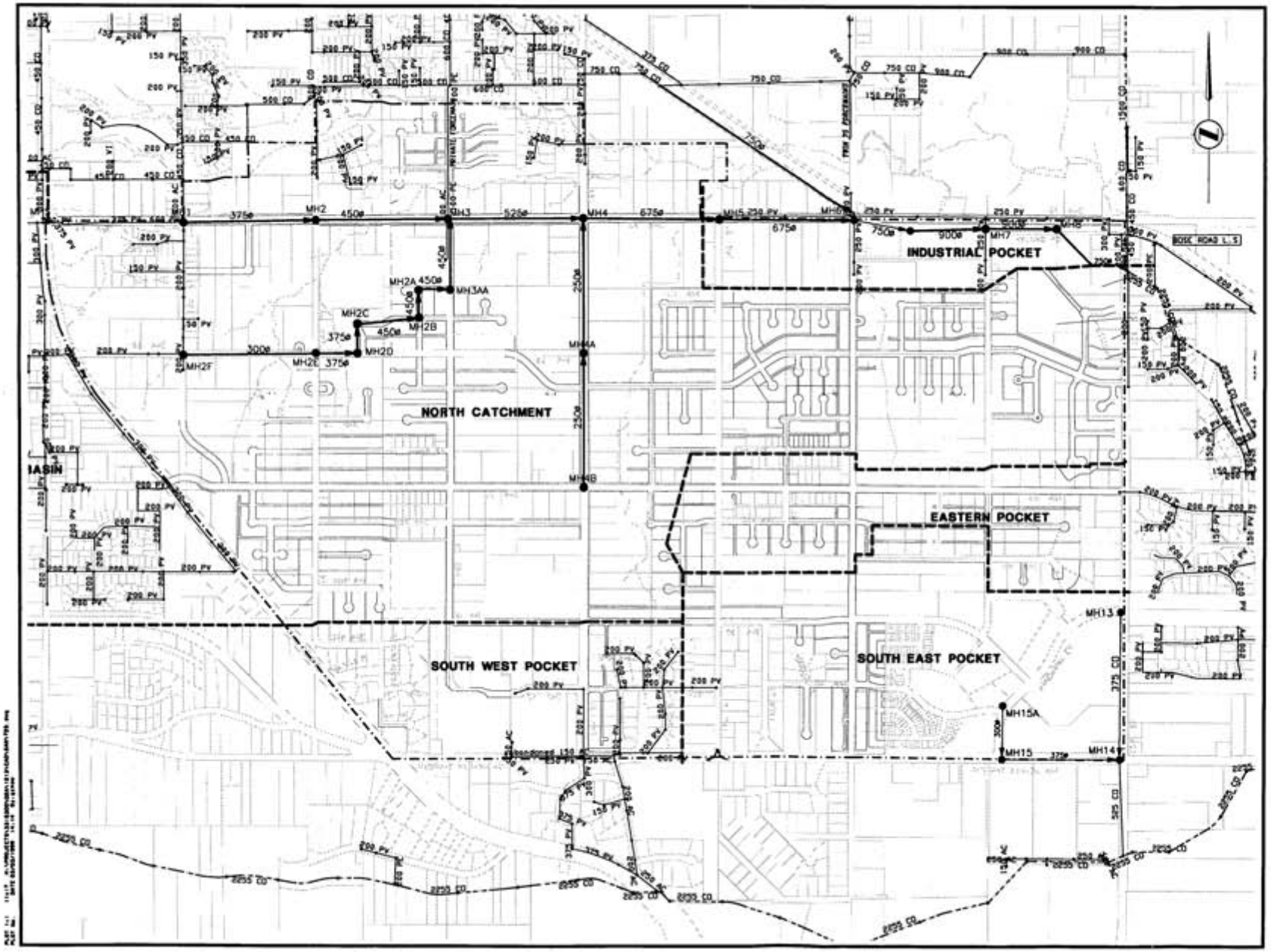
Reid Crowther

Title:

City of Surrey

Figure 3.2

Conceptual Sanitary Sewer Servicing



Project:

City of Surrey

South Newton Neighbourhood Concept Plan

LEGEND

- Development Boundary (NCP)
- Subcatchment Boundary
- 300 PV Existing Sanitary Sewer
- 2250 CO Existing GVS&DD Trunk Sewer
- 300 PV Proposed Sanitary Trunk Sewer (Q=>40 l/s)

Reid Crowther

Title:

City of Surrey

Figure 3.3 Sanitary Trunk Sewers

4.0 STORMWATER MANAGEMENT SYSTEM

4.1 Background

This section addresses the stormwater drainage system for the South Newton Neighborhood Concept Plan (NCP).

The urban development of rural/undeveloped areas into urban land use has the potential to negatively impact the watercourses. An urban drainage system that conveys stormwater runoff may be conceptualized as having two components. The first is the minor system consisting of sewers and the low flow channels of watercourses retained during and after development. The second component is the major system, which accommodates surface runoff resulting from a rainstorm, which is greater than the capacity of the minor system. The current design policy for the City of Surrey requires the minor system be designed for a 1 in 5-year storm and the 1 in a 100-year storm event.

A major drainage system will always exist, whether or not it has been designed. The key design requirement is to provide a well planned continuous route to convey the flows safely through the development and into the receiving waters. Current practices in urban land use/drainage planning and environmental protection are attempting to provide design solutions that mitigate these impacts.

Study Area

The South Newton NCP area is located within the City of Surrey and covers an area of 479 ha. and, has been divided into four main drainage catchments. These have been labeled as follows:

North Catchment - which drains to the Hyland Creek (approx. 340 ha)

South Catchment - which drains to the existing ditches and drains along Highway 10 west of 152 Street and eventually to the 148 Street pump station. (approx. 99 ha)

Southwest Corner - drains to existing storm sewers on King George Highway and eventually to the Colebrook pump station (approx. 10 ha)

Eastern pocket - drains east across 152 Street through a developed area and into a ditch system, which flows to the Hook Brook, pump station. (approx. 30 ha)

Flows from the study area discharge directly to watercourses or are pumped into the Serpentine river by three pump stations (Hook Brook, 148 Street & Colebrook). The pump stations form part of the lowland drainage system which pump water over the dykes that protect the agricultural lands. These Pump stations and dykes are integral parts of the area drainage system.

This study provides a more detailed investigation into the servicing requirements for the study area and builds on the findings of previous reports and master drainage plans for the area.

Existing system constraints are identified for future consideration and their impact on the proposed mitigative measures. The sizing and general layout for the selected alternatives are defined for use in future detailed design. The report is not a detailed design but is a guide for overall servicing of the area.

Three basic categories of impacts to the natural drainage system are considered. Firstly, increased runoff in terms of peak flows and volume which can cause flooding and erosion along existing natural watercourses within the study area or downstream areas external to the study area. Secondly, increased runoff from road surfaces as well as urban activity and vehicular traffic can lead to detrimental impacts on downstream water quality. Thirdly, the potential decrease in groundwater recharge and the resulting reduction in the base flows along the downstream fish-bearing watercourses.

4.2 Existing Drainage System

This section reviews the drainage design issues for the South Newton NCP taking into consideration the various design guidelines and the intent is to provide a continuation of the ongoing improvements to the design guidelines and available mitigative solutions.

The key background reports relevant to the South Newton area Storm Drainage are:

- 1978 Master Drainage Plan by Sigma Resource Consultants;
- 1995 Hyland Master Drainage Plan by UMA Consultants;
- 1995 Environmental Report on Hyland Creek by ECL Consultants;
- 1996 Draft Storm Drainage Report by Reid Crowther & Partners Ltd.;
- 1997 Engineering Servicing Plan Report by Reid Crowther & Partners Ltd.
- 1999 Modifications to the Storm Drainage Servicing Plan

Area Characteristics

The Study area is hilly with a relief of 80 meters. Being mostly on the hill side the study area has slopes in the range of 2% to 8%. The drainage from the area is hydraulically divided by a single ridge, which runs west to east approximately along 60 Avenue.

The area has several artesian wells as reported in the National Hydrology Research Institute paper number 26 "Groundwater Supply - Fraser Lowland. The soil in the area consists mainly of

marine and glaciomarine stony silty clay that overlies a thick layer of till material. The top layers are estimated to be 3 to 30 meters thick. The hydraulic conductivity of the top layers is in the order of 1.3 to 7.6 mm/hr.

Opportunities and Constraints

The implementation of the proposed development of the land in this project area will span at least over the next two decades or more. Hyland Creek is a very important watershed as it supports natural populations of Coho salmon, so servicing must be sensitive to the protection of watercourses, as well as aquatic and terrestrial habitats.

Although Stormwater Management cannot fully mitigate potential impacts of urbanization on fish habitat, the development of a servicing plan provides a timely opportunity to incorporate a wide range of management facilities which can reduce the impacts of urbanization on the environment. Most of these practices involve detention, retention or infiltration of urban stormwater to enhance pollutant removal and reduce the impact of hydrological changes brought about by the increase in impervious area.

Predevelopment Conditions

The predevelopment land use conditions for the study area is defined as the conditions that were present in 1978 where the watershed was largely undeveloped. These conditions were recorded in the 1978 Sigma report, which developed the original Master Drainage Plan for the Surrey area. The predevelopment flows were computed using the OTTHYMO program.

Existing Drainage system

The existing conditions in the study area are similar to the predevelopment conditions with the exception of development in Panorama since 1995. A comparison of the land use at present and in 1978 shows that the industrial area along 64 Avenue and 148 Street, residential development at 64 Avenue and 138 Street, and east of City Hall, along with additional homes along 60 Avenue and institutional development in the vicinity of City Hall and the initial stages of the Panorama Project at 152 Street and Highway 10 are the most evident changes to the predevelopment land use conditions. The existing drainage boundaries have not been significantly altered by the recent developments.

Outside Contributing Areas

Areas outside the study area contribute runoff that must be conveyed through the NCP Area. Much of the area outside and upstream of the NCP are fully developed. It is not expected that those areas will contribute increased flows in the future as the NCP development is completed. The impact of upstream development have been investigated in the Hyland Master Drainage

Plan. The contributing area outside the NCP is divided into three subcatchments of 80.2 ha, 61.6 ha and 47.0 ha. These areas contribute a total flow of 3.36 m^3/s to the NCP for the 5-year event. Any proposal to reduce peak flows form these developed areas must be provided outside of the South Newton NCP due to effectiveness, implementation and financing issues.

System Inventory

A inventory of the existing drainage system was completed. Many of the structures identified in previous reports still require upgrading. Watercourses have been reviewed under the environmental review and found to be in reasonable condition with few sections experiencing significant active erosion. The tributaries to the Hyland watercourse are the primary watercourses. Downstream of the NCP area, Highland Creek has a direct tie into the Serpentine River.

Existing Flow Rates

The existing flow rates for the catchment area have been defined in the Hyland Master Drainage Plan for subcatchments tributary to Hyland watercourse. The southern sections of the catchment have been included in the computer model for the study area.

4.3 Future Drainage System

Proposed Future Land Use

The future land uses are based on the proposed NCP.

The existing land use for the area, which consists of rural and suburban properties, has an overall impervious ratio of the range of 20%. The proposed land use changes will increase the impervious ratio for the NCP area to the 55% range. The increase in imperviousness will result in increased runoff.

Mitigative Options

An evaluation of the available Best Management Practices (BMPs) has been made. The primary objectives for these BMPs are to provide peak flow control as well as suspended solid and sediment removal. The catchment areas for the proposed structures are relatively large. The topography of the area limits the placement of structures with larger tributary areas requiring the structures to be located near the bottom of the catchment areas.

The most appropriate BMP to meet the desired objectives while providing the greatest flexibility for location and accommodating the physical characteristics of the area are wet ponds or extended detention ponds. These are to be located off line at locations suitable to provide controlled low flows to watercourses.

In addition, as discussed in Section 4.4, additional on-site BMPs for the purpose of facilitating in-ground infiltration of stormwater runoff will be required on a development-by-development basis.

Drainage Servicing Plan

The proposed drainage servicing plan calls for a combination of pipes and ponds to convey the flows for events up to the 5-year return frequency.

Flows from events which exceed the 5-year runoff values will be conveyed by the major drainage system. This system should be designed into the final developments to ensure public safety and avoid damages, which may result.

Minor System

The minor system will consist of a series of pipes designed to convey the 5-year runoff from the catchment. The southern catchments currently have minor drainage systems in place or are currently in the process of installing it. The Eastern Pocket and the Northern Catchment have some existing minor system in the form of roadside ditches in place but are generally unserviced with storm sewers. The proposed trunk servicing is shown in ***Figure 4.1*** and will provide pipes, which will run along the existing roads south to north.

The existing system is not complete with most of the pipes located at the very bottom of the catchment. The proposed new system can be connected to the existing infrastructure where the size and condition of the existing pipe is adequate. Existing pipes that are unsuitable for the final servicing of the area will require twinning or replacement. The system will be connected to future ponds to permit low flows to pass through the ponds and then to the watercourses.

A total of nine (9) BMP structures have been identified in the Northern Catchment area. These are shown on ***Figure 4.1***. The ponds are located to attempt to provide a reasonable level of flow and pollution control. The total volume released from the catchment will not be attenuated by the ponds but peak flow volumes will be reduced by attenuation. The provision of a low flow drain to the system could extend the base flow characteristics of the watercourses.

The future detailed design of the detention structures will require consideration the following items: required storage volume, duration for discharge of stored volumes, two stage design , wetland creation, extended detention control device, pilot channels, side slopes, pond buffer, embankments, site access, maintenance, and sediment removal. In addition to the above, it is recommended that the final design performance include an allowance for continuous events which will impact the storage requirements or operation of the structure.

Table 4.1 and Table 4.2 *list the pond requirements for each subcatchment area. The tables identify the storage required and the land required to accommodate the storage, as well as to provide a buffer for landscaping, maintenance and access. The overall controlled peak flows are lower than corresponding peak predevelopment flows.*

The proposed minor system along 64 Avenue will provide a future interceptor system for flows which currently discharge directly to the watercourse. This will permit the flows to be redirected to the BMPs providing an additional water quality improvement.

Major System

During the peak period of a 100-Year event, flows will likely fill local roads entirely; flow depths of no more than 0.30 m at the gutter are desirable. Standing water at low points should not exceed 0.5 m or extend to adjacent buildings. No building should be allowed in the area flooded by the major event unless they have been specially designed with floodproofing techniques to withstand flood waters.

Velocities in overland channels must be minimized to sustainable levels.

Open watercourses will be a major component in the overland flow path. The occurrence of infrequent major flows will not have a significant impact on the drainage system as the peak flows will be of short duration. Leave strips and vegetation strips provide additional protection to surrounding properties by ensuring that flows remain contained within predefined areas.

The watercourse floodplains should be kept clear of any significant structures or major obstructions to the 1:100-year overland path.

POND	CONTRIBUTING AREA	PRE-DEVELOPMENT FLOWS (5-YEARS)	Design Flow	Qpeak	STORAGE VOLUME		Qmax.	Recommended
			50% of 2YR Qpeak UNCONT.	5YR UNCONT.	STORAGE = 200 m^3/ha	ROUTE RESERVOIR	CONTROL 5YR	LAND AREA REQ'D
	(ha)	(m^3/s)	(m^3/s)	(m^3/s)	(ha.m)	(ha.m)	(m^3/s)	(ha)
P1A	47.04	0.84	0.35	1.05	0.94	0.53	0.72	0.69
P1B	12.20	0.10	0.09	0.22	0.25	0.19	0.10	0.54
P1C	16.35	0.07	0.03	0.22	0.33	0.11	0.21	0.29
P2	61.62	1.10	n/a	n/a	n/a	n/a	n/a	n/a
P4	31.02	0.26	0.20	0.66	0.62	0.54	0.22	1.17
P5	34.70	0.29	0.20	0.70	0.69	0.60	0.23	0.80
P6	30.85	0.26	0.16	0.60	0.62	0.52	0.19	0.83
P7	49.53	0.45	0.34	1.05	1.00	0.88	0.38	1.49
P8	81.94	0.75	0.59	1.80	1.64	1.55	0.64	1.94
TOTAL	365.25	4.12	1.96	6.30	6.09	4.92	2.69	7.75

Notes:
1. Storage volume: 200 m^3/ha is based on City's Interim Criteria; 'Route Reservoir' storage is based on 'OTTHYMO' analysis.
2. At site P2, storage is not computed since the upstream area is fully developed with local SWM facilities.
3. Pond P12 eliminated; Contributing areas and land requirements for P7 & P8 increased.
4. Pond control rates for P1C balanced with outflow rates for P1A and P1B to optimize total system performance.

Table 4.1

Peak Pond Flow and Pond Storage Summary

For 5-Year Design Storm

Reid Crowther

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STAGE	P1A				P1B				P1C				P2		P4			
(m)	Area (ha)	Length (m)	Width (m)	Storage (m^3)	Area (ha)	Length (m)	Width (m)	Storage (m^3)	Area (ha)	Length (m)	Width (m)	Storage (m^3)	Area (ha)	Storage (m^3)	Area (ha)	Length (m)	Width (m)	Storage (m^3)
0.00	0.13	61.51	20.50	0	0.02	25.87	8.62	0	0.02	23.38	7.79	0	n/a	n/a	0.15	66.61	22.20	0
0.50	0.19	68.51	27.50	786	0.05	32.87	15.62	184	0.04	30.38	14.79	158	n/a	n/a	0.21	73.61	29.20	907
1.00	0.26	75.51	34.50	1909	0.09	39.87	22.62	538	0.08	37.38	21.79	474	n/a	n/a	0.29	80.61	36.20	2174
1.50	0.34	82.51	41.50	3417	0.14	46.87	29.62	1111	0.13	44.38	28.79	997	n/a	n/a	0.38	87.61	43.20	3850
2.00	0.43	89.51	48.50	5358	0.20	53.87	36.62	1951	0.18	51.38	35.79	1776	n/a	n/a	0.48	94.61	50.20	5984
2.50	0.54	96.51	55.50	7783	0.27	60.87	43.62	3108	0.25	58.38	42.79	2860	n/a	n/a	0.58	101.61	57.20	8625
3.00	0.65	103.51	62.50	10740	0.34	67.87	50.62	4631	0.33	65.38	49.79	4299	n/a	n/a	0.70	108.61	64.20	11822

STAGE	P5				P6				P7				P8			
(m)	Area (ha)	Length (m)	Width (m)	Storage (m^3)	Area (ha)	Length (m)	Width (m)	Storage (m^3)	Area (ha)	Length (m)	Width (m)	Storage (m^3)	Area (ha)	Length (m)	Width (m)	Storage (m^3)
0.00	0.16	68.52	22.84	0	0.11	57.75	19.25	0	0.27	90.00	30.00	0	0.61	135.28	45.09	0
0.50	0.23	75.52	29.84	955	0.17	64.75	26.25	703	0.36	97.00	37.00	1572	0.74	142.28	52.09	3378
1.00	0.30	82.52	36.84	2278	0.24	71.75	33.25	1724	0.46	104.00	44.00	3614	0.88	149.28	59.09	7436
1.50	0.39	89.52	43.84	4019	0.32	78.75	40.25	3113	0.57	111.00	51.00	6173	1.03	156.28	66.09	12224
2.00	0.49	96.52	50.84	6227	0.41	85.75	47.25	4918	0.68	118.00	58.00	9299	1.19	163.28	73.09	17789
2.50	0.60	103.52	57.84	8950	0.50	92.75	54.25	7189	0.81	125.00	65.00	13041	1.36	170.28	80.09	24182
3.00	0.72	110.52	64.84	12239	0.61	99.75	61.25	9974	0.95	132.00	72.00	17449	1.54	177.28	87.09	31452

Note: These preliminary sizes are based on a rectangular shape geometry (in plan) with length three times the width and side slopes of 7:horizontal to 1:vertical.
During next stages of the design process, the locations, shapes and configurations of these ponds have to be further refind to satisfy site specific conditions.

Table 4.2
Stage versus Minimum Area / Storage Pond Data

4.4 Hydrogeological Assessment

Background

Reid Crowther & Partners Ltd. (RCPL), as part of their storm drainage assessment work on this project, retained Piteau Associates Engineering Ltd. (PAEL) to carry out a study of groundwater in the Study Area. The following is a summary of their findings.

The principal focus of this groundwater study was to address concerns raised by the Federal Department of Fisheries and Oceans (DFO) and the BC Ministry of Environment, Lands and Parks (MoELP) that urbanization of the Study Area would result in reduced watercourse flows in the late summer dry period (baseflows), which in turn could result in a loss of fish habitat.

Baseflow reduction is a consequence of either one or a combination of the following processes:

1) Covering over the groundwater recharge areas or compacting surface soils and making them less permeable.

2) Changing the shape of the ground surface (such as filling in hollows and digging ditches), decreasing opportunities for infiltration to the groundwater.

3) Intercepting shallow groundwater flow and diverting it into nearby surface drainage channels.

If it can be demonstrated that the reduction in baseflow could be significant enough to reduce water levels in streams during dry periods, then as a precautionary measure, mitigative measures must be implemented at source to maximize soil infiltration rates where practically possible.

Findings

As a point of reference, the Study Area can be divided into four topographic regions; Southern Escarpment, Uplands, Northern Flank, and Hyland Lowlands (see ***Figure 4.2***). As the southern escarpment does not contribute to Hyland Creek it is not considered in any detail in this study.

The northern portion of the Uplands area includes the upper limits of Hyland Creek Catchment areas No. 3, 4, and 5 and overlies the groundwater divide. The area north of this divide is of great significance as it lies within the area where water infiltrates into the ground and some of which will eventually flow to Hyland Creek.

The Northern Flank area includes some groundwater recharge zones as well as some discharge zones, including many springs and areas where wells have artesian heads.

In the Hyland Lowland area (shown on ***Figure 4.2***), the ground slopes are gentler than in the other areas and ranges from 1% to 3%. Most of the springs and artesian wells are located in this area and while some recharge does occur, the amount is relatively small in comparison to the Upland and Northern Flank Areas. For this reason the necessity for ensuring recharge of rainfall in the lowland area is not critical.

The Study Area is underlain primarily by moderately low permeability glaciomarine silty clays, with occasional sand or gravel interbeds, vertical jointing and thin sand seams. Groundwater recharge for the local groundwater system comes from infiltration of precipitation or and surface water runoff in the upland and Northern Flank regions. No detailed hydrogeological studies have been performed of deep ground water flow systems underlying the South Newton area. However, based on evidence gathered and seepage calculations performed for this study it is concluded that this unit has sufficient inter-connected sand beds to support an active groundwater flow system.

The predicted average base flow rate for these significant catchments are 1.7, 3.4, and 10.3 ℓ/s, respectively for a total contribution of about 15.4 ℓ/s, which represents about 37% of the baseflow in Hyland Creek.

Development of the remainder of the study area outside the principal recharge areas (***Figure 4.2)*** will involve removing the existing tree cover, constructing roads, driveways, and housing with relatively impervious surfaces and installing surface and subsurface drainage systems to control the increased surface storm runoff from the area. Unless precautions are taken, these activities will result in a reduction of water infiltration to the ground which could cause a lowering of the water table and/or a more rapid movement of groundwater. Infiltration calculations carried out as part of this study have shown that if the development proceeded using conventional construction techniques, there could result in up to a 50% reduction of base flow into Hyland watercourse (i.e., a flow loss of about 8 ℓ/s).

Interviews with long term residents in the area has lead to the conclusion that there has been some reduction of creek baseflows in and spring flows over the past 30 years. However, as no flow or groundwater level information is available we do not have definitive evidence of a substantial reduction in base flow that can directly be attributed to land development.

Recommendations

In order to lessen the potential for reduction of Hyland Creek baseflows below its current flow regime, it is recommended that the City encourage measures to promote infiltration of rainwater runoff in the principal recharge areas, shown on ***Figure 4.2***.

Construction of pavements and roofs will reduce the amount of water infiltrating into the ground, and hence infiltration systems will be required to mitigate this loss. These measures could

include modified stormwater pipe networks to promote infiltration of water into the sand bedding around the pipes, constructing seepage trenches or dry wells to accept run off from parking lots and around buildings, and inclusion of infiltration ponds or sand drains on public lands such as parks and school play grounds. As the underlying soils are relatively impermeable and infiltration systems could cause localized high water table conditions, it will be important to utilize systems that disperse infiltration water over as wide an area as is practicable.

It is recommended that by installing mitigative systems, development will not lead to further reduction in existing rates of infiltration. This requirement could be administered in a similar manner to the requirement that peak surface runoff will not exceed the pre-development flow rate.

It is important to recognize that enhancement of infiltration into the ground is not a substitute for control of stormwater runoff. The estimated supplementary infiltration flow required is 0.008 m^3/s, which is small when compared to the anticipated stormwater peak flows of several cubic meters per second, from the study area.

4.5 Conclusions

a) The proposed ongoing urbanization in this South Newton NCP area will increase the rainfall related runoff flow volumes and flow rates. Also, the opportunity for pollutants and sediments to reach receiving watercourses also will increase. The loss of infiltration areas to pavement and roofs will may reduce the base flows by altering the groundwater recharge process in the area. These in turn will adversely impact the physical integrity of the watercourses and their supportive role as a habitat for the aquatic/wildlife as identified in the environmental assessment of the watercourses. Thus the proper management of rainfall related runoff as well as in-ground infiltration are critical for the future sustenance of the watercourses and the associated aquatic/wild life.

b) Using a comprehensive urban drainage planning approach to implement mitigative measures such as effective area-wide stormwater management practices and the adoption of "Best Management Practices" on all developing lots to promote in-ground infiltration can reduce the impact of urbanization.

c) Stormwater storage facilities are a central component of the storm drainage management plan. The siting of these community facilities depend heavily on local topography, drainage patterns and gravity drainage. Therefore, the reserving of appropriate sites prior to development as in ***Figure 4.1*** for these facilities on a watershed basis is needed to minimize land use conflicts.

4.6 Recommendations

a) The proposed stormwater servicing scheme including the extended wet ponds is developed as a servicing concept to provide both discharge control and silt reduction associated with the runoff from urban areas. It is recommended that the scheme in ***Figure 4.1*** be adopted as part of the land use plan.

b) The early protection of the low flow channels, the flood plains, leave strips and the riparian vegetation along and in the upper reaches of all the identified watercourses within the watershed is recommended as an integral component of the storm drainage management plan for the area.

The required administrative measures such as registering of covenants or right of ways and/or approval of bylaws should be completed at the earliest opportunity to prevent encroachments into these environmentally sensitive areas by land owners adjoining the watercourses.

c) To encourage developers to modify their construction practices to watercourses, particularly the Archibald Creek sub-basin and the creek east of 144 Street.

A two-pronged precautionary approach to minimizing baseflow reduction is recommended. This would include promoting the voluntary construction of groundwater infiltration systems to reduce storm runoff and monitoring of baseflows and groundwater levels during the dry season at selected sites. If properly implemented in selected areas, a few year of monitoring data will enable the development of a database of hydrogeologic information prior to, during, and following urban development in the City. This information will be of considerable value when planning future development in the Hyland Creek Basin, and many other hydrogeologically similar areas in Surrey.

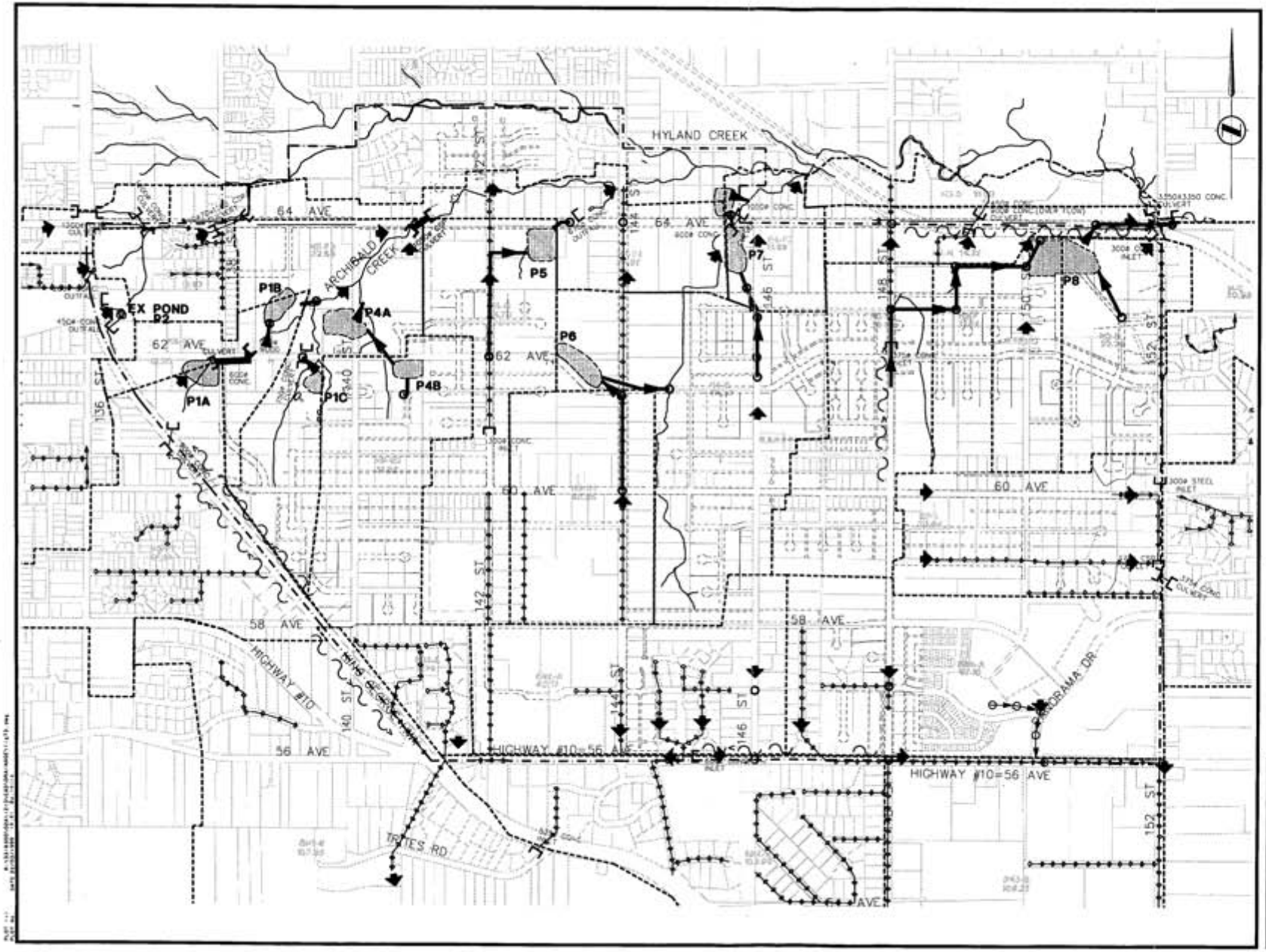
Consideration should be given to the city implementing and monitoring the performance of a demonstration development project that has been designed to maximize surface water infiltration into the ground.

d) The proposed stormwater pond lands must be controlled by the City prior to development in any given drainage Sub-Catchment Area.

e) The detailed hydrologic/hydraulic operation design of the proposed pond storage facilities should be continued with continuous modeling of the facilities to account for the multiple storm events.

f) The final and functional design of these storage facilities should incorporate recreational and other compatible uses which enhance the surrounding areas and provide residents with multi-use community facilities.

g) All culvert facilities along Archibald Creek be upgraded to provide for future projected 1:100-year major system requirements, and the creek restored as an open watercourse between King George Highway and 64 Avenue as a creek enhancement project.



Project:

City of Surrey

South Newton Neighbourhood Concept Plan

LEGEND

- PROPOSED TRUNK STORM SEWER
- PROPOSED STORMWATER RETENTION POND
- CULVERT UPGRADE
- STORM CATCHMENT BOUNDARIES
- SUBCATCHMENT NAME
- SUBCATCHMENT AREA (ha)
- OVERLAND FLOW
- EXISTING STORM SEWER
- EXISTING CULVERT OR INLET/OUTLET
- EXISTING DITCH
- EXISTING WATERCOURSE
- NCP BOUNDARY

Reid Crowther

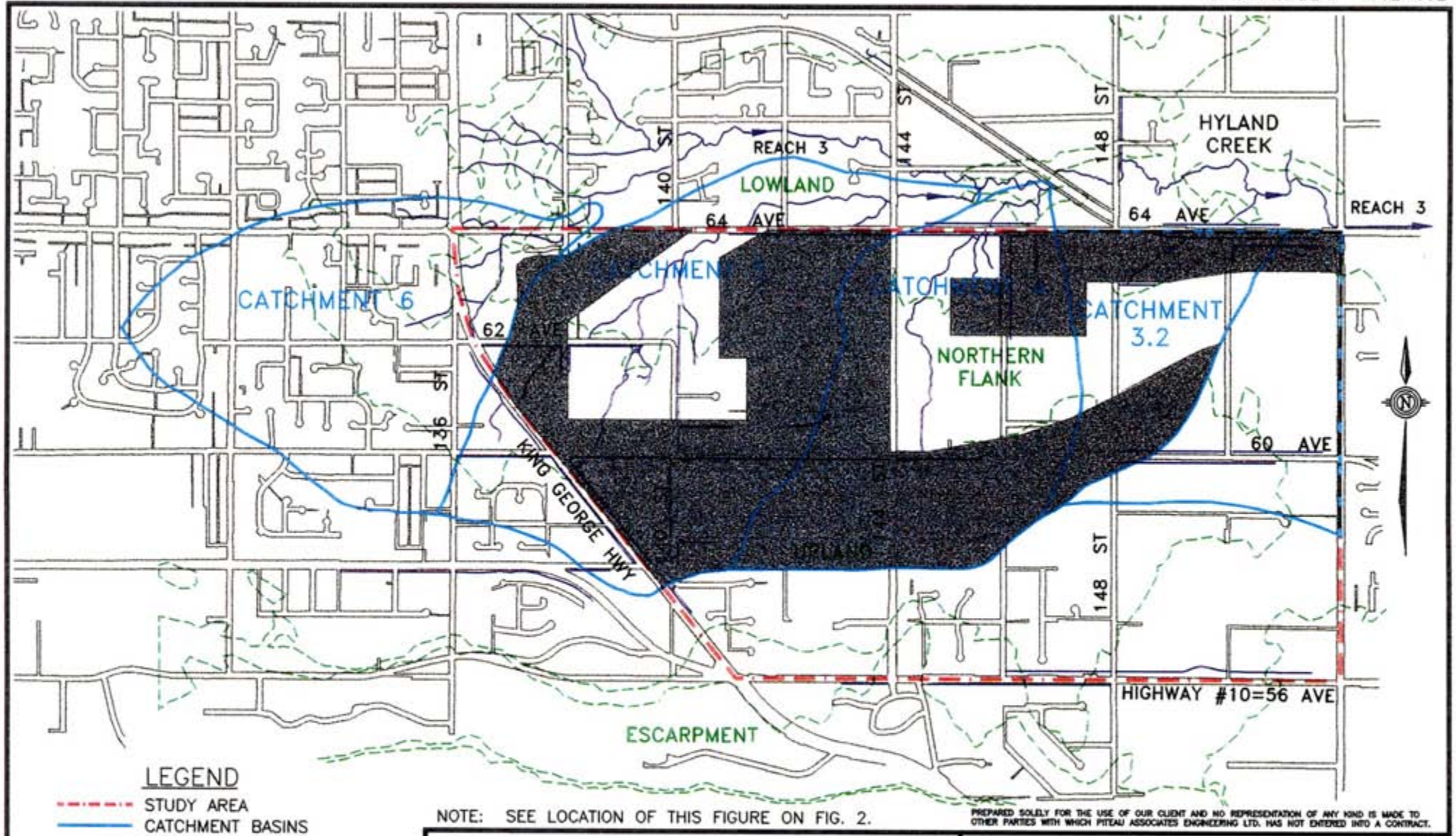
Title:

City of Surrey

Figure 4.1

Proposed Storm Drainage System

DWG. NUMBER: 1602-002



NOTE: SEE LOCATION OF THIS FIGURE ON FIG. 2.

REID CROWTHER & PARTNERS LTD.

PITEAU ASSOCIATES
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

HYDROGEOLOGICAL ASSESSMENT OF SOUTH NEWTON AREA, SURREY, B.C.

STUDY AREA

BY: RAD/AB

DATE: NOV. 96

Figure 4.2

5.0 TRANSPORTATION

5.1 Background

The transportation planning component of the Engineering Servicing Plan was developed between the fall of 1995 and the spring of 1996. The following formal reports were submitted to the City of Surrey for review and comment:

"South Newton Generalized NCP: Transportation Planning Technical Memo No.1", May, 1996

- Data Collection and Review
- Issues, Opportunities, Constraints and Objectives
- Evaluation of Generalized Land Use Concepts
- Generalized NCP Road Network Recommendations

South Newton NCP Stage 2: Traffic Impact Study Final Reports, March 27, 1998

- Base Conditions
- Future Conditions Without South Newton Development
- Impact of South Newton Development
- Modifications to the 10-Year Servicing Plan
- Modification to the GNCP

Since March, 1998, the South Newton Land Use Plan was refined and updated, incorporating many of the recommendations identified in these two reports.

5.2 Analysis

The focus of the transportation planning analysis was conducted as part of the Traffic Impact Study, utilizing the land use, population and employment projections for the South Newton area in March, 1997. The methodology for the analysis was consistent with the Institute of Transportation Engineers Recommended Practice for Site Impact Studies. A 10-year time horizon was chosen in order to identify those road network improvements required for inclusion in the City's 10-Year Servicing Plan to support the projected 10-year growth of the South Newton area. Ten year-growth projections were provided by the City of Surrey Planning Department for the analysis.

The following sections describe in detail the final recommendations related to transportation servicing in South Newton.

5.3 Road Hierarchy Recommendations

The recommended road hierarchy for the south Newton Land Use Plan is shown on ***Figure 5.1.*** Elements of this plan are summarized below:

- **Provincial Highways:**
  - King George Highway (ultimate 4 lanes, with access restrictions, plus two exclusive transit lanes. To become a Surrey Arterial in April, 1999)
  - Highway 10 (ultimate 4 lanes, with access restrictions).
- **Arterials (ultimate 4 lanes, no parking):**
  - 64 Avenue
  - 144 Street
  - 148 Street (designation as an Arterial is required for access control due to steep grades)
  - 152 Street
- **Major Collectors (ultimate 2 lanes with parking)**
  - 142 Street
  - 60 Avenue
  - 57 Avenue, 142 to 144 Street, and 148 Street to Panorama Ring Road
  - Panorama Ring Road (currently designated Arterial on June, 1993 R-91 Plan)
- **Through Locals (ultimate 2 lanes, with parking)**

  These roads are considered through local roads important for neighbourhood circulation
  - 58 Avenue from 148 Street to Panorama Ring Road (currently designated Major Collector on June, 1993 R-91 Plan)
  - 62/62 A Avenue from 138 Street to 152 Street
  - 146 Street from 64 Avenue to 58 Avenue
  - 150 Street from 62 Avenue to 58 Avenue

Right-of-Way Dedication Recommendations

The City of Surrey's Subdivision Bylaw and Standard Construction Drawings (SCD) specify roadway dedications and design specifications for various types of road network elements, which are influenced by adjacent land uses. For the Major Road Network elements, the Arterial and Major Collector roads, it is recommended to follow the dedication and design requirements indicated in the Subdivision Bylaw and SCD. For the local road elements, new Through Local and Limited Local Roads standards are in effect.

5.2 Access to Arterials

Traffic Controls on Access

In order to ensure safe movements on/off Arterial Roads, it is recommended that:

- the access to 146 Street at Highway 10 be planned for ultimate right-in/right-out operation
- the access to King George Highway to 62 Avenue be planned for ultimate right-in/out operation

Vertical Alignment Issues

Based on a review of as-built roadway drawings for the main roads (Highways/ Arterials/Collectors) within and abutting South Newton, we note the following issues related to vertical alignment:

- Improvements have been undertaken on all perimeter Arterials, so maximum grades are currently less than 8.3%;
- Collector and Arterial roads accessing these boundary Arterials with steep unimproved approach grades include 148 Street at Highway 10 and 60 Avenue at 152 Street; both of these streets have 8% approach grades to the intersections. Special grading and strict access control will be required in these approach sections to ensure safe operation;

Access Control on 148 Street

In the Stage I South Newton Generalized Neighbourhood Concept Plan (GNCP) Transportation Planning Report, it was considered that the designation of 148 Street designation be changed to Major Collector, from Arterial. This consideration was based on:

- the lack of continuity of 148 Street north of 76 Avenue and south of Highway 10;
- the designation of 148 Street north of 64 Avenue as Major Collector;
- the expected low peak hour traffic volumes anticipated on 148 Street.

This change would result in an Arterial spacing between King George Highway, 144 Street and 152 Street of 1600 m, and a Major Collector spacing of 800 m, which do not meet the City's current designation for grid road spacing for urban development. However, because of the lack of north-south continuity in the major road network in the South Newton area and the low density areas immediately to the south, we believe this spacing is adequate to handle the anticipated traffic volumes to the year 2021. The traffic projections indicate that afternoon peak hour volumes on 148 Street are expected to be in the order of 200-300 vph, which do not indicate the need for 4 travel lanes. 148 Street will never be as attractive as King George Highway, 144 Street or 152 Street due to a lack of continuity.

The vertical alignment of 148 Street does, however, require that 148 Street have very limited (or no) driveway access in sections of steep slopes. To ensure this, it is recommended that 148 Street be retained as an Arterial to control access. In this case, the functional designation of Arterial is employed to enforce what is essentially a design constraint; therefore, the Plan shows continuous rear lane access on both the east and west sides of 148 Street.

Access on 64 Avenue

The existing and planned future land uses on or adjacent to the frontage of 64 Avenue are shown on ***Table 5.1 and Table 5.2***. These tables also indicate the preferred access strategy for each land use type. (Some broad assumptions have been necessary regarding the short/long term potential for lot consolidation. Generally, if only two or three lots require consolidation to achieve a shared back access, we have assumed that back access is achievable in the short term and should be required by the City during the development process.

General observations are:

- It is recommended the City should develop road or lane back access for the entire north and south frontages in the long term through dedication during development, so the City should plan for a continuous median on 64 Avenue in the long term;

- It will be necessary for some developers to consolidate lots in the short term to obtain access; temporary access to 64 Avenue for these lots should be discouraged;

- Temporary short term access may have to be allowed for some development proposals through temporary median breaks (30% of developable frontage on south side, 70% on the north side will require temporary short term direct access) because back access will require significant lot consolidations;

- Lot consolidation in the short term should be encouraged by the City as much as possible through the development process in order to minimize temporary access points. The success of the proposed "green buffer" strip along 64 Avenue will depend on its continuity, so it

should not be interrupted by frequent driveway access. In addition, the median breaks should be minimized to enhance both drivers' and residents' visual experience. Turning traffic volumes at uncontrolled intersections should also be minimized to reduce areas of turning conflicts on 64 Avenue;

- If a temporary access point between major intersections is required, then it should be located such that a left turn bay can be safely developed; this requirement alone may necessitate the consolidation of lots and sharing of access points, even in the short term;

- It is recommended that the City stage development of raised medians along 64 Avenue in concert with the re-development of the frontage to multi-family units and the construction of back access. In the interim, access to existing single family homes should be maintained, but only where absolutely necessary and/or where residents object to right-in/right-out driveways.

Access to 152 Street

Reid Crowther reviewed the design drawings for the 152 Street widening project and checked the sight distances at the proposed 152 Street/62 Avenue unsignalized intersection in order to locate the intersection in the optimum location.

The critical sight distance situation for vehicles at the proposed 62 Avenue/152 Street intersection is for eastbound to northbound left turners, who have to cross two lanes of southbound traffic on 152 Street and merge with northbound traffic. The RTAC Manual and the TAC Urban Design Supplement specify that for a design speed of 60 km/h, left-turning passenger vehicles crossing a two lane road without a median will require sight distances of approximately 140 m in the northbound direction, and 160 m in the southbound direction, using Figure D 5.4 in the TAC Manual. Some additional sight distance must be added to these estimates, however, since 152 Street will be a four lane divided arterial road. We estimated this to be approximately 50 m, using Table D 5.2 in the TAC Manual. Therefore, approximately 190 m and 210 m of sight distance will be required in the northbound and southbound directions.

Using the vertical profile information between 60 Avenue and 64 Avenue provided on the design drawings, it appears that if the proposed intersection was located approximately between STA 1+290 and 1+330, the sight distance requirements would be very close to being met (within 20 or 30 m). This would locate the intersection approximately at the property line between 6147 and 6165 152 Street, so the burden of the road dedication could be shared equally between these land owners, or slightly offset to the South if the existing historical residence is to be saved.

While the turning sight distance requirements are not quite met, we believe this to be acceptable, given the level of accuracy of the turning sight distance calculation and the likelihood that in the long term, the intersection would be signalized and turning sight distance would not be a concern

at that time. Another option, if sight distance became a significant problem, would be to restrict this intersection to right-in/right-out operation.

Local Road Network

Comments on the local road network and access issues in the Stage I Plan (June 27, 1997 version) were provided in memos to the City of Surrey dated November 27, 1996 and July 8, 1997. Many of these comments were incorporated into the final Land Use Plan for South Surrey.

5.4 Pedestrian Linkages

We support the following pedestrian connections north of 64 Avenue, connecting 64A Avenue cul-de-sac with new loop Road;

- from the end of the existing walkway on 57A Avenue just east of Bradford Place to 142 Street (to provide linkage to Park);
- from the end of the cul-de-sac on 63 Avenue to the proposed High School;
- from 148 Street to 150 Street, along the proposed 63 Avenue alignment, or in the Buffer Zone. This will require a pedestrian/cyclist bridge crossing (and MOE approval) but a continuous east-west linkage would be formed from 150 Street to the proposed High School, so there is significant merit in this proposal;
- from the end of the 151A Street or from 61 Avenue to the new townhouse development at 60 Avenue/150 Street.

TABLE 5.1

64 AVENUE CORRIDOR: BACK ACCESS POTENTIAL
Inventory of Land Uses and Access Strategies - Southern Frontage

From	To	Frontage Distance (m)	Existing Land Use	Future Land Use	Back Access Potential for New/Redevelopment
King George Highway	136B Street	70	Surrey Public Market	Surrey Public Market	Current access is via 136B Street
137 Street	138 Street	315	Undeveloped	Park	No road access required
138 Street	140 Street	385	Single Family (SF) 0.5 to 1 acre	Park/buffer, with TH behind	Back access only possible if purchase of one of the homes on 138 Street is possible; long term plan only. Recommend temporary median break on 64 Avenue (one only); this will require consolidation of lots before development can occur
140 Street	142 Street	210	SF 0.5 to 1 acre	Park/buffer, with TH behind	Back access via lane behind TH development is recommended - possible conflict with school? Fence required
		190	SF 0.5 to 1 acre	Park/buffer with ESA behind	No direct access to 64 Avenue through Park is recommended
142 Street	144 Street	70	SF 0.5 to 1 acre	Park/buffer, with TH behind	Back access via 142 Street possible; requires no consolidation of properties.
		305	SF 0.5 to 1 acre	Park/Pond with TH behind for 150m	No back access through park/buffer recommended; consolidation of properties is possible in shorter term. Access via 144 Street preferred.
144 Street	146 Street	380	SF 0.5 to 1 acre	School/Park/ Pond	School access should be from 144 and preferably 146 Street, but this will depend on sensitivity of pond and park area. Pick-up/drop-off should not be on 64 Avenue.
146 Street	148 Street	386	Industrial	Industrial	Back access possible in long term if redevelopment occurs; in short term, access to 64 Avenue is likely required for separate developments. Recommend two-way left turn lane in this section

Total Southern Frontage (m)	**2311**
Frontage identified for future development in NCP (m)	1350
Percentage of developable frontage (excluding ESAs and current development)	58%
Amount of developable frontage with long term back access	1350
Percentage of developable frontage with long term back access	100%
Amount of developable frontage with temporary direct access required	385
Percentage of developable frontage with temporary shorter term direct access	29%

TABLE 5.2

64 AVENUE CORRIDOR: REDEVELOPMENT AND BACK ACCESS POTENTIAL
Inventory of Land Uses and Access Strategies - Northern Frontage

From	To	Frontage Distance (m)	Existing Land Use	Future Land Use	Back Access Potential for New/Redevelopment
King George Highway	138 Street	385	Undeveloped/SF	Not included in NCP boundary	Back access essential if redeveloped due to proximity of major intersection and congestion
138 Street	138B Street	95	Undeveloped/SF	Park, with ESA behind	No access to ESA necessary
138B Street	140 Street	285	Undeveloped/SF	Park/buffer, with TH behind	Access to TH should not go through park/buffer; back access possible in long term via 140 Street. Temporary median break may be necessary in short term.
140 Street	141 Street	190	Undeveloped/SF	Park/buffer, with TH behind	Access to TH should not go through park/buffer; back access possible in short term with consolidation of a few lots.
141 Street	142 Street	45	Undeveloped/SF	Single Family Urban	Access from 142 Street
		100	Undeveloped/SF	Park/buffer, with TH behind	Access via 142 Street
142 Street	144 Street	340	Undeveloped/SF	Park/buffer, with TH behind	Access to TH should not go through park/buffer; back access possible in long term via 142 Streets. Temporary median breaks may be necessary in short term.
		40	Undeveloped/SF	Commercial	Access via 144 Street
144 Street	146 Street	200	Undeveloped/SF	Park/buffer, with TH behind	Access to TH should not go through park/buffer; back access possible in long term via 142 Streets. Temporary median breaks may be necessary in short term.
		200	Undeveloped/SF	Park, with ESA behind	No access through buffer to ESA required
146 Street	148 Street	380	Various SF and Industrial Uses	Not in NCP area	Two-way left turn lane access recommended in short term as temporary direct access; long term back access possible via 65 Avenue but if land uses are industrial, traffic may not be compatible

Total Northern Frontage (m)	**1495**
Frontage identified for future development in NCP (m)	1200
Percentage of developable frontage (excluding ESAs and current development)	80%
Amount of developable frontage with long term back access	1200
Percentage of developable frontage with long term back access	100%
Amount of developable frontage with temporary direct access required	825
Percentage of developable frontage with temporary shorter term direct access	69%

South Newton - Stage 2
Neighbourhood Concept Plan
Road Classification
City of Surrey Planning & Development Department
PRELIMINARY
Date: June 24, 1999
LEGEND
South Newton NCP Boundary
Highways
Arterials
Collectors
Through Locals
Existing Local Roads / Lanes
Proposed Local Roads / Lanes
Creeks
Railway Line
Existing Signals
Proposed Signals
Utility Right-of-Ways
Right In / Right Out Only
KING GEORGE HWY
HIGHWAY #10
64 AVE
62 AVE
60 AVE
152 ST
148 ST
144 ST
142 ST
138 ST

Figure 5.1

6.0 WATER DISTRIBUTION

6.1 Background

This section outlines the water distribution servicing system improvements to provide both consumptive demands and fire flow requirements for the South Newton Neighbourhood Concept Plan.

The South Newton area receives water via a 300 mm grid main on 64 Avenue and a 450 mm feeder main on 60 Avenue, which reduces to a 350 mm feeder main east of King George Highway. The 350 mm feeder main was recently extended to 152 Street to connect the network through Intracorp site. The study area is separated into two pressure zones above and below roughly the 50 m geodetic contour: with 135 m and 90 m geodetic static heads respectively.

Current Condition

The majority of the interconnections between the 135 m and 90 m pressure zones are via older 100 mm mains that are inadequate to meet fire flow requirements under the ultimate development scenario. The flow of water from the higher pressure zone to the lower pressure zone is to be regulated by pressure reducing valves (PRVs) at selected locations. The pressure zones are physically interconnected at other locations by existing water mains although they are separated by normally closed valves. To prevent the water in the inter-connecting mains from becoming stagnant at the pressure zone boundaries, the City has a current practice of installing a minor PRV around these normally closed valves to provide a minimum flow in the connecting mains.

6.2 System Analysis

The preferred land use concept and zoning densities were used as the basis to formulate population projections for estimating domestic water needs. The total projected equivalent population used for the ultimate development condition was 19,870. For residential areas water demand was calculated on the basis of an average daily per capita allowance of 500 lpcd, a maximum day consumption of 1000 lpcd and a peak hour demand of 2000 lpcd in accordance with the City's design criteria. For all other areas such as commercial, institutional etc. the City's criteria were used as guidelines. A summary of the water demands for the projected population and respective nodes is provided in ***Table 6.1 in Appendix E.***

Existing Distribution System

A water network model of the existing distribution system was prepared using WATERWORKS to analyze the suitability of the existing system for the ultimate development condition. The basic network skeleton is shown on ***Figure 6.1***. In accordance with the City's design criteria, the available head at the source node(s) for each of the pressure zones was assumed to be 70% of the design static head (0.7 x [geodetic static head - ground elevation]).

The 90 m pressure zone is fed from the 135 m pressure zone via a PRV on the 300 mm grid main on 64 Avenue. For the purposes of our analysis the available upstream HGL at the PRV on 64 Avenue east of King George Highway (Node 51) was calculated to be 109.8 m geodetic.

The 135 m pressure zone is fed via a 350 mm feeder main on 60 Avenue (Node 50) and the available HGL was calculated to be 117.5 m just west of King George Highway.

While this was the basis of our analysis, the City's long term plan for the 90 m pressure zone involves the construction of a reservoir at 128 Street and 62 Avenue with a direct gravity feed main that will supply the lower (90 m) pressure zone.

The low pressure zone is currently fed from the pumping station at 128 Street and 62 Avenue. The construction of the reservoir and gravity feed main in conjunction with a pumping capacity increase will provide the necessary supply for the ultimate development condition in the 135 m pressure zone.

The timing of these works is projected to be sometime beyond the next 15 years.

The results of the model confirmed that for the ultimate development scenario, the existing distribution network is inadequate to meet the minimum pressure requirements of 14 m (137.30 kPa) at Max. Day plus fire and 28 m (274.60 kPa) at Peak Hourly flow without upgrading.

Proposed Distribution System

In order to service the ultimate development it was necessary to modify the existing distribution system. The existing system is insufficient to service the ultimate development condition and the inability to meet minimum pressure criteria at peak hourly flow in the vicinity of the City Hall (nodes 35, 36 and 37) and the inability to provide fire flows via the existing 100 mm mains for the proposed schools at the higher elevations of the 90 m pressure zone near the 135 m pressure zone boundary.

When the proposed system is simulated under both the peak hour and the maximum day plus fire conditions almost all of the supply comes from the source node on the 350 mm feeder main on 60 Avenue. This is because the two source nodes are in close proximity and the assumed

differential in available head between the source nodes is 7.65 m geodetic or 75 kPa. Under these assumptions the 350 mm feeder main (Node 50) will be the principle source of supply for both the 135 m and the 90 m pressure zones. The 300 mm grid main (Node 51) will function primarily as a backup source of supply for the 90 m pressure zone.

A number of simulations were undertaken for the proposed system and it was determined that if 70% of the static head pressure is available at the supply nodes, in accordance with our assumptions, there is enough pressure to meet the City of Surrey design criteria for the maximum day plus fire flow and peak hourly flow demands.

Simulation printouts are provided for the following scenarios in ***Appendix E***:

Table 6.2 -	Ultimate Development Peak Hourly Demand (460 ℓ/s)
Table 6.3 -	Ultimate Development Maximum Daily Demand (230 ℓ/s) plus Fire Flow (250 ℓ/s) at Node 7
Table 6.4 -	Summary of Results Ultimate Development Simulations
Table 6.5 -	Interim Development Peak Hourly Demand (8,000 population-190 ℓ/s)
Table 6.6 -	Interim Development Maximum Daily Demand (8,000 population-95 ℓ/s) (250 ℓ/s) at Node 7

6.3 Conclusions

a) The 90 m and 135 m pressure zones will have to be separated by means of pressure reducing valves, as shown on ***Figure 6.2***. Permanent inter-connections with normally closed valves will be provided between the pressure zones at 138 Street, 142 Street, 144 Street, 146 Street, and 148 Street to provide a redundancy in supply in the event of a line failure or other disruption in service. The current practice of installing minor PRVs at normally closed valves should be maintained at all of these locations.

b) The proposed grid and feeder main network shown on ***Figure 6.3*** meets minimum flow and pressure requirements for both the maximum day plus fire flow and peak hour design conditions for ultimate development.

c) An evaluation of the 10-year interim servicing requirements was undertaken on the basis that the South Newton NCP area will have a projected population of 8,000 with the majority of the population in the eastern half of the study area. In order to meet interim flow and pressure criteria it will be necessary to install the 300 mm grid main network from 144 Street to 152 Street, as shown in ***Figure 7.5*** over the next 10 years. The actual timing of the grid main installation will be development driven.

d) According to the City's long-range plans, offsite improvements will be required to meet long-term supply requirements for ultimate development of the 90 m and 135 m pressure zones.

6.4 Recommendations

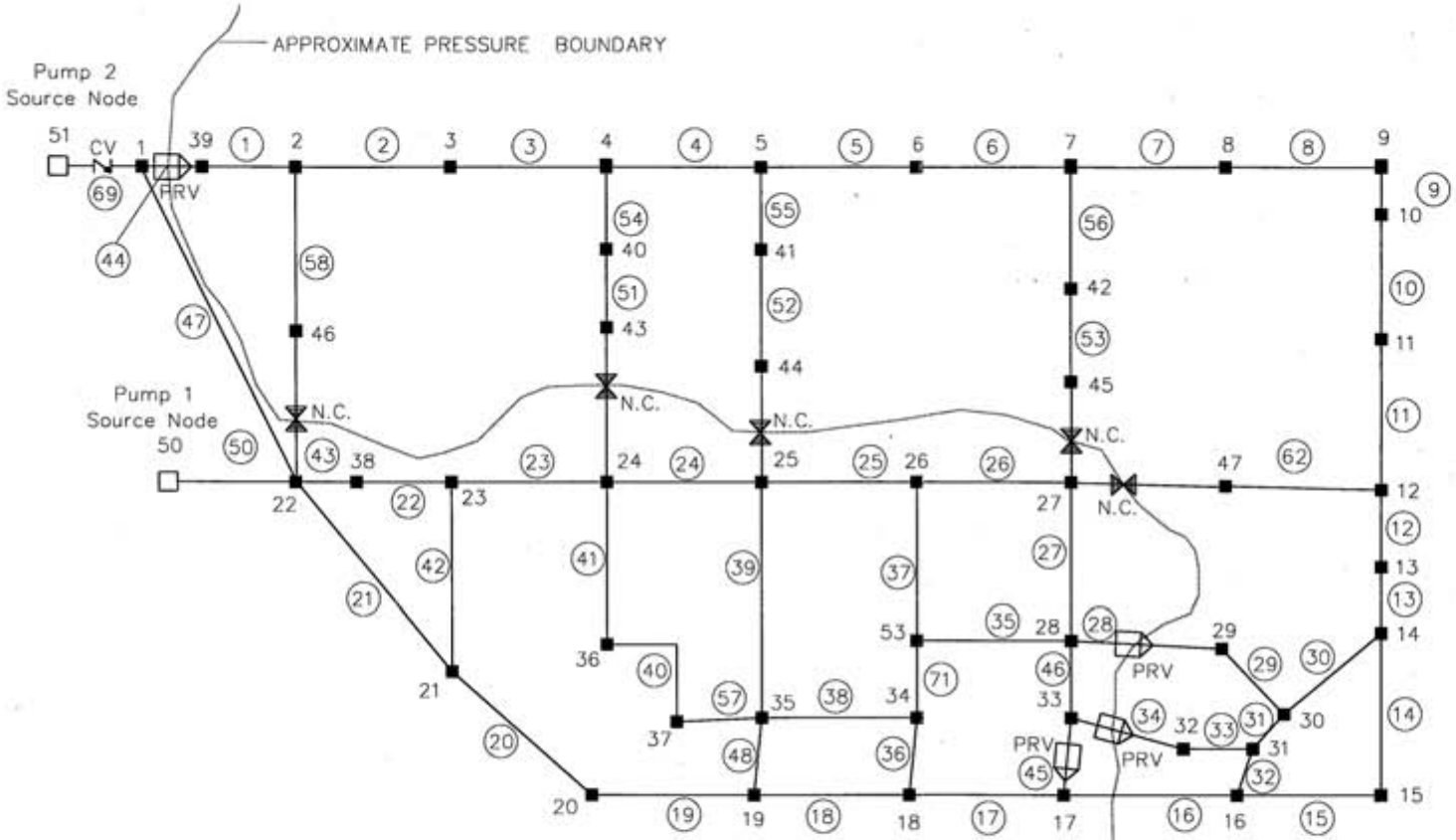
The following recommendations are made for the ultimate water distribution system:

a) Design the system for an ultimate equivalent population of 20,000 based on the recommended land use plan, and provide a minimum of 70% of static head or 117.45 m geodetic at 60 Avenue and King George Highway to service the 135 m pressure zone and 109.80 m geodetic at 64 Avenue and King George Highway to service the 90 m pressure zone;

b) Provide a grid and feeder main network, as shown on ***Figure 6.2***, and separate the pressure zones through the use of PRVs with interconnections between the pressure zones with normally closed valves and minor PRVs at 138 Street, 142 Street, 144 Street, 146 Street, and 148 Street.

c) Construct a new reservoir and gravity feed main to supply the 90 m pressure zone and increase pumping capacity at the pumping station at 128 Street and 62 Avenue to supply the ultimate development of the 135 m pressure zone. The timing of these works is projected to be beyond the next 15 years and will be development driven.

Based on the 10-year population projections, in order to meet the interim servicing requirements to the year 2006 for the proposed school sites at 150 Street and 144 Street, in the 90 m pressure zone, it will be necessary to construct the 300 ϕ grid main along 62 Avenue, from 144 Street to 152 Street, and the remainder of the proposed 300 ϕ grid mains between 144 Street and 152 Street. These will be paid for by the area developers and the need will be driven by the actual timing of development.



Pipe Number	Pipe Length (m)	Pipe Diameter (mm)	Pipe Number	Pipe Length (m)	Pipe Diameter (mm)	Pipe Number	Pipe Length (m)	Pipe Diameter (mm)
1	380	300	21	650	200	41	410	150
2	400	300	22	380	350	42	500	150
3	400	300	23	400	350	43	20	350
4	400	300	24	400	350	44	20	300
5	400	300	25	400	300	45	200	300
6	400	300	26	400	300	46	200	300
7	400	300	27	410	300	47	840	200
8	400	300	28	375	350	48	200	300
9	120	250	29	275	350	50	5	450
10	300	250	30	400	350	51	200	100
11	380	250	31	140	300	52	300	100
12	200	250	32	140	250	53	200	100
13	170	150	33	210	250	54	200	200
14	420	300	34	210	250	55	200	150
15	370	350	35	400	350	56	300	150
16	450	200	36	200	100	57	200	300
17	400	200	37	380	100	58	400	200
18	400	200	38	400	350	62	400	200
19	420	200	39	580	350	69	5	300
20	400	200	40	400	300	71	200	350

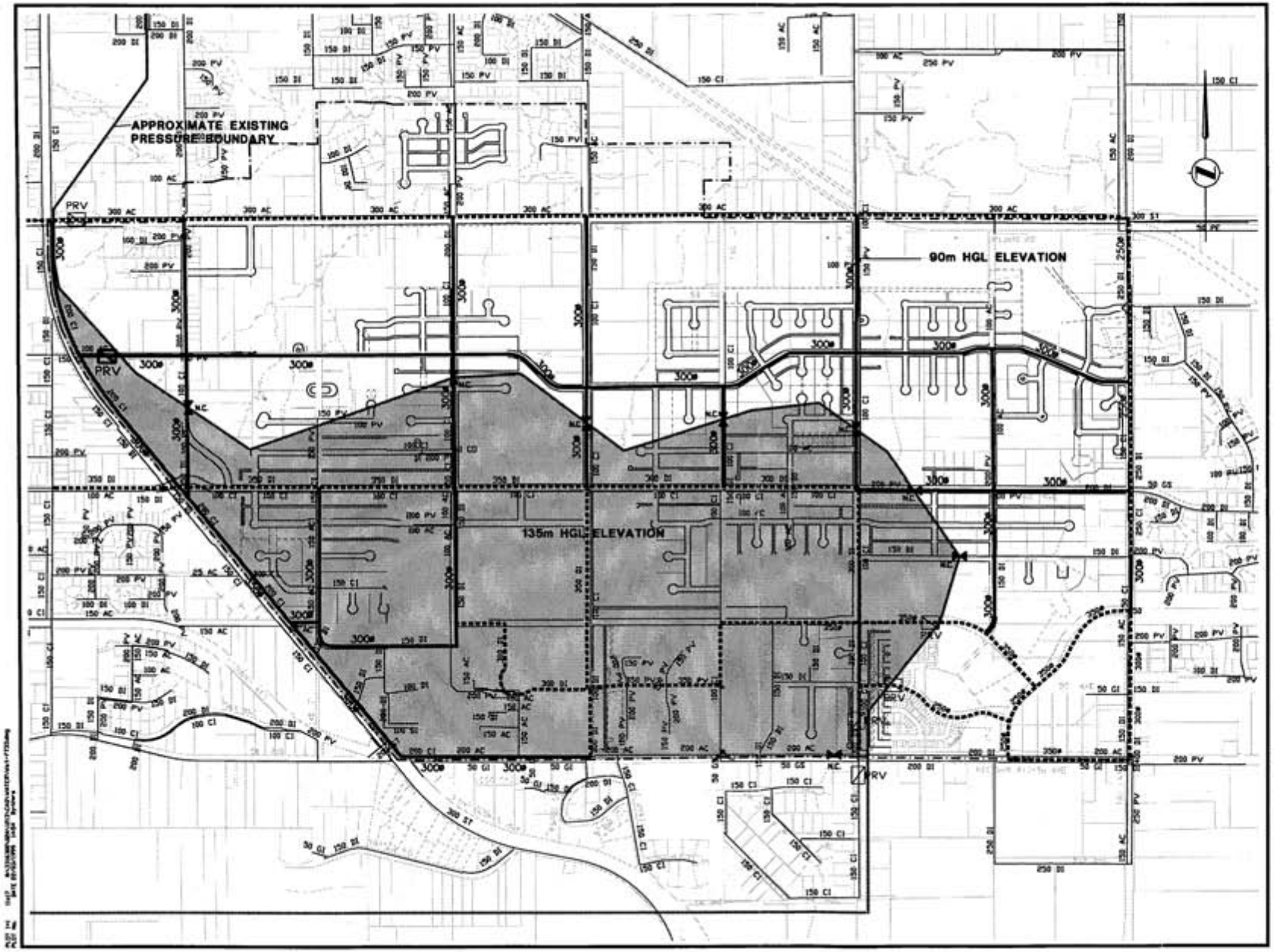
Notes:
1) PRV's located on pipes 28 and 34 are not existing but proposed as part of development in SE corner.
2) Normally closed interconnections between pressure zones were not modelled and they are shown on the schematic for clarity purposes only.

Project:
City of Surrey
South Newton Neighbourhood Concept Plan

PRV — Pressure Reducing Valve
Pump 1 — Simulated Pump At Source Node
■ 35 — Node Number
(54) — Pipe Number
CV — Check Valve
——— Existing Pipe
N.C. — Existing Valve Normally Closed

Reid Crowther

Title:
City of Surrey
Figure 6.1
Existing Network Schematic



Project:

City of Surrey

South Newton Neighbourhood Concept Plan

LEGEND

- Development Boundary (NCP)
- 150 PV — Existing Water Pipe System
- 300ø — Proposed Feeder and Grid Mains
- Approximate Pressure Boundary
- PRV — Proposed Pressure Reducing Valve
- PRV — Existing Pressure Reducing Valve
- N.C. — Proposed Valve Normally Closed
- 300 PV — Existing Feeder and Grid Mains
- High Pressure Zone (135m)

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Title:

City of Surrey

Figure 6.3

Proposed Water Grid and Feeder Main Network

7.0 INFRASTRUCTURE FINANCING

7.1 Principles

As is the case for most Neighbourhood Concept Plans (NCPs) in the City of Surrey, the following principles for engineering infrastructure financing will apply:

- The City will not finance costs for new infrastructure to serve development.
- The Development Cost Charges (DCCs) collected in the NCP must balance with or exceed required expenditures for the total build out of the NCP.

7.2 Approach

The financial analysis was based on the following approach and planning assumptions:

- Land Use Plan and population projections provided by City of Surrey Planning Department (March 1999).
- Current (February 1999) DCC rates.
- Both a build-out and 10-year planning horizon were checked to confirm that all required DCC infrastructure elements can be financed.

7.3 Density and DCC Revenue Projections

Table A in ***Appendix F*** summarizes the estimated number of units for each type of land use for the South Newton NCP. The population of South Newton is expected to increase by 15,490 with an additional 6,200 residential units.

The corresponding projected DCC revenues for the build-out of the NCP are summarized in ***Table 7.1*** below.

Table 7.1
Projected DCC Revenues

Sanitary	$5,659,000
Storm	$11,241,000
Water	$6,066,000
Collector Roads	$7,171,000

7.4 DCC Eligible Infrastructure

The NCP area servicing requirements and DCC eligible infrastructure are summarized as follows:

- **Sanitary System** – spreadsheet and schematic of Sewer DCC elements required in the NCP Area Plan for the Year 2006. (***Table 7.4 and Figure 7.4***).
- **Water System** – spreadsheet and schematic of Water DCC elements required in the NCP Area Plan for the Year 2006. (***Table 7.3 and Figure 7.3***).
- **Storm Drainage System** – spreadsheet and schematic of Drainage DCC elements required in the NCP area plan for the Year 2006. (***Table 7.5 and Figure 7.5A*** and for build-out ***Table 7.6)***
- **Collector Roads** – Summary of collector road elements required for the Year 2006 and build-out in ***Table 7.6 and Figure 7.6***.

7.5 Financial Summary

Table 7.2 provides a comparison of projected DCC revenues and expenditure requirements for the build-out of the NCP. There are sufficient DCC revenues to fund the required infrastructure.

Phases 1 to 5 (to 2006)

Utility	Projected DCC Revenue	Projected DCC Expenditures	Balance +ve (-ve)
Sanitary Sewers	$3,110,930	$1,297,000	$1,813,930
Storm	$6,018,655	$5,279,000	$739,655
Water	$3,335,119	$925,000	$2,410,119
Collector Roads	$3,825,889	$2,992,000	$833,889

Phases 1 to 11 (Full Build-Out)

Utility	Projected DCC Revenue	Projected DCC Expenditures	Balance +ve (-ve)
Sanitary Sewers	$5,658,572	$4,322,000	$1,336,572
Storm	$11,241,128	$11,026,000	$215,128
Water	$6,066,066	$3,008,000 (1)	$3,058,066 (2)
Collector Roads	$7,171,355	$6,496,000	$675,355

Note: (1) Within the NCP Area Only

(2) Contributions required to ultimate offsite supply

Table 7.2
Summary of Projected DCC Revenues and Expenditures
(10-Year Plan and Full Build-Out)

Item No.	I.D. No. - 10-Year Plan	Location	Scope (Type & Size of Works)	Notes	Total Cost	DCC Component Cost (1)	Non DCC Component Costs	Required by Year-2006	Projected Phasing Stage	New DCC Item (Y/N)	Funding Type	Part City Funded (Y/N)	Other
1.	13926	62A Ave.: 148 - 152 St.	300mm Main	This main will be an integral part of the main grid system at the NE corner of the study area.	$351,000	$ 140,000	$ 211,000	Y					
2.	13925	62A Ave.: 144 - 148 St.	300mm Main	This main will be an integral part of the main grid system at the NE corner of the study area.	$334,000	$ 134,000	$ 200,000	Y					
3.	2459	148 St.: 60A - 63A Ave.	300mm Main	This main will be used to strengthen the 300mm connections between 62 Ave. and 64 Ave. Extension of the Main to 60 Ave. (normally closed) will also serve as an emergency connection between the 90m and 135m pressure zones. Closed valves should be maintained.	$180,000	$ 72,000	$ 108,000	Y					
4.	4814	148 St.	100m - 300mm Grid Main	The pressure zone boundary is located at approximately 60A Ave. and the valve on this Main will normally be closed. Extension of the 300mm Grid Main will serve as an emergency connection between the 90m and 135m pressure zones.	$ 43,000	$ 17,000	$ 26,000	Y					
5.	642	144 St.: 60 Ave. to Hyland Rd.	300mm Main	300mm dia. at 144 St. to be placed between 60 Ave. and 64 Ave. The proposed pressure boundary runs between 60 Ave. and 62 Ave. and causes the system to be physically separated at that location by using normally closed valves.	$578,000	$(231,000) Total $140,000 Part	$ 347,000	Y					
6.	4820	146 St.: 62 Ave. - 64 Ave.	300mm Main	This Main is not planned to be part of the Main Grid Loop and a 300mm dia. Main will be provided as an emergency connection between the 90m and 135m pressure zones from 60 Ave. to 62 Ave. The Main Grid Loop will consist of 300mm dia. Grid Mains at 62 Ave., 64 Ave., 144 St., and 148 St.	$191,000	$ 29,000	$ 162,000	Y					
7.		150 St.: 58 Ave. - 62 Ave.	300mm Main	Upgrading of the existing Mains is required to strengthen the grid network in the 90m pressure zone.	$387,000	$ 155,000	$ 232,000	Y					
8.		60 Ave.: 148 St. - 152 St.	300mm Main	Upgrading of existing Mains is required to strengthen the Grid Main Network in the 90m pressure zone. Interconnection to 135m zone (with normally closed valve at 159 St.)	$344,000	$ 238,000	$ 206,000	Y					
				TOTALS		$ 925,000	$1,492,000						

Notes: (1) usually assumed to be 0.4 of total cost.

Table 7.3
10-Year Servicing Plan
Water Distribution Network

Item No.	I.D. No. - 10-Year Plan	Location	Scope (Type & Size of Works)	Notes	Total Cost	DCC Component Cost (1)	Non DCC Component Costs	Required by Year-2006	Projected Phasing Stage	New DCC Item (Y/N)	Funding Type	Part City Funded (Y/N)	Other
1.	13739	138 St. - 142 St.	375/450mm	The proposed 375/450mm diameter trunk is to be constructed. (100% DCC)	$ 1,150,000	$ 1,150,000	$ -	N					
2.	13740	142 St. - 147 St.	450/675mm	The proposed 450/675mm diameter trunk is to be constructed. $(816,000) (Part East of 144 St.) (2)	$ 1,350,000	$ 1,350,000	$ -	Part	$(659,000)				
3.	13741	148 St. - Southern Railway	750mm	The required trunk diameter is 750mm since the planned 750mm relief trunk at Hyland Rd (66 Ave. - 64 Ave.) will deliver the additional sanitary flow through 64 Ave. trunk. (Built 1998)	$ 113,000	$ 113,000	$ -	Y					
4.	13742	Southern Railway - 149 St.	750mm	The proposed 750mm diameter trunk is to be constructed.	$ 213,000	$ 213,000	$ -	Y					
5.	13743	149 St. - 151A St.	750mm	The proposed 750mm diameter trunk is to be constructed.	$ 527,000	$ 211,000	$ 316,000	Y					
6.	13744	151A St. - 152 St.	750mm	The proposed 750mm diameter trunk is to be constructed. (100% DCC)	$ 250,000	$ 100,000	$ 150,000	Y					
7.	13766	66 Ave. - 64 Ave.	750mm	The 750mm diameter relief trunk is proposed and will be constructed in 1999, as a part of 66 Ave. trunk relief.	$ 810,000	$ 810,000	$ -	N					
8.	4708	142 St.: From 62 Ave. - 64 Ave.	250mm	The proposed 250mm diameter trunk is to be constructed.	$ 143,000	$ 57,000	$ 86,000	N			O		
9.	4709	144 St.: From 60 Ave. - 64 Ave.	250mm	The proposed 250mm diameter trunk is to be constructed.	$ 286,000	$ 114,000	$ 172,000	Y			O		
10.		62 Ave.: From 138 St. - 140 St.	300mm	The proposed 300mm diameter trunk is to be constructed.	$ 150,000	$ 60,000	$ 90,000	N		Y	O		
11.		62 Ave./63 Ave.: From 140 St. - 142 St.	375/450mm	The proposed 375/450mm diameter trunk is to be constructed.	$ 260,000	$ 104,000	$ 156,000	N		Y	O		
12.		144 St.: From 63 Ave. - 64 Ave.	450mm	The proposed 450mm diameter trunk is to be constructed.	$ 99,000	$ 40,000	$ 59,000	N		Y	O		
				TOTAL		$ 4,322,000							

Note: (1) Usually 40% of total cost

(2) East of 144 St. required by 2006

Table 7.4
10-Year Servicing Plan
Sanitary Distribution Network

Trunk Item No.	I.D. No. - 10-Year Plan	Location	Scope (Type & Size of Works)	Notes	Total Cost	DCC Component Cost	Non DCC Component Costs	Required by Year	Projected Phasing Stage	New DCC Item (Y/N)	Funding Type	Part City Funded (Y/N)	Other
P8	9807	150 St. - 151 St.: South of 64 Ave.	Creation of Detention Pond (P8)		$ 2,257,000	$2,257,000	$ -	2006	3	N			
P7	9809	64 Ave.: 145 St. - 146 St.	Creation of Detention Pond (P7)		$ 1,485,000	$1,173,000 (1)	$ -	2006	4	N			
P6	11032	63 Ave.: West of 144 St.	Creation of Detention Pond (P6)		$ 942,000	$ 330,000 (1)	$ -	2006	5	N			
1.	9770	144 St.: 60 Ave. - 62 Ave.	400m - 600mm		$ 183,000	$ 64,050 (1)	$ -	2006		N			
2.	--	62 Ave: 143 St. - 145 St.	190m - 600mm		$ 110,000	$ 38,500 (1)	$ -	2006		N			
3.	--	145ASt. - 146 St.: 62 Ave. - 64 Ave.	400m - 600mm		$ 235,000	$ 186,000 (1)	$ -	2006					
4.	--	63 Ave. - 63A Ave.: West of 148 St. to 149 St.	330m - 750mm + 236m - 525mm		$ 380,000	$ 380,000	$ -	2006		Y			
5.	--	63A Ave.: West of 149 St. to 150 St.	315m - 900mm		$ 300,000	$ 300,000	$ -	2006		Y			
7.	--	151 St.: South of 63 Ave. to Pond P8	65m - 750mm		$ 50,000	$ 50,000	$ -	2006		Y			
8.	--	151 St. to 152 St.: South of 64 Ave. to 64 Ave.	300m - 1500mm		$ 500,000	$ 500,000	$ -	2006		Y			
				TOTAL		$5,278,550							

Notes: Land values for ponds assumed at $650,000/Ha.

(1) Pro-rata Basin Share of Total in Stage 1 to 5

Table 7.5
10-Year Storm Servicing Plan (1997 - 2006)
Stormwater Management System

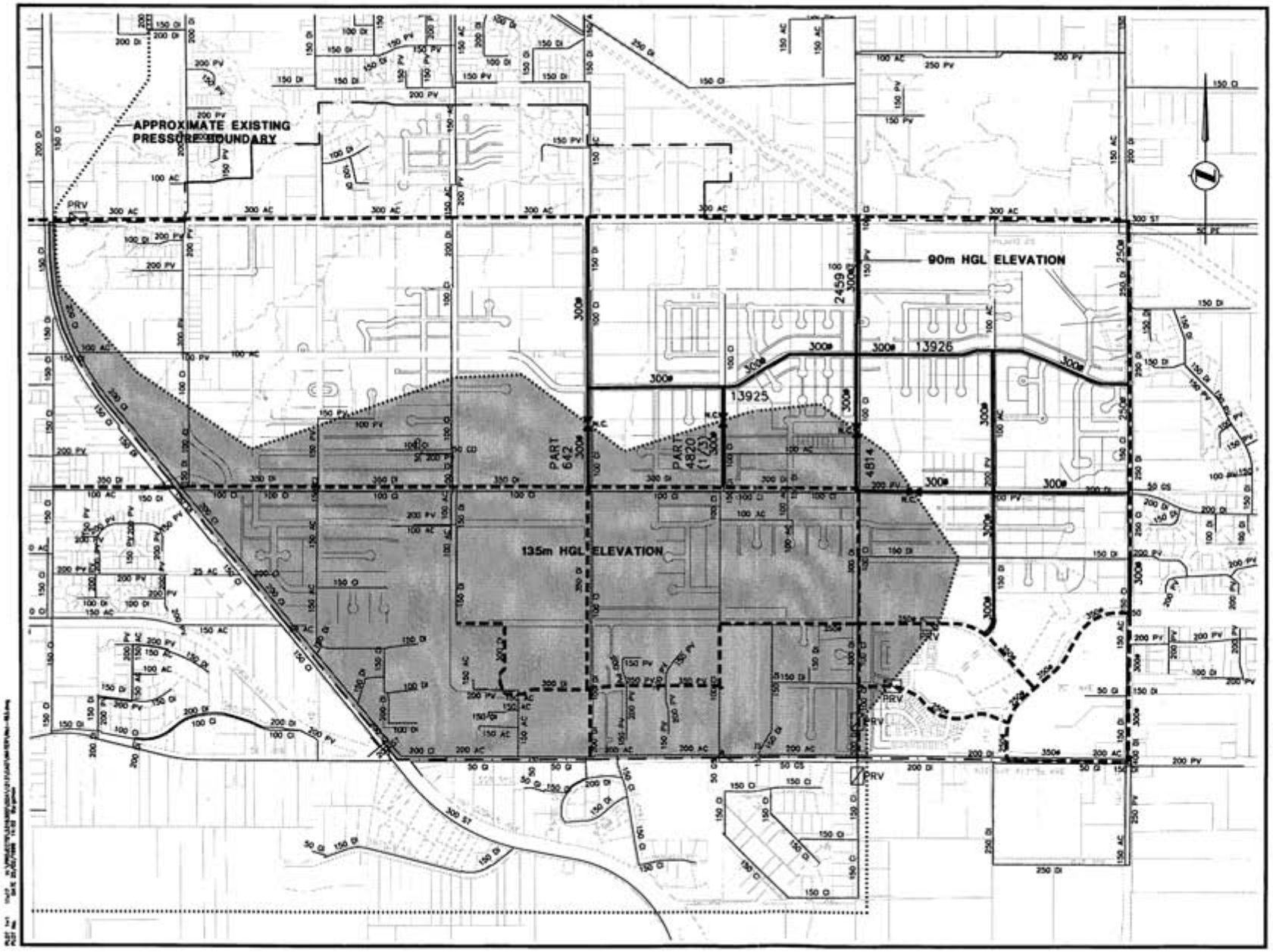
Trunk Item No.	I.D. No. - 10-Year Plan	Location	Scope (Type & Size of Works)	Notes	Total Cost	DCC Component Cost	Non DCC Component Costs	Required by Year	Projected Phasing Stage	New DCC Item (Y/N)	Funding Type	Part City Funded (Y/N)	Other
P1	9814, 11034	62 Ave.: West of 138 St.	Creation of Detention Ponds P1A, P1B and P1C at 62 Ave. and 137 St. to 139 St.		$ 2,326,000	$ 2,326,000	$ -	2003					
P4	9813, 11033	140 St.: Between 62 Ave. - 63 Ave.	Creation of Detention Ponds P4A and P4B. 61 Ave. to 63 Ave. from 140 St. to 141 St.		$ 939,000	$ 939,000	$ -						
P5	9812	143 St./64 Ave.	Creation of Detention Pond P5 at 64 Ave., West of 143 St.		$ 1,050,000	$ 1,050,000	$ -						
P6	11032	144 St./63 Ave.	Creation of Detention Pond P6 at 63 Ave. & 144 St.		$ 942,000	$ 942,000	$ -	2006					
P7	9809	64 Ave.: 145 St. - 146 St.	Creation of Detention Pond (P7)		$ 1,485,000	$ 1,485,000	$ -	2006					
P8	9807	150 St. - 151 St.: South of 64 Ave.	Creation of Detention Pond (P8)		$ 2,257,000	$ 2,257,000	$ -	2006					
1.	9770	144 St.: Lane North of 62 Ave. to South of 64 Ave.	320m - 600mm on 144 St.		$ 183,000	$ 183,000	$ -	2003					
2.	--	62 Ave.: 143 St. - 145 St.	190m - 600mm		$ 110,000	$ 110,000	$ -						
3.	--	145A St. - 146 St.: 62 Ave. - 64 Ave.	400m - 600mm		$ 235,000	$ 235,000	$ -						
4.	--	West of 148 St. - 149 St.: 63 Ave. - 63A Ave.	330m - 750mm 236m - 525mm		$ 380,000	$ 380,000	$ -						
5.	--	63A Ave.: West of 149 St. to 150 St.	315m - 900mm		$ 300,000	$ 300,000	$ -						
7.	--	151 St.: South of 63 Ave. - Pond P8	65m - 750mm		$ 50,000	$ 50,000	$ -						
8.	--	151 St. - 152 St.: South of 64 Ave. - 64 Ave.	300m - 1500mm		$ 500,000	$ 500,000	$ -						
9.	--	142 St.: 62 Ave. to 64 Ave.	320m - 600mm		$ 183,000	$ 183,000	$ -						
10.	9774	South of 62 Ave. to P4 North	150m - 600mm between Ponds P4N and P4S		$ 86,000	$ 86,000	$ -						
				TOTAL		$ 11,026,000							

Costs adjusted for land value from $650,000/ha. (February 1999)

Table 7.5A
Stormwater Infrastructure Elements at Build-Out

Item No.	I.D. No. - 10-Year Plan	Location	Scope (Type & Size of Works)	Notes	Total Cost	DCC Component Cost	Non DCC Component Costs	Required by Year	Projected Phasing Stage	New DCC Item (Y/N)	Funding Type	Part City Funded (Y/N)	Other
1.	1344	60 Ave.: 136 St. - 140 St.	Interim Major Collector Widening		$ 592,000	$ 592,000	$ -	2006		N			
2.	1348	60 Ave.: 140 St. - 144 St.	Interim Major Collector Widening		$ 600,000	$ 600,000	$ -	2006		N			
3.	1351	60 Ave.: 144 St. - 148 St.	Interim Major Collector Widening		$ 600,000	$ 600,000	$ -	2006		N			
4.	1353	60 Ave.: 148 St. - 152 St.	Interim Major Collector Widening		$ 600,000	$ 600,000	$ -	2006		N			
5.	597	142 St.: 60 Ave. - 64 Ave.	Interim Major Collector Widening		$ 600,000	$ 600,000	$ -	2006		N			
				SUBTOTAL		$2,992,000							
6.	New	58 Ave.: 142 St. - 144 St.	New Major Collector		$ 600,000	$ 600,000	$ -	2016		Y			
7.	New	142 St.: 58 Ave. - 60 Ave.	Upgrade to Ultimate		$ 260,000	$ 260,000	$ -	2016		Y			
8.	New	142 St.: 60 Ave. - 64 Ave.	Upgrade to Ultimate		$ 511,000	$ 511,000	$ -	2016		Y			
9.	New	60 Ave. at King George Hwy	New Alignment to 40 Ave.		$ 600,000	$ 600,000	$ -	2016		Y			
10.	New	60 Ave.: 40 Ave. - 44 Ave.	Upgrade to Ultimate		$ 511,000	$ 511,000	$ -	2016		Y			
11.	New	60 Ave.: 44 Ave. - 48 Ave.	Upgrade to Ultimate		$ 511,000	$ 511,000	$ -	2016		Y			
12.	New	60 Ave.: 48 Ave. - 50 Ave.	Upgrade to Ultimate		$ 511,000	$ 511,000	$ -	2016		Y			
				TOTAL		$6,496,000							

Table 7.6
Servicing Plan
Major Collector Road Requirements
(2006 and Build-Out)



Project:

City of Surrey

South Newton Neighbourhood Concept Plan

LEGEND

- Development Boundary (NCP)
- 150 PV — Existing Water Pipe System
- 300# — Proposed Feeder and Grid Mains
- Approximate Pressure Boundary
- PRV — Proposed Pressure Reducing Valve
- PRV — Existing Pressure Reducing Valve
- N.C. — Proposed Valve Normally Closed
- 300 PV — Existing Feeder and Grid Mains
- 13926 — Project ID
- High Pressure Zone (135m)

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Title:

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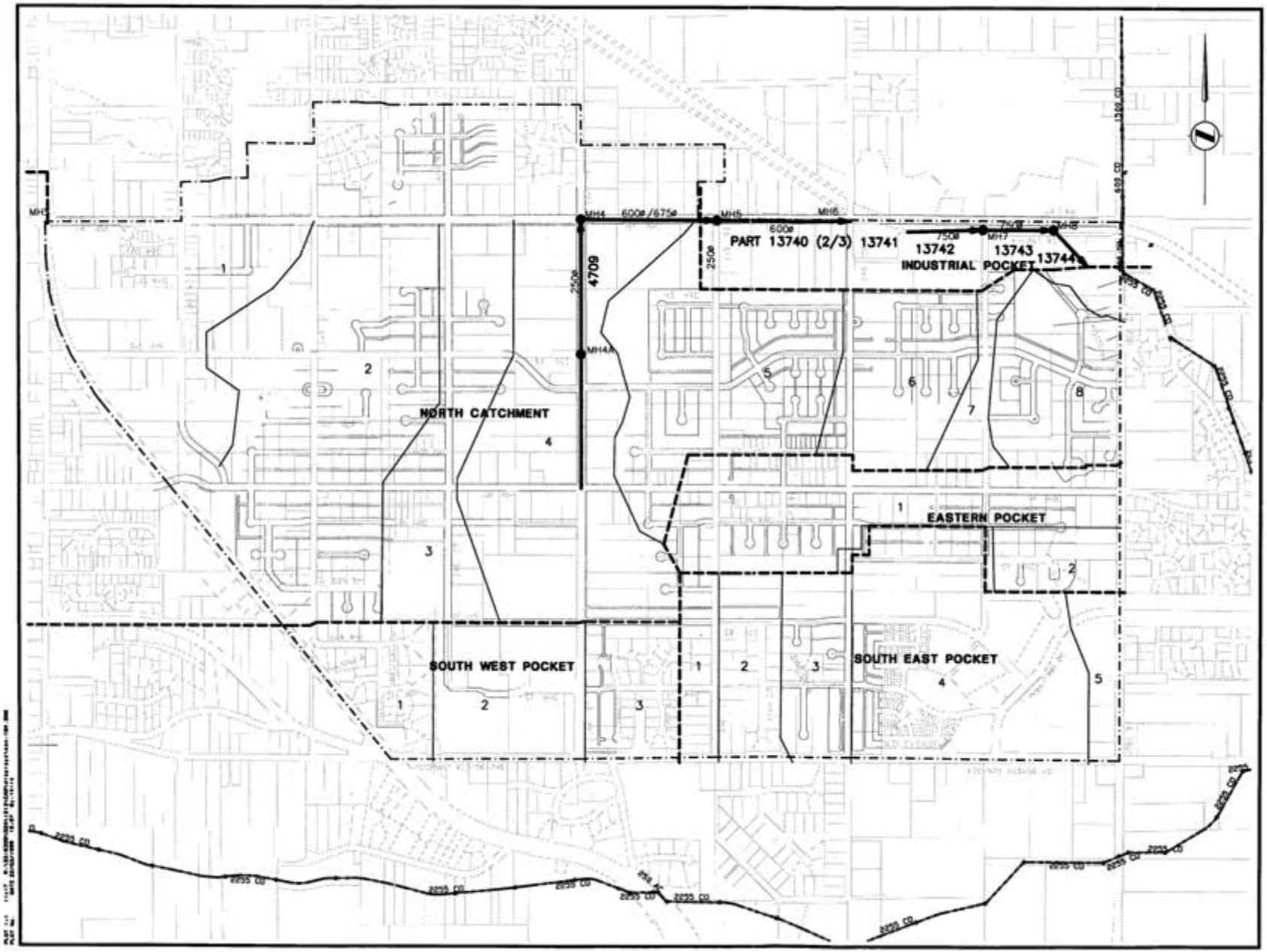
Figure 7.3

Proposed Water DCC Infrastruct. Elements



Project:

City of Surrey

South Newton Neighbourhood Concept Plan

LEGEND

- Development Boundary (NCP)
- Subcatchment Boundary
- 2250 CD Existing GVS&DD Trunk Sewer
- 300 PV Proposed Sanitary Trunk Sewer (Q=>40 l/s)
- 13740 Project ID

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Title:

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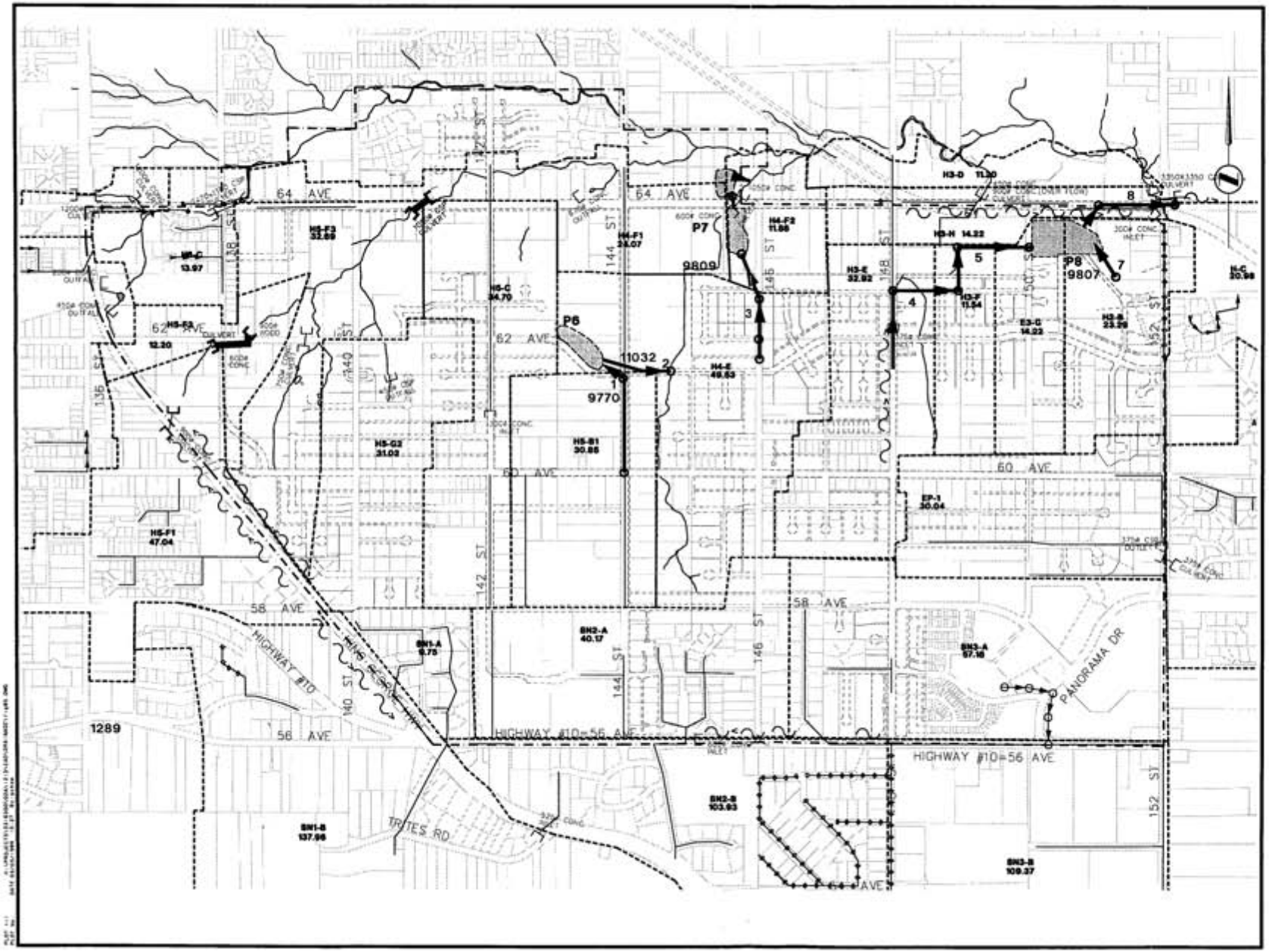
Figure 7.4

Proposed Sanitary DCC Infrastructure Elements



Project:

City of Surrey

South Newton Neighbourhood Concept Plan

LEGEND

- PROPOSED TRUNK STORM SEWER
- PROPOSED STORMWATER RETENTION POND
- CULVERT UPGRADE
- 9830 PROJECT ID
- STORM CATCHMENT BOUNDARIES
- H2-B SUBCATCHMENT NAME
- 23.29 SUBCATCHMENT AREA (ha)
- EXISTING STORM SEWER
- EXISTING CULVERT OR INLET/OUTLET
- EXISTING DITCH
- EXISTING WATERCOURSE
- NCP BOUNDARY

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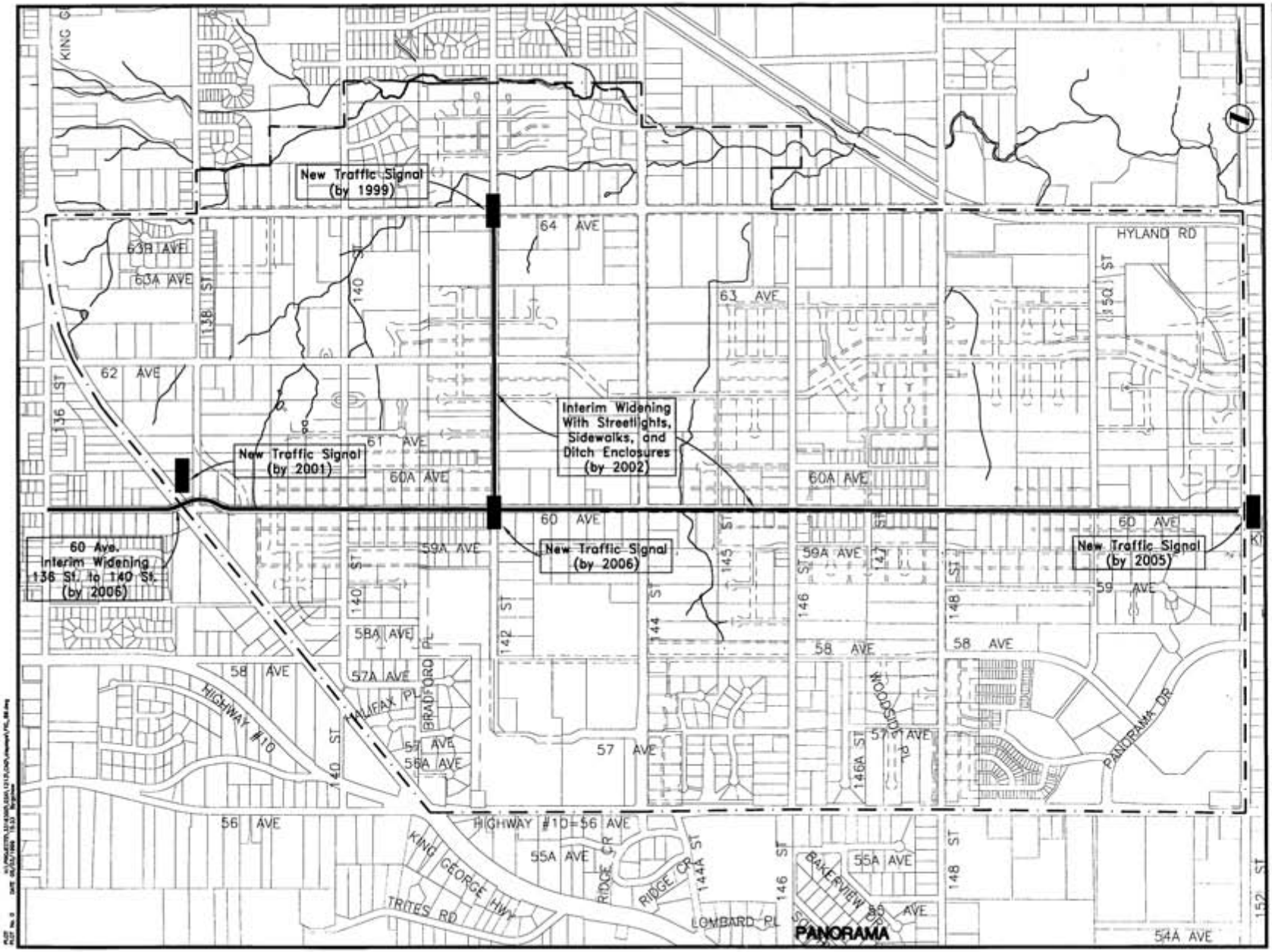
Title:

City of Surrey

Figure 7.5

Proposed Drainage DCC Infrastructure Elements



Project:

City of Surrey

South Newton Neighbourhood Concept Plan

LEGEND

- Arterial Signal Program
- Non-Arterial Widening Program
- NCP Boundary

SCALE 1:10000

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Figure 7.6

Proposed Roadway DCC Infrastructure Elements

SECTION 8.0
DEVELOPMENT IMPLEMENTATION AND STAGING

8.0 DEVELOPMENT IMPLEMENTATION AND STAGING

A Plan for the future urban development of the South Newton NCP Areas was supported by the City of Surrey council. To date, the existing NCP Area has a current residential population of about 2,000 persons and is substantially rural in nature. Pockets of existing urban development exist along the north side of Highway 10, abutting 64 Avenue in the existing Industrial Area and south west of 138 Street, and abutting Hyland Creek North of 64 Avenue.

The dominantly rural areas are presently serviced by rural roadways, surface storm drainage systems, a limited grid of water distribution mains, and individual sewage disposal systems.

8.1 Development Staging

To provide the infrastructure for the development of the approximately 6,900 residential units to accommodate an additional 15,500 population, each of the municipal trunk infrastructure elements, trunk sanitary sewers, trunk storm sewers, collector roadways, and trunk watermains will have to be upgraded to current Municipal Standards, to meet the expanded servicing demands.

Due to the existing ground topography, the NCP area is divided into a number of drainage sub-basin areas; those draining directly south across Highway #10 to the Serpentine River called the South West Pocket and the South East Pocket, the Eastern Pocket that drains east across 152 Street at 60 Avenue, and the largest areas, divided into several tributaries, draining north to 64 Avenue and Hyland Creek (***Figure 3.1***).

As there is an existing grid of trunk watermains and rural collector and arterial roads servicing the area, these infrastructure elements can be strengthened and upgraded for the new urban system demands as the area develops.

The servicing requirements of trunk sanitary sewers and stormwater detention ponds will, however, require significant financial commitment before development. Therefore, a staging plan presented which provides the most cost efficient implementation of infrastructure in the north area of the NCP.

As both Sanitary and Storm Trunk Services exist at the NCP Plan boundaries for the South West Pocket, South East Pocket, and part of the Eastern Pocket, these areas can proceed to development by providing an extension of existing trunk services.

The large northern areas tributary to Hyland Creek require the extension of the 64 Avenue trunk sanitary sewer westwards from 152 Street (***Figure 3.3***), and the provision of stormwater ponds for various sub-basins, as identified in the Stormwater Management Plan (***Figure 4.1***).

The cost of stormwater detention ponds for each sub-basin area is significant and requires lands to be acquired. It is an important principle that lands required for stormwater detention be secured on behalf of the City prior to development proceeding. This avoids the possibility of the stormwater management plan not being realized. This approach results in the initial developer purchasing the land for the detention pond, constructing the pond and ensuring the drainage system is adequate to serve the development. As other areas within the NCP proceed to develop, the City reimburses the original developer DCC funds as they are collected to the value of the capital cost of the pond.

Within limitations imposed by technical, financial, and environmental considerations, there is some flexibility as to the location of detention ponds and other trunk services. If a proponent presents an alternative-servicing scheme, it may be approved by the City providing the financing of the NCP remains unaffected and the alternative scheme is acceptable to the Engineering Department.

The following presents the most cost effective staging plan for development in the South Newton NCP, in so far as it maximizes the growth while minimizing the infrastructure financing debt.

The Planning Department have forecast a population growth of 6,000 in the South Newton NCP area before 2006. It is financially advantageous to concentrate the early stages of growth in areas requiring the least infrastructure requirements.

Figure 8.1 shows the three stages of development in the NCP. Stage A involves development where minimal or no downstream drainage facilities are required and no extension of sanitary servicing is needed. Therefore, the City can accrue a surplus of DCCs as development proceeds in Stage A.

Stage B will require extension of the sanitary trunk sewer along 64 Avenue and the provision of stormwater detention facilities.

Stage C requires the maximum extension of the sanitary trunk along 64 Avenue in addition to other stormwater detention ponds.

If development proceeds in the order of Stage A to C, the infrastructure can be financed and constructed with the minimum debt servicing costs by developers.

8.1.2 Financing Implications of Staging Development

The City of Surrey will not be controlling the sequence or rate of development in the NCP, however, in the interest of fairness and efficiency, certain rules will govern the financing of DCC related infrastructure.

As stated previously, developments in Stage A will require no DCC eligible infrastructure. Development may begin in either Stage B or Stage C, although the upfront costs in Stage C will be higher primarily due to the length of sanitary trunk sewer to be constructed. Regardless of where development initially starts a DCC front ender agreement will be required to finance the sub-basin detention pond and trunk storm sewer requirements. If a subsequent development requires a different detention pond, the City will enter into another DCC front ender agreement with the proviso that the obligations under the first agreement will be paid out before any reimbursement is made under the second agreement. In this way the market will control the sequence of development and the developers risks minimized with initial capital outlays recovered within a reasonable time frame.

8.2 Private Utilities

This section summarizes the key private utility trunk requirements, as summarized in ***Figure 8.2,*** and pose no known significant constraint to staging or development.

BC HYDRO

1. **Substation** - The Surrey Substation (SRY) is location within the plan, abutting the civic centre complex. It is planned that this facility will be retained and it may be necessary to add a transformer to this site.

2. **Transmission Lines** - The substation is fed from the north by two (2) 69 kV sub-transmission lines. Future expansion will be limited to upgrading these lines. Similarly, there is an existing 60 kV line abutting the rail tracks at 152 Street and 64 Avenue. There are no other known transmission corridors in the area.

3. **3-Phase Overhead Backbone Grid** - A 3-phase overhead "backbone grid" distribution system is required in 148 Street and 60 Avenue. Part of this already exists on 148 Street. Within Panorama, the 3-phase distribution is underground. As road widths are established and road alignments change, BC Hydro's flexibility will be constrained.

   Overall, there are no known limitations to the development or staging controls. All distribution systems will be fed from the 3-phase overhead "backbone grid".

BC TEL

They have identified two major items in the conceptual design:

1. **Underground Support Structure**

   BC Tel has an existing conduit system on 64 Avenue between King George Highway and 152 Street, also on 152 Street between 64 Avenue and Highway 10. This system will have to be reinforced to accommodate the distribution network. Examples of the additional ducts required can be seen on the first two phases of the 64 Avenue road widening project (PHI 64 Avenue - 120 Street to 128 Street, PHII 64 Avenue - 128 Street to King George Highway).

   Following the City of Surrey's underground policy, and looking at the population density of this plan, it is recommended that a backbone conduit system be installed at the onset of the project. This backbone system would be located on 144 Street - 64 Avenue to Highway 10 and 60 Avenue 152 Street to 140 Street ***(Figure 8.2)***. The cost of this backbone would be undertaken by developers. As individual projects come on line, it would become the developer's responsibility to place the conduit to the point of contact along the backbone system.

   Development of a backbone system would eliminate costs to the City for any future aerial to underground conversions.

2. **An Additional Wire Centre**

   The proposed density of this plan will exhaust the existing BC TEL facilities and would necessitate an additional wire centre. This wire centre requires a piece of property of approximately 6,000 square feet.

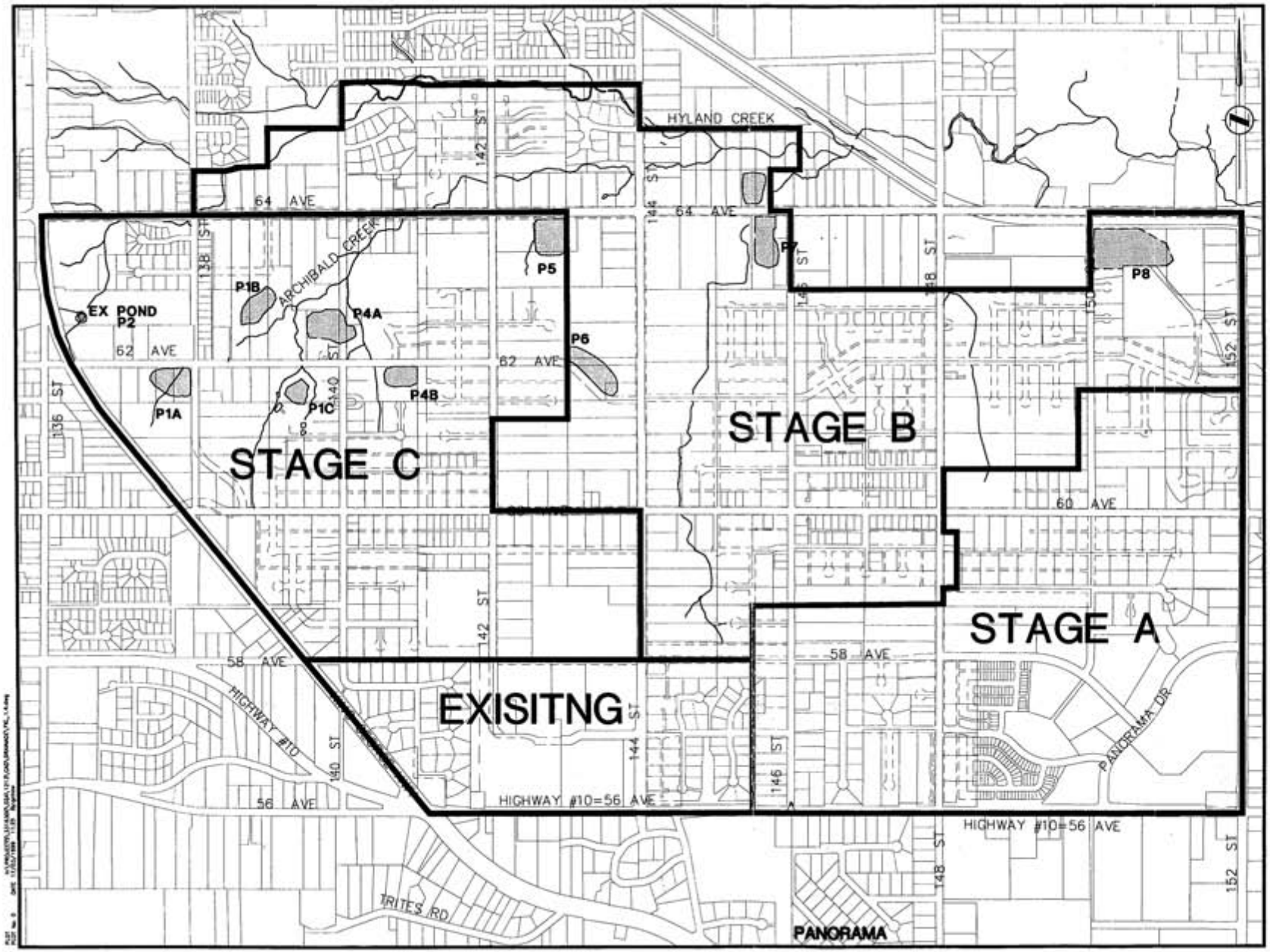
BC GAS

Gas mains required on the new road network would typically be installed as development occurs. Wherever possible, BC Gas would like to coordinate any system reinforcement of mains on existing roads with other roadwork that is required. If BC Gas's existing gas network needs to be relocated or altered to facilitate the development, be aware that the developer/municipality may be responsible for the costs.

There is a BC Gas regulating station at 64 Avenue and 152 Street fed from the I.P. trunk gas main on 152 Street.

Conclusion

Where practical utility corridors should be integrated to reduce overall costs. Consideration should be given to integrating the 144 Street and 148 Street Facilities into a single corridor.



Project:

City of Surrey

South Newton Neighbourhood Concept Plan

NOTES:
1. STAGING BOUNDARIES ARE CONCEPTUAL ONLY.
2. EACH STAGE IS EXPECTED TO TAKE SEVERAL YEARS AND OVERLAP.

SCALE 1:10000

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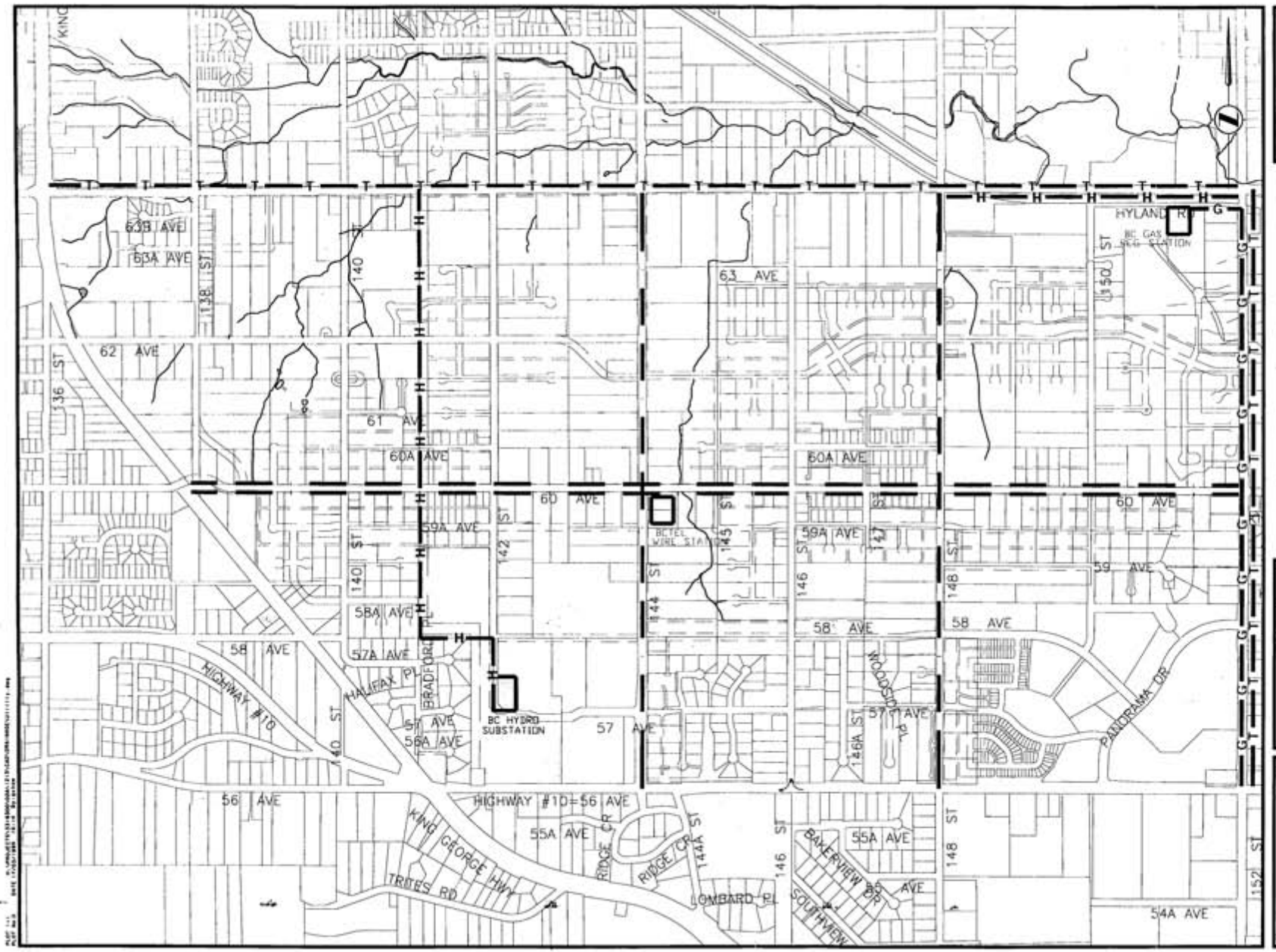
Title:

City of Surrey

Figure 8.1

Servicing Plan Stages



Project:

City of Surrey

South Newton Neighbourhood Concept Plan

LEGEND

- H — H EXISTING BC HYDRO TRUNK LINE
- FUTURE BC HYDRO TRUNK LINE
- T — T EXISTING BCTEL TRUNK LINE
- FUTURE BCTEL TRUNK LINE
- G — G EXISTING BC GAS TRUNK LINE
- FUTURE BC GAS TRUNK LINE

SCALE 1:10000

Reid Crowther

Title:

City of Surrey

Figure 8.2

Proposed Hydro, Tel, & Gas Trunk Facilities

APPENDIX A
CORPORATE REPORTS

SURREY
CITY OF PARKS

Corporate Report

NO: R 126

COUNCIL DATE: July 14/97

REGULAR COUNCIL

TO: Mayor & Council DATE: July 9, 1997

FROM: General Manager, Planning & Development
General Manager, Engineering FILE: 2350-000

SUBJECT: Amendments to Approved Neighbourhood Concept Plans (NCPs)

RECOMMENDATION

It is recommended that:

1. Proposed amendments to the approved land use, density and major road network included in approved Neighbourhood Concept Plans be subject to the procedure described in this report and be considered by City Council for approval;

2. The General Manager of Engineering and the General Manager of Planning & Development be authorized to approve minor amendments to the local road systems in approved Neighbourhood Concept Plans after considering the technical merits and input from affected property owners; and

3. The General Manager of Engineering be authorized to approve minor amendments to the watermain, sanitary and storm sewer servicing concepts included in approved Neighbourhood Concept Plans after considering the technical and practical merits of the amendment.

INTENT

The intent of this report is to seek Council's endorsement of procedural guidelines to deal with proposed amendments to approved Neighbourhood Concept Plans.

BACKGROUND

Surrey's eight approved Neighbourhood Concept Plans consist of a land use, density and circulation plan (Stage 1), a road network plan (Stage 1 & 2) and a conceptual underground services plan (Stage 2).

As development proceeds in these new neighbourhoods, as property ownership changes, and as more detailed technical information becomes available, there will be situations where minor amendments to approved Neighbourhood Concept Plans will be requested. In most cases these amendments will have minimal impact upon the strategies contained in the Neighbourhood Concept Plan. However, administrative procedures are required to ensure that proposed amendments are dealt with in a consistent and fair manner.

DISCUSSION

There will be generally three types of proposed amendments to Neighbourhood Concept Plans including: 1) changes to the land use, density or major road network (e.g. the location of a major collector), 2) changes to the local road network, and 3) changes to the servicing layouts for sanitary sewers, water distribution and storm sewers. Each has a different degree of impact upon the approved Neighbourhood Concept Plan, and each would require a different level of public consultation before implementing a change. Consequently different procedural guidelines to deal with these amendments are proposed. It is noted that all proposals would be assessed on their technical merits and benefits to the City, and not upon the relative benefits to individual property owners.

1. Major Amendment - Land Use, Density & Major Road Network

A proposed amendment may come as a request by a developer to change the approved land use, density or major road pattern. This type of request is usually the result of ownership changes within the Neighbourhood Concept Plan area (e.g. land assemblies) and the timing of development.

The proponent of a major amendment to a Neighbourhood Concept Plan should undertake a qualitative and quantitative analysis of the proposed change to the Neighbourhood Concept Plan as well as undertake an appropriate public consultation program. A report should be submitted to the Planning & Development Department and the Engineering Department outlining the results of the analysis and the public planning process. The report should contain an objective evaluation of the impact of the proposed amendment on all aspects of the Neighbourhood Concept Plan including land use, population, densities, schools, parks, impacts upon amenities, facilities and utilities, roads and transportation, and the funding of services and public amenities.

The following items should be addressed in the report and through the associated planning process:

1) The proposal should be reviewed carefully in terms of its impacts on the basic economic, social and servicing structure of the neighbourhood, and

all of the implications with respect to Surrey's Official Community Plan should be evaluated.

2) The potential impacts of the change should be evaluated in the context of the approved Neighbourhood Concept Plan and the community at large.

3) The report should contain a clear indication of the planning and/or engineering rationale to support the proposed amendment.

4) The issue of precedent and potential for additional requests for changes to the Neighbourhood Concept Plan should be evaluated.

5) Property owners within and adjacent to the Neighbourhood Concept Plan area and, if possible, the former Steering Committee members should be consulted. The most effective method of initiating this consultation would be through a public meeting.

6) A public opinion survey should be undertaken in conjunction with the first public meeting to seek the views of the public on this proposal. The appropriate methodology and questionnaire should be reviewed by the Planning & Development Department in advance of its distribution. The results of the survey should also be transmitted to the City for review.

7) City staff should attend all public meetings respecting the proposed amendment and should be kept apprised of the progression of the process.

8) All costs associated with the analysis and planning process will be incurred by the proponents and not by the City.

2. Minor Amendment - Local Road Network

This type of amendment would involve the proposed relocation of a limited collector, local road or lane, and would not affect the land use or overall density. It may, however, affect the lot or unit yield of one or more of the affected properties.

The following procedural guidelines are proposed:

1) The proponent should conduct a complete technical analysis of the proposed change, including an evaluation of the impacts upon the road network in the Neighbourhood Concept Plan area and other areas in the vicinity of the proposed amendment. This analysis should also include an evaluation of the lot/unit yields for the affected properties.

2) The report should contain a clear indication of the planning and/or engineering rationale to support the proposed amendment.

3) The proponent should contact all of the property owners affected by the amendment and achieve a certain degree of consensus among the owners regarding the proposal. The results of the consultation should be transmitted to the City.

4) The proposal must be reviewed and supported by the City's Engineering Department and other City Departments as required.

5) Depending on the nature of the amendment and the results of the process, the amendment may require Council's endorsement.

3. Minor Amendment - Underground Services

A proposed amendment may include minor changes to the underground services resulting from detailed technical information provided by consultants working for developers. These changes do not have a significant impact upon the land use or yield of developing properties, and will not affect the serviceability of any properties within the Neighbourhood Concept Plan area but may affect the timing and/or cost of servicing specific properties.

The following procedural guidelines are proposed:

1) The Engineering Department would evaluate the proposal.

2) Where significant discussions have taken place previously with the Citizen Advisory or Steering Committee regarding the specific utility requirements proposed to be amended, the Engineering Department would advise the developer to inform the owners of the properties directly affected by the proposed change by sending them a copy of the proposal and requesting input.

3) Where input is requested, the land owners would be given a specific period of time, say 2 weeks, to notify the City of any concerns.

4) The Engineering Department would review any input provided to determine if there were any technical reasons not to accept the proposed change.

CONCLUSION

Amendments to the land use, density and major road networks in approved Neighbourhood Concept Plans are considered to have a significant impact upon the neighbourhood and require considerable policy review, technical analysis and public input. These amendments would require consideration by City Council. The procedural guidelines described in this report prescribe an evaluative process for dealing with major amendments.

APPENDIX B
NCP AMENDMENTS

APPENDIX C
RELATED REPORTS (UNDER SEPARATE COVER)

APPENDIX C
RELATED REPORTS
(UNDER SEPARATE COVER)

Transportation Technical Memo #1. Reid Crowther & Partners Ltd., May 1996.

An Environmental Assessment of the South Newton NCP Area. ECL Envirowest Consultants Limited, June 1996.

Hydrogeological Assessment for the South Newton NCP. Piteau Associates Engineering Ltd., Draft July 1996.

Draft Storm Drainage Report. Reid Crowther & Partners Ltd., August 1996.

Engineering Servicing Plan Report – Stage 1. South Newton NCP. Reid Crowther & Partners Ltd., June 1997.

South Newton NCP – Stage 2. Traffic Impact Study. Reid Crowther & Partners Ltd., Final Report March 1998.

APPENDIX D
SANITARY SYSTEM

TABLE 3.1(b) - Sanitary Sewer Design Table (Option 1)

Catchment Name	Sub Basin Name/Number	Area Type	Area	Total Area	Manhole No. From	Manhole No. To	Population Density	Tributary Population	Average Daily (0.x350 l/capita/day)	Harman Peaking Factor	Peak Q	Infiltration Rate (Ext.1 l/s/ha)	Total Q	Slope of Sewer	Required Diameter	1/2 Pipe Capacity	Proposed / Existing Diameter
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
			(ha)	(ha)			people/ha		(l/s)		(l/s)	(l/s)	(l/s)	(%)	(m)	(l/s)	(m)
	West Sub Ba		110.25	110.25		MH5		6836	27.69	3.12	86.30	11.03	97.33		0.200		0.300
	West Sub Ba		110.25	110.25	MH5	MH1		6836	27.69	3.12	86.30	11.03	97.33	0.044	0.578	183.79	0.525/0.600
	1	SF	2.60				50	130	0.53			0.26		0.05	0.200	38.65	-
		T	13.40				114	1528	6.19			1.34		0.05	0.200	38.65	-
		C/A	0.40				90	36	0.15			0.04		0.05	0.200	38.65	
		A	1.60					324	1.31			0.16					-
	SUB-TOTAL			18.00		MH1A		2018	8.17	3.58	29.28	1.80	31.08	0.060	0.200	38.65	-
		T	7.70				114	878	3.56			0.77					
		C	2.10				90	189	0.77			0.21					
	TOTAL			27.80	MH1A	MH1		3084	12.49	3.43	42.88	2.78	45.66	0.030	0.300	66.34	0.300
	W.S.B.+1	SF	0.60				50	30									
		T	2.70				114	308									
				141.35	MH1	MH2		10258	41.56	2.54	122.83	14.14	136.40	0.017	0.450	186.77	0.450
	2	SF	36.30				50	1815	7.35			3.63					-
		T	3.90				114	445	1.80			0.39					-
		C/R	0.40				102	41	0.17			0.04					
	SUB-TOTAL			40.60		MH2A		2300	9.32	3.54	32.97	4.06	37.03	0.011	0.300	50.68	-
		PSO	5.80				-	300	1.22			0.58					
		SF	6.50				50	325	1.32			0.65					
	TOTAL			52.90	MH2A	MH2		2925	11.85	3.45	40.90	5.29	46.19	0.015	0.300	58.19	0.300
	W.S.B.+1+	SF	0.40				50	20									
		T	1.90				114	217									
				196.55	MH2	MH3		13429	54.36	2.63	153.68	19.66	173.34	0.013	0.525	248.06	0.525
	3	PSO	9.20				-	300	1.22			0.92					
		SF	9.20				50	460	1.86			0.92					
	SUB-TOTAL			18.40		MH3A		760	3.08	3.87	11.93	1.84	13.77	0.030	0.200	28.39	-
		T	3.60				114	410	1.66			0.36					
		SF	3.60			MH3	50	180	0.73			0.36					
	TOTAL			25.60	MH3A	MH3		1350	5.47	3.71	20.31	2.56	22.87	0.055	0.200	38.44	0.200
	W.S.B.+1+2	SF	0.50				50	25									
		T	2.20				114	251									
				224.85	MH3	MH4		15046	60.95	2.75	168.28	22.49	191.74	0.012	0.525	238.44	0.525
	4	PSO	10.40				-	1100	4.46			1.04					
		SF	1.40				50	70	0.28			0.14					
		T	18.00				114	2052	8.31			1.80					
		A	2.30					420	1.70			0.23					
		C/A	1.40				90	126	0.51			0.14					
	SUB-TOTAL			33.50	MH4B	MH4A		3768	15.26	3.36	51.23	3.35	54.58	0.040	0.250	59.44	0.250
		PSO	11.50				-	1100	4.46			1.15					
		SF	1.40				50	70	0.28			0.14					
		T	19.20				114	2189	8.87			1.92					
		A	2.30					420	1.70			0.23					
		C/A	1.40				90	126	0.51			0.14					
	SUB-TOTA			35.80		MH4A		3906	15.82	3.34	52.87	3.58	56.45	0.045	0.250	59.44	
		T	7.40				114	844	3.42			0.74					
West Sub Basin		PSO	5.80				-	0	0.00			0.00					
	TOTAL			49.00	MH4A	MH4		4746	19.24	3.27	62.82	4.32	67.14	0.055	0.250	69.70	
		T	0.90				114	103									
	W.S.B.+1...+4			274.75	MH4	MH5		19897	80.60	2.85	213.95	27.48	241.43	0.004	0.675	365.58	0.675
		SF	26.40				50	1320	5.35			2.64					
	5	PSO	3.90				-	0	0.00			0.00					
	SUB-TOTAL			30.30		MH5A		1320	5.35	3.72	19.89	2.64	22.53	0.040	0.200	32.78	-
		SF	5.60				50	280	1.13			0.56					
		PSO	4.30				-	0	0.00			0.00					
	TOTAL			30.30	MH5A	MH5		1600	6.48	3.66	23.72	3.20	26.92	0.034	0.200	30.22	-
	W.S.B.+1...	IND	7.70				90	693									
				312.75	MH5	MH6		22190	89.89	2.61	234.37	31.28	265.64	0.006	0.675	365.58	0.675
		SF	13.20				50	660	2.67			1.32					
	6	I	0.60				50	30	0.12			0.06					
		T	2.50				114	285	1.15			0.25					
		PSO	2.80				-	0	0.00			0.00					
	TOTAL			19.10	MH6A	MH6		975	3.95	3.81	15.04	1.63	16.67	0.034	0.200	30.22	-
	W.S.B.+1...	IND	7.10				90	639									
				The assumed peak inflow to the 64 Ave. trunk sewer from the Hyland Rd. trunk sewer is 130 l/s													
				338.95	MH6	MH7		23469	95.07	2.59	375.53	33.90	409.45	0.005	0.900	639.72	0.750
		SF	2.60				50	130	0.53			0.26					
	7	T	2.70				114	308	1.25			0.27					
		PSO	2.40				-	300	1.22			0.24					
	TOTAL			7.70	MH7A	MH7		738	2.99	3.68	11.00	0.77	12.37	0.036	0.200	31.10	-
	W.S.B.+1...	C	0.70				90	63									
				The assumed peak inflow to the 64 Ave. trunk sewer from the Hyland Rd. trunk sewer is 130 l/s													
				347.35	MH7	MH8		24269	98.31	2.57	382.60	34.74	417.24	0.008	0.900	639.72	0.900
		SF	11.30				50	565	2.29			1.13					
	8	T	7.10				114	809	3.28			0.71					
	TOTAL			18.40	MH8A	MH9		1374	5.57	3.71	20.64	1.84	22.48	0.040	0.200	32.78	-

Shaded pipe reaches are trunk sewers, all others are laterals. Laterals are not shown on Figure 7.2.3.

TOTAL NORTH CONTRIBUTING AREA **258** (excludes parks, ponds and the west sub-basin)

Landuse	Population / ha
SF5 - Suburban 1/2 a	19
SF - Single Family	50
T - Townhouse	114
A - Apartment	Based on transportation zoneal forecasts
C - Commercial	90
I - Institutional	50
IND - Industrial	90
R - Residential	114
PSO - Parks/Schools/	site specific

TABLE 3.2 - Sanitary Sewer Design Table

Catchment Name	Area Upstream				Manhole No.		Population Density	Tributary Population	Average Qdaily (Fx350 l/capita/day)	Harman Peaking Factor	Peak Q	Infiltration Rate (Ex0.1 l/s/ha)	Total Q	Slope of Sewer	Required Diameter	1/2 Pipe Capacity	Proposed / Existing Diameter
A (-)	Sub Basin Name/Number B (-)	Area Type C (-)	Area D (ha)	Total Area E (ha)	From F (-)	To G (-)	(people/ha)	H (-)	I (l/s)	J (-)	K (l/s)	L (l/s)	M (l/s)	N (m/m)	O (m)	P (l/s)	Q (m)
SOUTH WES POCKET	1	C	0.20		MH19A	MH21	50	10	0.04			0.02					-
		SF5	9.70				19	184	0.75			0.97					-
	SUB-TOTAL			9.90				194	0.79	4.15	3.27	0.99	4.26	0.027	0.200	26.93	-
	2	I	17.80		MH21B	MH21	19	338	1.37			1.78					-
	SUB-TOTAL			17.80				338	1.37	4.06	5.56	1.78	7.34	0.003	0.200	8.96	-
	1+2																-
				27.70	MH21	MH22		533	2.16	3.96	8.54	2.77	11.31	0.062	0.200	40.81	0.200
		SF	3.20			MH22	50	160	0.65			0.32					-
	3	SF5	8.10				19	154	0.62			0.81					-
	SUB-TOTAL			11.30				314	1.27	4.07	5.18	1.13	6.31	0.088	0.200	48.62	-

-Shaded pipe reaches are trunk sewers, all others are laterals. Laterals are not shown on Figures.

Landuse	Population / ha
SF5 - Suburban 1/2 acre	19
SF - Single Family	50
T - Townhouse	114
A - Apartment	725
C - Commercial	90
I - Institutional	50
IND - Industrial	90
R - Residential	114
PSO - Parks/Schools/Office	site specific

TABLE 3.3 - Sanitary Sewer Design Table

Catchment Name A (-)	Area Upstream: Sub Basin Name/Number B (-)	Area Type C (-)	Area D (ha)	Total Area E (ha)	Manhole No. From F (-)	Manhole No. To G (-)	Population Density (people/ha)	Tributary Population H (-)	Average Qdaily (Fx350 l/capita/day) I (l/s)	Harman Peaking Factor J (-)	Peak Q K (l/s)	Infiltration Rate (Ex0.1 L (l/s)	Total Q M (l/s)	Slope of Sewer N (m/m)	Required Diameter O (m)	1/2 Pipe Capacity P (l/s)	Proposed/ Existing Diameter Q (m)
SOUTH EAST POCKET	1	SF	1.80		MH18A	MH17	50	90	0.36			0.18					-
		SF5	3.30				19	63	0.25			0.33					-
	SUB-TOTAL			8.70				153	0.62	4.19	2.59	0.51	3.10	0.032	0.200	29.32	-
	2	SF	1.90		MH17A	MH17	50	95	0.38			0.19					-
		SPO	1.70					0	0.00			0.17					
		SF5	6.20				19	118	0.48			0.62					-
	SUB-TOTAL			9.80				213	0.86	4.14	3.57	0.98	4.55	0.040	0.200	32.78	-
	1+2			18.50	MH17	MH16		366	1.48	4.04	5.98	1.85	7.83	0.038	0.200	31.95	0.200
	3	SF	3.40		MH16A	MH16	50	170	0.69			0.34					-
		SF5	4.20				19	80	0.32			0.42					-
		SPO	1.70					300	1.22			0.17					
	SUB-TOTAL			9.30				550	2.23	3.95	8.80	0.93	9.73	0.034	0.200	30.22	-
	1+2+3			27.80	MH16	MH15		915	3.71	3.82	14.18	2.78	16.96	0.055	0.200	38.44	0.450
	4	SF	6.40		MH15B	MH15A	50	320	1.30			0.64					-
		A	4.10					516	2.09			0.41					-
		T	11.80				114	1345	5.45			1.18					
		C	0.00				90	0	0.00			0.00					
		I	3.20				50	300	1.22			0.32					
	SUB-TOTAL			25.50				2481	10.05	3.51	35.29	2.55	37.84	0.033	0.250	53.99	-
	4	SF	12.80		MH15A	MH15	50	640	2.59			1.28					-
		A	4.10					516	2.09			0.41					-
		T	15.40				114	1756	7.11			1.54					
		C	3.10				90	279	1.13			0.31					
		I	3.20				50	300	1.22			0.32					
	SUB-TOTAL			38.60				3491	14.14	3.39	47.87	3.86	51.73	0.033	0.250	53.99	-
	1+2+3+4			66.40	MH15	MH14		4406	17.85	3.30	58.82	6.64	65.46	0.03	0.300	83.70	0.375

-Shaded pipe reaches are trunk sewers, all others are laterals. Laterals are not shown on Figures.

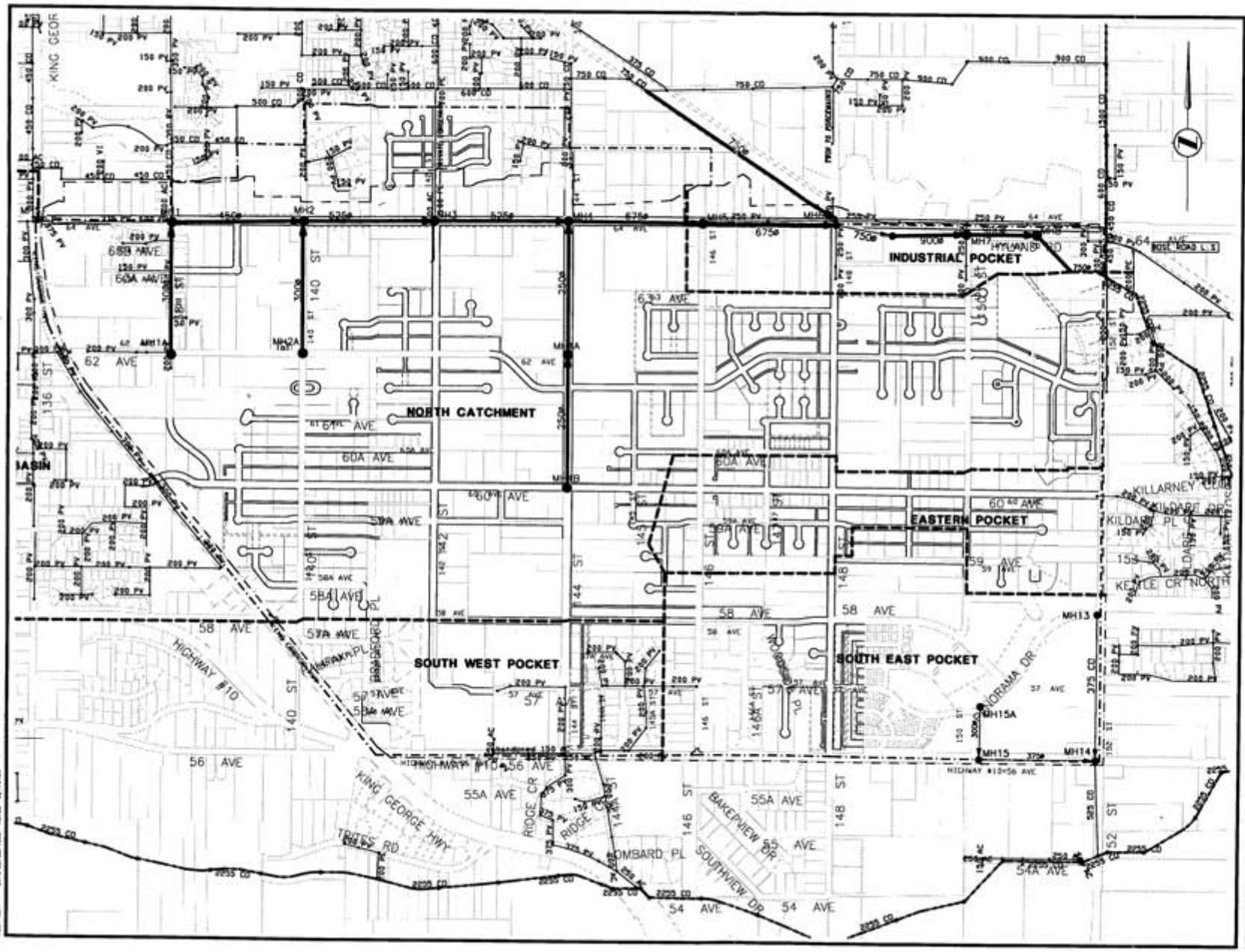
Landuse	Population / ha
SF5 - Suburban 1/2 acre	19
SF - Single Family	50
T - Townhouse	114
A - Apartment	725
C - Commercial	90
I - Institutional	50
IND - Industrial	90
R - Residential	114
PSO - Parks/Schools/Office	site specific

TABLE 3.4 - Sanitary Sewer Design Table

Catchment Name	Area Upstream				Manhole No.		Population Density	Tributary Population	Average Qdaily (Fx350 l/capita/day)	Harman Peaking Factor	Peak Q	Infiltration Rate (Ex0.1 l/s/ha)	Total Q	Slope of Sewer	Required Diameter	1/2 Pipe Capacity	Proposed / Existing
A	Sub Basin Name/Number	Area Type	Area	Total Area	From	To											
(-)	B (-)	C (-)	D (ha)	E (ha)	F (-)	G (-)	(people/ha)	H (-)	I (l/s)	J (-)	K (l/s)	L (l/s)	M (l/s)	N (m/m)	O (m)	P (l/s)	Q (m)
EASTERN																	
POCKET + South East Sub Basin	1+2	SF	31.80			MH12	50	1590	6.44			3.18					-
		T	3.50				114	399	1.62			0.35					-
		C/R	1.50				102	153	0.62			0.15					
		I	0.70				50	35	0.14			0.07					-
	SUB-TOTAL			37.50				2177	8.82	3.56	31.37	3.75	35.12	0.003	0.375	47.99	-
	1+2+(SE#5)	I	2.80			MH13	50	140	0.57			0.28					-
		A	1.00					148	0.60			0.10					-
		C	1.00				90	90	0.36			0.10					
	TOTAL			42.30				2555	10.35	3.50	36.23	3.75	39.98	0.042	0.375	179.57	-

-Shaded pipe reaches are trunk sewers, all others are laterals. Laterals are not shown on Figures.

Landuse	Population / ha
SF5 - Suburban 1/2 acre	19
SF - Single Family	50
T - Townhouse	114
A - Apartment	725
C - Commercial	90
I - Institutional	50
IND - Industrial	90
R - Residential	114
PSO - Parks/Schools/Office	site specific



Project:

City of Surrey

South Newton Neighbourhood Concept Plan

LEGEND

- Development Boundary (NCP)
- Subcatchment Boundary
- 300 PV Existing Sanitary Sewer
- 2250 CO Existing GVS&DD Trunk Sewer
- 300 PV Proposed Sanitary Trunk Sewer (Q=>40 l/s)

Reid Crowther

Title:

City of Surrey

Figure 3.4
Sanitary Trunk Sewers Option No. 1

APPENDIX E
WATER DISTRIBUTION

Node Number	Flow Demand per Node			
	Elevation	Average Daily Flow	Maximum Daily Flow	Peak Hourly Flow
1	51.00	0.00	0.00	0.00
2	35.00	6.27	12.54	25.08
3	29.00	4.89	9.78	19.56
4	23.00	2.92	5.84	11.68
5	18.00	2.18	4.36	8.72
6	16.50	3.41	6.82	13.64
7	14.00	3.08	6.16	12.32
8	12.00	1.00	2.00	4.00
9	6.00	0.52	1.04	2.08
10	8.00	1.85	3.70	7.40
11	22.50	1.38	2.76	5.52
12	30.00	5.65	11.30	22.60
13	32.00	2.34	4.68	9.36
14	30.00	1.40	2.80	5.60
15	14.00	1.19	2.38	4.76
16	25.50	1.08	2.16	4.32
17	50.00	1.25	2.50	5.00
18	55.00	0.00	0.00	0.00
19	59.00	1.76	3.52	7.04
20	68.00	0.62	1.24	2.48
21	83.00	3.51	7.02	14.04
22	76.50	3.82	7.64	15.28
23	71.00	3.70	7.40	14.80
24	70.00	2.68	5.36	10.72
25	62.50	2.32	4.64	9.28
26	66.00	6.00	12.00	24.00
27	60.00	5.09	10.18	20.36
28	65.00	2.84	5.68	11.36
29	45.00	2.30	4.60	9.20
30	25.50	4.67	9.34	18.68
31	28.50	0.84	1.68	3.36
32	45.00	2.64	5.28	10.56
33	60.00	1.19	2.38	4.76
34	65.00	3.57	7.14	14.28
35	73.00	3.75	7.50	15.00
36	81.50	1.50	3.00	6.00
37	77.00	1.16	2.32	4.64
38	75.00	0.00	0.00	0.00
39	49.00	1.04	2.08	4.16
40	34.00	1.46	2.92	5.84
41	23.50	2.18	4.36	8.72
42	26.00	2.44	4.88	9.76
43	45.00	2.21	4.42	8.84
44	43.00	2.80	5.60	11.20
45	49.00	3.44	6.88	13.76
46	43.00	1.20	2.40	4.80
47	47.50	2.36	4.72	9.44
48	31.50	0.50	1.00	2.00
49	42.50	1.00	2.00	4.00
50	50.00	0.00	0.00	0.00
51	76.50	0.00	0.00	0.00
53	23.00	0.00	0.00	0.00
Total:		**115.00**	**230.00**	**460.00**

Table 6.1
Projected Node Demands

TABLE 6.2 - Ultimate Development Scenario, Peak Hourly Demand (Q=460 l/s)

PIPE TABLE

Pipe	UpNode	DnNode	Length	Diameter	Roughness	Flow	Velocity	HeadLoss	Status
			m	m	C	l/s	m/s	m	Open
1	39	2	380	0.30	125	33.08	0.47	0.39	
2	2	3	400	0.30	125	47.52	0.67	0.71	
3	3	4	400	0.30	125	27.96	0.40	0.27	
4	4	5	400	0.30	125	24.25	0.34	0.20	
5	5	6	400	0.30	125	12.67	0.18	0.06	
6	6	7	400	0.30	125	-0.97	-0.01	0.00	
7	7	8	400	0.30	125	-3.91	-0.06	0.01	
8	8	9	400	0.30	125	-7.91	-0.11	0.03	
9	9	10	120	0.25	125	-9.99	-0.20	0.03	
10	10	11	300	0.25	125	-17.39	-0.35	0.20	
11	11	12	380	0.25	125	-19.89	-0.41	0.33	
12	12	13	200	0.25	125	-29.92	-0.61	0.37	
13	13	14	170	0.30	125	-39.28	-0.56	0.35	
14	14	15	420	0.30	125	-12.38	-0.18	0.06	
15	15	16	370	0.35	125	-17.14	-0.18	0.00	
16	17	16	450	0.20	100	6.79	0.22	0.24	
17	17	18	400	0.20	100	0.00	0.00	0.00	No
18	18	19	400	0.20	100	-18.84	-0.60	1.39	
19	19	20	420	0.30	125	-75.11	-1.06	1.74	
20	20	21	400	0.30	125	-77.59	-1.10	1.76	
21	21	22	650	0.35	135	-139.76	-1.45	4.00	
22	38	23	380	0.35	125	173.68	1.81	3.50	
23	23	24	400	0.35	125	131.47	1.37	2.20	
24	24	25	400	0.35	125	122.07	1.27	1.92	
25	25	26	400	0.30	125	95.94	1.36	2.60	
26	26	27	400	0.30	125	67.38	0.95	1.35	
27	27	28	410	0.30	125	47.02	0.67	0.71	
28	28	29	375	0.35	125	108.75	1.13	14.03	
29	29	30	275	0.35	125	45.63	0.47	0.21	
30	30	14	400	0.35	125	32.50	0.34	0.17	
31	31	30	140	0.25	125	5.55	0.11	0.01	
32	16	31	140	0.25	125	-14.67	-0.30	0.11	
33	32	31	210	0.25	125	23.57	0.48	0.21	
34	33	32	210	0.25	125	34.13	0.70	13.62	
35	53	28	400	0.35	125	123.78	1.29	1.97	
36	18	34	200	0.20	100	18.84	0.60	0.70	
37	26	53	380	0.20	100	4.56	0.15	0.10	
38	35	34	400	0.35	125	114.66	1.19	1.71	
39	35	36	580	0.35	125	16.85	0.18	0.07	
40	36	37	400	0.30	125	68.21	0.97	1.38	
41	34	36	410	0.30	125	-1.33	-0.02	0.00	
42	23	21	500	0.30	125	27.41	0.39	0.32	
43	22	38	20	0.35	125	173.68	1.81	0.18	
44	1	39	20	0.30	125	37.24	0.53	18.99	
45	33	17	200	0.30	125	11.79	0.17	13.71	
46	28	33	200	0.30	125	50.69	0.72	0.40	
47	1	48	420	0.30	125	-58.68	-0.83	1.10	
48	19	35	200	0.30	125	49.23	0.70	0.38	
49	49	42	450	0.30	125	24.89	0.35	0.24	
50	50	22	5	0.45	125	461.44	3.03	0.09	
51	43	40	200	0.30	125	13.82	0.20	0.04	
52	44	41	300	0.30	125	5.86	0.08	0.01	
53	45	42	340	0.30	125	-5.75	-0.08	0.01	
54	40	4	200	0.30	125	7.96	0.11	0.01	
55	41	5	200	0.30	125	-2.86	-0.04	0.00	
56	42	7	300	0.30	125	9.38	0.13	0.03	
57	35	37	200	0.30	125	-63.57	-0.90	0.61	
58	2	46	400	0.30	125	-39.51	-0.56	0.50	
59	46	43	800	0.30	125	47.72	0.68	1.43	
60	43	44	450	0.30	125	25.06	0.35	0.24	
61	44	45	850	0.30	125	8.01	0.11	0.06	
62	47	12	400	0.30	125	12.57	0.18	0.06	
63	21	36	450	0.30	125	75.54	1.07	1.88	
64	47	49	450	0.30	125	31.92	0.45	0.38	
65	49	11	450	0.30	125	3.03	0.04	0.00	
66	29	47	400	0.30	125	53.92	0.76	1.03	
67	48	22	420	0.30	125	-152.72	-2.16	6.46	
68	48	48	315	0.30	125	92.04	1.30	19.98	
69	51	1	5	0.30	125	-21.44	-0.30	0.00	
71	34	53	200	0.35	125	119.22	1.24	0.92	

NODE TABLE

Node	Elevation	Demand	Pressure	HGL	XCoord	YCoord	Status
	m	l/s	kPa	m			ON
1	51.00	0.00	575.81	109.80	0	1620	
2	35.00	25.08	542.73	90.42	400	1620	
3	29.00	19.56	594.55	89.71	800	1620	
4	23.00	11.68	650.72	89.45	1200	1620	
5	18.00	8.72	697.69	89.25	1600	1620	
6	16.50	13.64	711.78	89.18	2000	1620	
7	14.00	12.32	736.26	89.18	2400	1620	
8	12.00	4.00	755.92	89.19	2800	1620	
9	6.00	2.08	814.93	89.22	3200	1620	
10	8.00	7.40	795.63	89.25	3200	1500	
11	22.50	5.52	655.59	89.45	3200	1180	
12	30.00	22.60	585.33	89.77	3200	790	
13	32.00	9.36	569.32	90.14	3200	590	
14	30.00	5.60	592.32	90.49	3200	420	
15	14.00	4.76	749.61	90.55	3200	0	
16	25.50	4.32	637.03	90.55	2830	0	
17	50.00	5.00	399.41	90.79	2380	0	
18	55.00	0.00	523.63	108.47	1980	0	
19	59.00	7.04	498.08	109.86	1580	0	
20	68.00	2.48	426.94	111.60	1160	0	
21	84.00	14.04	287.44	113.36	800	320	
22	76.50	15.28	400.10	117.36	400	810	
23	71.00	14.80	417.88	113.68	800	810	
24	70.00	10.72	406.13	111.45	1200	810	
25	62.50	9.28	460.80	109.56	1600	810	
26	66.00	24.00	401.05	106.96	2000	810	
27	60.00	20.36	446.57	105.80	2400	810	
28	65.00	11.36	390.63	104.89	2400	400	
29	45.00	9.20	449.13	90.87	2790	380	
30	25.50	18.68	638.01	90.65	2950	210	
31	28.50	3.36	608.74	90.66	2870	120	
32	45.00	10.56	449.18	90.87	2690	120	
33	60.00	4.76	435.69	104.49	2400	200	
34	65.00	14.28	418.89	107.78	2000	200	
35	73.00	15.00	357.27	109.49	1600	200	
36	61.50	6.00	293.52	111.48	1200	390	
37	77.00	4.64	324.04	110.09	1380	190	
38	75.00	0.00	412.99	117.18	420	810	
39	49.00	4.16	409.39	90.61	20	1620	
40	34.00	5.84	543.12	89.46	1200	1410	
41	23.50	8.72	643.80	89.24	1600	1410	
42	26.00	9.76	619.00	89.21	2400	1310	
43	45.00	8.84	435.74	89.50	1200	1210	
44	43.00	11.20	452.94	89.25	1600	1110	
45	49.00	13.76	393.64	89.20	2400	1070	
46	43.00	4.80	469.31	90.93	400	1200	
47	50.00	9.44	390.05	89.63	2800	800	
48	60.00	2.00	498.43	110.90	85	1220	
49	42.50	4.00	459.77	89.45	2800	1250	
50	76.50	0.00	400.98	117.45	395	810	
51	51.00	0.00	575.79	109.80	-5	1620	
53	70.00	0.00	380.94	106.86	2000	400	

INFLOW TABLE

Node	Pumps	OpCurve	%Estimate	%Actual	Inflow
					l/s
50	1.00	Pump1	0.50	1.05	-461.44
51	1.00	Pump2	0.50	-0.05	21.44

REDUCING (PRV) TABLE

Pipe	Source	Pressure	OpenK	CKV	PRVLoss	CKVState
		kPa			m	
44	50	410.00	0.00	Yes	18.97	Open
28	50	450.00	0.00	Yes	12.58	Open
34	50	450.00	0.00	Yes	13.13	Open
45	50	400.00	0.00	Yes	13.68	Open
68	50	470.00	0.00	Yes	18.08	Open

PUMP1

Flow	Head
l/s	m
0	40.95
50	40.95
100	40.95
150	40.95
200	40.95
250	40.95
300	40.95
350	40.95
400	40.95
450	40.95
500	40.95
550	40.95
600	40.95

PUMP2

Flow	Head
l/s	m
0	58.80
50	58.80
100	58.80
150	58.80
200	58.80
250	58.80
300	58.80
350	58.80
400	58.80
450	58.80
500	58.80
550	58.80
600	58.80

TABLE 6.3 - Ultimate Development Scenario, Max. Daily Flow (Q=230 l/s) + Fire Flow at Node 7 (Q=250 l/s)

PIPE TABLE

Pipe	UpNode	DnNode	Length m	Diameter m	Roughness C	Flow l/s	Velocity m/s	HeadLoss m	Status Open
1	39	2	380	0.30	125	47.14	0.67	0.65	
2	2	3	400	0.30	125	84.35	1.19	2.05	
3	3	4	400	0.30	125	74.57	1.06	1.63	
4	4	5	400	0.30	125	78.26	1.11	1.78	
5	5	6	400	0.30	125	90.28	1.28	2.32	
6	6	7	400	0.30	125	83.46	1.18	2.01	
7	7	8	400	0.30	125	-56.66	-0.80	0.98	
8	8	9	400	0.30	125	-58.66	-0.83	1.05	
9	9	10	120	0.25	125	-59.70	-1.22	0.79	
10	10	11	300	0.25	125	-63.40	-1.29	2.20	
11	11	12	380	0.25	125	-61.19	-1.25	2.61	
12	12	13	200	0.25	125	-66.22	-1.35	1.59	
13	13	14	170	0.30	125	-70.90	-1.00	0.64	
14	14	15	420	0.30	125	-22.71	-0.32	0.19	
15	15	16	370	0.35	125	-25.09	-0.26	0.06	
16	17	16	450	0.20	100	8.08	0.26	0.33	
17	17	18	400	0.20	100	0.00	0.00	0.00	No
18	18	19	400	0.20	100	-19.83	-0.63	1.53	
19	19	20	420	0.30	125	-72.41	-1.02	1.62	
20	20	21	400	0.30	125	-73.65	-1.04	1.59	
21	21	22	650	0.35	125	-126.07	-1.31	3.31	
22	38	23	380	0.35	125	156.22	1.62	2.88	
23	23	24	400	0.35	125	123.30	1.28	1.95	
24	24	25	400	0.35	125	119.68	1.24	1.85	
25	25	26	400	0.30	125	98.40	1.39	2.73	
26	26	27	400	0.30	125	76.35	1.08	1.70	
27	27	28	410	0.30	125	66.17	0.94	1.34	
28	28	29	375	0.35	125	159.66	1.66	13.88	
29	29	30	275	0.35	125	53.78	0.56	0.29	
30	30	14	400	0.35	125	50.99	0.53	0.38	
31	31	30	140	0.25	125	6.55	0.13	0.02	
32	16	31	140	0.25	125	-19.16	-0.39	0.14	
33	32	31	210	0.25	125	27.39	0.56	0.28	
34	33	32	210	0.25	125	32.67	0.67	13.55	
35	53	28	400	0.35	125	144.80	1.51	2.63	
36	18	34	200	0.20	100	19.83	0.63	0.76	
37	26	53	380	0.20	100	10.05	0.32	0.41	
38	35	34	400	0.35	125	122.06	1.27	1.92	
39	25	35	580	0.35	125	18.64	0.17	0.07	
40	36	37	400	0.30	125	86.18	0.94	1.31	
41	24	36	410	0.30	125	-1.74	-0.02	0.00	
42	23	31	500	0.30	125	25.52	0.36	0.28	
43	22	38	20	0.35	125	156.22	1.62	0.15	
44	1	39	20	0.30	125	49.22	0.70	18.99	
45	33	17	200	0.30	125	10.58	0.15	13.64	
46	28	33	200	0.30	125	45.83	0.65	0.33	
47	1	48	420	0.30	125	-23.21	-0.33	0.20	
48	19	35	200	0.30	125	49.06	0.69	0.38	
49	49	42	450	0.30	125	83.51	1.18	2.25	
50	50	22	5	0.45	125	453.99	2.85	0.08	
51	43	40	200	0.30	125	12.45	0.18	0.03	
52	44	41	300	0.30	125	20.73	0.29	0.11	
53	45	42	340	0.30	125	37.61	0.53	0.39	
54	40	4	200	0.30	125	9.53	0.13	0.02	
55	41	5	200	0.30	125	16.37	0.23	0.05	
56	42	7	300	0.30	125	116.04	1.64	2.77	
57	35	37	200	0.30	125	-63.86	-0.90	0.81	
58	7	46	400	0.30	125	-49.76	-0.70	0.77	
59	46	43	800	0.30	125	87.69	1.24	4.40	
60	43	44	450	0.30	125	70.82	1.00	1.67	
61	44	45	850	0.30	125	44.49	0.63	1.33	
62	47	12	400	0.30	125	6.27	0.09	0.02	
63	21	36	450	0.30	125	70.92	1.00	1.67	
64	47	49	450	0.30	125	90.29	1.28	2.62	
65	49	11	450	0.30	125	4.97	0.07	0.01	
66	29	47	400	0.30	125	101.28	1.43	2.89	
67	48	22	420	0.30	125	-164.05	-2.32	7.38	
68	48	46	315	0.30	125	139.85	1.98	19.07	
69	51	1	5	0.30	125	26.01	0.37	0.00	
71	34	53	200	0.35	125	134.75	1.40	1.15	

NODE TABLE

Node	Elevation m	Demand l/s	Pressure kPa	HGL m	XCoord	YCoord	Status ON
1	51.00	0.00	575.76	109.80	0	1620	
2	35.00	12.54	540.10	90.15	400	1620	
3	29.00	9.78	578.79	88.11	800	1620	
4	23.00	5.84	621.58	86.47	1200	1620	
5	18.00	4.36	653.07	84.65	1600	1620	
6	16.50	6.82	645.01	82.37	2000	1620	
7	14.00	256.16	649.81	80.36	2400	1620	
8	12.00	2.00	679.00	81.34	2800	1620	
9	6.00	1.04	748.01	82.38	3200	1620	
10	8.00	3.70	736.13	83.17	3200	1500	
11	22.50	2.76	615.69	85.37	3200	1180	
12	30.00	11.30	567.80	87.98	3200	790	
13	32.00	4.68	563.76	89.57	3200	590	
14	30.00	2.80	589.67	90.22	3200	420	
15	14.00	2.38	748.22	90.41	3200	0	
16	25.50	2.16	636.22	90.47	2935	0	
17	50.00	2.50	399.48	90.80	2380	0	
18	55.00	0.00	531.88	109.32	1980	0	
19	59.00	3.52	507.68	110.84	1580	0	
20	69.00	1.24	435.43	112.47	1150	0	
21	84.00	7.02	294.34	114.06	800	320	
22	76.50	7.64	400.19	117.37	400	810	
23	71.00	7.42	424.40	114.34	800	810	
24	70.00	5.36	415.06	112.39	1200	810	
25	62.50	4.64	470.40	110.54	1600	810	
26	66.00	12.00	409.43	107.81	2000	810	
27	60.00	10.18	451.51	106.11	2400	810	
28	65.00	5.68	389.42	104.77	2400	400	
29	45.00	4.60	449.34	90.89	2790	380	
30	25.50	9.34	637.47	90.60	2950	210	
31	28.50	1.68	608.25	90.61	2870	120	
32	45.00	5.28	449.41	90.89	2690	120	
33	60.00	2.38	435.17	104.44	2400	200	
34	65.00	7.14	426.46	108.55	2000	200	
35	73.00	7.50	396.89	110.47	1600	200	
36	81.50	3.00	302.45	112.39	1200	390	
37	77.00	2.32	333.72	111.08	1380	190	
38	75.00	0.00	413.40	117.22	420	810	
39	49.00	2.08	409.39	90.81	20	1620	
40	34.00	2.92	514.03	89.49	1200	1410	
41	23.50	4.36	599.69	84.74	1600	1410	
42	26.00	4.88	559.46	83.13	2400	1310	
43	45.00	4.42	406.59	86.52	1200	1210	
44	43.00	5.60	409.84	84.85	1600	1110	
45	49.00	6.88	338.04	83.52	2400	1070	
46	43.00	2.40	469.31	90.93	400	1200	
47	50.00	4.72	372.10	88.00	2800	800	
48	60.00	1.00	489.56	109.99	85	1220	
49	42.50	2.00	419.94	85.38	2800	1250	
50	76.50	0.00	400.98	117.45	395	810	
51	51.00	0.00	575.79	109.80	-5	1620	
53	70.00	0.00	366.22	107.40	2000	400	

INFLOW TABLE

Node	Pumps	OpCurve	%Estimate	%Actual	Inflow l/s
50	1	Pump1	0.50	0.95	-453.99
51	1	Pump2	0.50	0.05	-26.01

REDUCING (PRV) TABLE

Pipe	Source	Pressure kPa	OpenK	CKV	PRVLoss m	CKVState
44	50	410.00	0.00	Yes	18.95	Open
28	50	450.00	0.00	Yes	10.93	Open
34	50	450.00	0.00	Yes	13.09	Open
45	50	400.00	0.00	Yes	13.62	Open
68	50	470.00	0.00	Yes	14.95	Open

PUMP1 Flow l/s	PUMP1 Head m	PUMP2 Flow l/s	PUMP2 Head m
0	40.95	0	58.80
50	40.95	50	58.80
100	40.95	100	58.80
150	40.95	150	58.80
200	40.95	200	58.80
250	40.95	250	58.80
300	40.95	300	58.80
350	40.95	350	58.80
400	40.95	400	58.80
450	40.95	450	58.80
500	40.95	500	58.80
550	40.95	550	58.80
600	40.95	600	58.80

TABLE 6.4 - Ultimate Development Scenario - Summary of Results

Run #	Case		Existing System															Proposed Modifications														
			Flow Demand			Max. Pressure		Min. Pressure		Max. Velocity		Min.Flow		Max. Flow				Flow Demand			Max. Pressure		Min. Pressure		Max. Velocity		Min.Flow		Max. Flow			
			Node Demand	Node	Fire Flow	Node	P	Node	P	Pipe	V	Pipe	Q	Pipe	Q	Comments		Node Demand	Node	Fire Flow	Node	P	Node	P	Pipe	V	Pipe	Q	Pipe	Q	Comments		
			(l/s)	/	(l/s)	/	(kPa)	/	(kPa)	/	(m/s)	/	(l/s)	/	(l/s)	/		(l/s)	/	(l/s)	/	(kPa)	/	(kPa)	/	(m/s)	/	(l/s)	/	(l/s)	/		
1	Average Daily Flow		115	/	/	15	756.36	21	289.16	47	2.17	37	0.67	47	68.11	Meets Design Criteria		115	/	/	9	830.05	21	324.29	67	1.84	41	0.34	67	129.84	Meets Design Criteria		
2	Peak Hourly Flow		460	/	/	15	699.70	36	66.24	13	2.18	37	0.19	22 43	207.43	Insufficient Residual Pressure		460	/	/	9	814.93	21	287.44	67	2.16	6	0.97	22 43	173.48	Meets Design Criteria		
3	Maximum Daily Flow + Fire Flow	Industry	230	7	250	15	753.23	36	243.39	47	2.17	36	1.42	22 43	116.39	Meets Design Criteria		230	7	250	15	748.22	21	294.34	67	2.32	41	1.74	67	164.05	Meets Design Criteria		
4		Institutions or Schools	230	15	120	15	604.06	36	31.27	22 43	2.20	9	0.13	22 43	211.37	Insufficient Residual Pressure		230	14	120	9	821.43	21	299.06	67	2.01	10	0.08	22 43	143.92	Meets Design Criteria		
5		Commercial	230	35	120	15	667.34	36	13.34	22 43	2.22	45	0.49	22 43	213.83	Insufficient Residual Pressure		230	31	120	9	824.26	21	297.49	67	1.99	8	0.17	22 43	148.20	Meets Design Criteria		
6		S.F.	230	35	60	15	752.39	36	142.12	47	2.17	36	0.43	22 43	166.84	Meets Design Criteria		230	48	60	9	827.26	21	316.04	67	2.23	16	0.59	67	157.26	Meets Design Criteria		
7		M.F.	230	13	75	15	750.69	13	68.26	13	4.10	37	1.07	22 43	148.60	Insufficient Fire Flow & Insufficient Residual Pressure		230	16	120	9	823.39	21	298.02	67	2.00	9	0.77	22 43	146.78	Meets Design Criteria		

Note: Nodes 50, 51 and pipes 50, 69 are not included in this summary since they represent imaginary nodes and pipes at supply nodes.

TABLE 6.5 - Interim Development Scenario (8,000 Population), Peak Hourly Demand (Q=190 l/s)

PIPE TABLE

Pipe	UpNode	DnNode	Length m	Diameter m	Roughness C	Flow l/s	Velocity m/s	HeadLoss m	Status Open
1	38	2	380	0.30	125	35.99	0.51	0.40	
2	2	3	400	0.30	125	31.99	0.45	0.34	
3	3	4	400	0.30	125	31.05	0.44	0.32	
4	4	5	400	0.30	125	29.17	0.41	0.29	
5	5	6	400	0.30	125	4.77	0.07	0.01	
6	6	7	400	0.30	125	-0.53	-0.01	0.00	
7	7	8	400	0.30	125	-3.99	-0.06	0.01	
8	8	9	400	0.30	125	-6.73	-0.10	0.02	
9	9	10	120	0.30	125	-8.81	-0.12	0.01	
10	10	11	300	0.30	125	-15.21	-0.22	0.06	
11	11	12	380	0.30	125	-31.21	-0.44	0.28	
12	12	13	200	0.30	125	-44.65	-0.63	0.32	
13	13	14	170	0.30	125	-48.21	-0.68	0.31	
14	14	15	420	0.30	125	-14.39	-0.20	0.08	
15	15	16	370	0.35	125	-18.13	-0.19	0.06	
16	17	16	450	0.20	100	6.07	0.19	0.19	
17	17	18	400	0.20	100	0.00	0.00	0.00	No
18	18	19	400	0.20	100	-2.44	-0.08	0.03	
19	19	20	420	0.20	100	-16.58	-0.53	1.15	
20	20	21	400	0.20	100	-19.08	-0.61	1.42	
21	21	22	850	0.20	100	-22.60	-0.72	3.17	
22	38	23	380	0.35	125	126.53	1.32	1.95	
23	23	24	400	0.35	125	114.61	1.19	1.71	
24	24	25	400	0.35	125	101.03	1.05	1.35	
25	25	26	400	0.30	125	44.94	0.64	0.64	
26	26	27	400	0.30	125	41.66	0.59	0.55	
27	27	28	410	0.30	125	40.68	0.58	0.54	
28	28	29	375	0.35	125	47.62	0.49	19.70	
29	29	30	275	0.35	125	47.16	0.49	0.23	
30	30	14	400	0.35	125	37.02	0.38	0.21	
31	31	30	140	0.25	125	2.95	0.06	0.00	
32	16	31	140	0.35	125	-16.09	-0.33	0.07	
33	32	31	210	0.25	125	21.71	0.44	0.22	
34	33	32	310	0.25	125	22.23	0.45	19.47	
35	53	28	400	0.35	125	53.66	0.56	0.42	
36	18	34	200	0.10	100	2.44	0.31	0.46	
37	26	53	380	0.10	100	2.13	0.27	0.68	
38	35	34	400	0.35	125	57.51	0.60	0.48	
39	25	35	580	0.35	125	55.65	0.58	0.65	
40	36	37	400	0.30	125	4.58	0.06	0.01	
41	34	36	410	0.15	100	10.58	0.60	1.99	
42	23	21	500	0.15	100	6.96	0.39	1.12	
43	22	38	20	0.35	125	126.53	1.32	0.10	
44	1	39	20	0.30	125	38.99	0.55	18.99	
45	33	17	200	0.30	125	10.37	0.15	19.58	
46	28	33	200	0.30	125	37.36	0.53	0.23	
47	1	48	420	0.20	100	-31.09	-0.99	3.69	
48	19	35	200	0.30	125	9.50	0.13	0.02	
49	49	42	450	0.30	125	9.04	0.13	0.04	
50	50	22	5	0.45	125	182.10	1.15	0.01	
51	43	40	200	0.30	125	-1.04	-0.01	0.00	
52	44	41	300	0.30	125	-12.31	-0.17	0.04	
53	45	42	340	0.10	100	-0.87	-0.11	0.12	
54	40	4	200	0.20	100	-1.32	-0.04	0.01	
55	41	5	200	0.30	125	-18.67	-0.26	0.06	
56	42	7	300	0.30	125	3.70	0.05	0.00	
57	35	37	200	0.30	125	-4.36	-0.06	0.00	
58	2	46	400	0.20	100	2.76	0.09	0.04	
59	46	43	800	0.30	125	0.00	0.00	0.00	No
60	43	44	450	0.30	125	0.00	0.00	0.00	No
61	44	45	850	0.30	125	3.81	0.05	0.01	
62	47	12	400	0.20	100	-7.60	-0.24	0.26	
63	21	36	450	0.30	125	0.00	0.00	0.00	No
64	47	49	450	0.30	125	0.00	0.00	0.00	No
65	49	11	450	0.30	125	-11.58	-0.16	0.06	
66	29	47	400	0.30	125	0.00	0.00	0.00	No
67	48	22	420	0.20	100	-32.23	-1.03	3.95	
68	48	46	315	0.30	125	0.00	0.00	0.00	No
69	51	1	5	0.30	125	7.90	0.11	0.00	
71	34	53	200	0.35	125	51.53	0.54	0.19	

NODE TABLE

Node	Elevation m	Demand l/s	Pressure kPa	HGL m	XCoord	YCoord	Status ON
1	51.00	0.00	575.79	109.80	0	1620	
2	35.00	1.24	542.56	90.41	400	1620	
3	29.00	0.94	597.99	90.07	800	1620	
4	23.00	0.58	653.59	89.74	1200	1620	
5	18.00	5.72	699.75	89.46	1600	1620	
6	16.50	5.30	714.34	89.45	2000	1620	
7	14.00	7.16	738.83	89.45	2400	1620	
8	12.00	2.74	758.49	89.45	2800	1620	
9	6.00	2.08	817.43	89.47	3200	1620	
10	8.00	6.40	797.94	89.48	3200	1500	
11	22.50	4.42	656.56	89.55	3200	1160	
12	30.00	5.84	585.88	89.83	3200	790	
13	32.00	3.56	569.36	90.14	3200	590	
14	30.00	3.20	591.99	90.45	3200	420	
15	14.00	3.74	749.48	90.53	3200	0	
16	25.50	4.00	637.45	90.60	2850	0	
17	50.00	4.30	399.40	90.79	2380	0	
18	55.00	0.00	354.68	111.67	1980	0	
19	59.00	4.64	518.02	111.70	1580	0	
20	68.00	2.48	439.17	112.85	1160	0	
21	84.00	15.50	296.39	114.27	800	320	
22	76.50	0.74	400.83	117.44	400	810	
23	71.00	4.96	434.63	115.39	800	810	
24	70.00	3.00	427.71	113.68	1200	810	
25	62.50	0.44	487.93	112.33	1600	810	
26	68.00	1.16	447.39	111.69	2000	810	
27	60.00	0.98	500.72	111.13	2400	810	
28	65.00	9.36	446.42	110.58	2400	400	
29	45.00	0.46	449.38	90.89	2790	380	
30	25.50	13.08	638.13	90.66	2950	210	
31	28.50	2.70	608.78	90.67	2870	120	
32	45.00	0.52	449.36	90.89	2690	120	
33	60.00	4.76	493.17	110.36	2400	200	
34	66.00	8.42	452.42	111.20	2000	200	
35	73.00	12.00	378.74	111.68	1600	200	
36	81.50	6.00	295.63	111.69	1200	390	
37	77.00	0.22	339.61	111.68	1380	190	
38	75.00	0.00	414.52	117.33	420	810	
39	49.00	3.00	409.39	90.81	20	1620	
40	34.00	0.28	545.82	89.74	1200	1410	
41	23.50	9.56	645.27	89.39	1600	1410	
42	26.00	4.48	621.35	89.45	2400	1310	
43	45.00	1.04	438.09	89.74	1200	1210	
44	43.00	8.50	453.88	89.35	1600	1110	
45	49.00	4.68	394.98	89.34	2400	1070	
46	43.00	2.76	463.83	90.37	400	1200	
47	50.00	7.40	387.48	89.57	2800	800	
48	60.00	1.14	523.79	113.49	85	1220	
49	42.50	2.54	460.13	89.49	2800	1250	
50	76.50	0.00	400.98	117.45	395	810	
51	51.00	0.00	575.79	109.80	-5	1620	
53	70.00	0.00	401.56	111.01	2000	400	

INFLOW TABLE

Node	Pumps	OpCurve	%Estimate	%Actual	Inflow l/s
50	1.00	Pump1	0.50	0.96	-182.10
51	1.00	Pump2	0.50	0.04	-7.90

REDUCING (PRV) TABLE

Pipe	Source	Pressure kPa	OpenK	CKV	PRVLoss m	CKVState
44	50.00	410.00	0.00	Yes	18.97	Open
28	50.00	450.00	0.00	Yes	19.38	Open
34	50.00	450.00	0.00	Yes	19.25	Open
45	50.00	400.00	0.00	Yes	19.56	Open

PUMP1 / PUMP2

PUMP1 Flow l/s	PUMP1 Head m	PUMP2 Flow l/s	PUMP2 Head m
0	40.95	0	58.80
50	40.95	50	58.80
100	40.95	100	58.80
150	40.95	150	58.80
200	40.95	200	58.80
250	40.95	250	58.80
300	40.95	300	58.80
350	40.95	350	58.80
400	40.95	400	58.80
450	40.95	450	58.80
500	40.95	500	58.80
550	40.95	550	58.80
600	40.95	600	58.80

TABLE 6.6 - Interim Development Scenario (8,000 Population), Maximum Daily Flow (Q=95 l/s) + Fire Flow at Node 7 (Q=250 l/s)

PIPE TABLE

Pipe	UpNode	DnNode	Length	Diameter	Roughness	Flow	Velocity	HeadLoss	Status
			m	m	C	l/s	m/s	m	Open
1	39	2	380	0.30	125	123.04	1.74	3.92	
2	2	3	400	0.30	125	121.04	1.71	4.00	
3	3	4	400	0.30	125	120.57	1.71	3.97	
4	4	5	400	0.30	125	119.63	1.69	3.91	
5	5	6	400	0.30	125	101.09	1.43	2.87	
6	6	7	400	0.30	125	98.44	1.39	2.73	
7	7	8	400	0.30	125	-75.05	-1.06	1.65	
8	8	9	400	0.30	125	-76.42	-1.08	1.71	
9	9	10	120	0.30	125	-77.46	-1.10	0.52	
10	10	11	300	0.30	125	-80.66	-1.14	1.41	
11	11	12	380	0.30	125	-160.56	-2.27	6.48	
12	12	13	200	0.30	125	-167.28	-2.37	3.64	
13	13	14	170	0.30	125	-169.06	-2.39	3.16	
14	14	15	420	0.30	125	-54.08	-0.77	0.94	
15	15	16	370	0.35	125	-55.95	-0.58	0.40	
16	17	16	450	0.20	100	18.08	0.58	1.45	
17	17	18	400	0.20	100	0.00	0.00	0.00	No
18	18	19	400	0.20	100	-4.77	-0.15	0.11	
19	19	20	420	0.20	100	-30.62	-0.97	3.59	
20	20	21	400	0.20	100	-31.86	-1.01	3.68	
21	21	22	650	0.20	100	-30.22	-0.96	5.42	
22	38	23	380	0.35	125	189.30	1.97	4.11	
23	23	24	400	0.35	125	179.92	1.87	3.93	
24	24	25	400	0.35	125	162.12	1.69	3.24	
25	25	26	400	0.30	125	81.49	1.15	1.92	
26	26	27	400	0.30	125	77.33	1.09	1.74	
27	27	28	410	0.30	125	76.84	1.09	1.77	
28	28	29	375	0.35	125	112.72	1.17	0.61	
29	29	30	275	0.35	125	112.49	1.17	1.13	
30	30	14	400	0.35	125	116.57	1.21	1.76	
31	31	30	140	0.25	125	55.62	0.22	0.04	
32	16	31	140	0.25	125	-39.87	-0.81	0.45	
33	32	31	210	0.25	125	51.84	1.06	1.09	
34	33	32	210	0.25	125	52.10	1.06	8.80	
35	53	28	400	0.35	125	115.28	1.20	1.73	
36	18	34	200	0.10	100	4.77	0.61	1.60	
37	26	53	380	0.10	100	3.58	0.46	1.79	
38	35	34	400	0.35	125	111.14	1.16	1.61	
39	29	35	580	0.35	125	80.41	0.84	1.28	
40	36	37	400	0.30	125	13.30	0.19	0.07	
41	24	36	410	0.15	100	18.30	0.92	4.43	
42	23	21	500	0.15	100	6.90	0.39	1.10	
43	22	38	20	0.35	125	189.30	1.97	0.23	
44	1	39	20	0.30	125	124.54	1.76	18.96	
45	33	17	200	0.30	125	20.23	0.29	8.89	
46	28	33	200	0.30	125	74.71	1.06	0.82	
47	1	48	420	0.20	100	-31.42	-1.00	3.76	
48	19	38	200	0.30	125	23.53	0.33	0.10	
49	49	42	450	0.30	125	76.42	1.08	1.92	
50	50	22	5	0.45	125	251.87	1.58	0.03	
51	43	40	200	0.30	125	-0.52	-0.01	0.00	
52	44	41	300	0.30	125	-12.51	-0.18	0.04	
53	45	42	340	0.10	100	5.92	0.75	4.05	
54	40	4	200	0.20	100	-0.66	-0.02	0.00	
55	41	5	200	0.30	125	-15.69	-0.22	0.05	
56	42	7	300	0.30	125	80.10	1.13	1.40	
57	35	37	200	0.30	125	-13.19	-0.19	0.03	
58	2	46	400	0.20	100	1.38	0.04	0.01	
59	46	43	800	0.30	125	0.00	0.00	0.00	No
60	43	44	450	0.30	125	0.00	0.00	0.00	No
61	44	45	850	0.30	125	8.26	0.12	0.06	
62	47	12	400	0.20	100	-3.80	-0.12	0.07	
63	21	36	450	0.30	125	0.00	0.00	0.00	No
64	47	49	450	0.30	125	0.00	0.00	0.00	No
65	49	11	450	0.30	125	-77.69	-1.10	1.98	
66	29	47	400	0.30	125	0.00	0.00	0.00	No
67	48	22	420	0.20	100	-31.99	-1.02	3.89	
68	48	46	315	0.30	125	0.00	0.00	0.00	No
69	51	1	5	0.30	125	93.13	1.32	0.03	
71	34	53	200	0.35	125	111.70	1.16	0.81	

NODE TABLE

Node	Elevation	Demand	Pressure	HGL	XCoord	YCoord	Status
	m	l/s	kPa	m			ON
1	51.00	0.00	575.49	109.77	0	1620	
2	35.00	0.62	508.14	86.89	400	1620	
3	29.00	0.47	527.73	82.89	800	1620	
4	23.00	0.28	547.59	78.92	1200	1620	
5	18.00	2.86	556.23	75.00	1600	1620	
6	16.50	2.65	544.86	72.14	2000	1620	
7	14.00	253.58	542.63	69.41	2400	1620	
8	12.00	1.37	578.38	71.06	2800	1620	
9	6.00	1.04	653.85	72.77	3200	1620	
10	8.00	3.20	639.41	73.29	3200	1500	
11	22.50	2.21	511.26	74.71	3200	1185	
12	30.00	2.92	501.22	81.18	3200	790	
13	32.00	1.78	517.29	84.62	3200	590	
14	30.00	1.60	567.78	87.98	3200	420	
15	14.00	1.87	733.73	88.93	3200	0	
16	25.50	2.00	635.05	89.33	2830	0	
17	50.00	2.15	369.31	90.76	2380	0	
18	55.00	0.00	465.96	154.63	1980	0	
19	59.00	2.32	447.86	154.74	1580	0	
20	68.00	1.24	394.87	156.33	1190	0	
21	84.00	5.25	274.20	112.00	800	320	
22	78.50	0.37	400.72	117.42	400	810	
23	71.00	2.48	412.26	113.10	800	810	
24	70.00	1.50	383.53	109.17	1200	810	
25	62.50	0.22	425.21	105.92	1600	810	
26	68.00	0.58	372.11	104.00	2000	810	
27	60.00	0.49	413.79	102.26	2400	810	
28	65.00	4.68	347.51	100.49	2400	400	
29	45.00	0.23	449.23	90.68	2790	380	
30	35.50	6.54	529.10	89.74	2950	210	
31	28.50	1.35	600.09	89.78	2870	120	
32	45.00	0.26	449.16	90.67	2690	120	
33	60.00	2.36	388.46	99.67	2400	200	
34	65.00	4.21	372.37	103.03	2000	200	
35	73.00	6.00	309.81	104.84	1600	200	
36	81.50	3.00	227.55	104.74	1200	390	
37	77.00	0.11	270.96	104.67	1380	190	
38	75.00	0.00	413.29	117.21	420	810	
39	49.00	1.50	409.39	90.61	20	1620	
40	34.00	0.14	439.85	78.92	1200	1410	
41	23.50	3.18	503.92	74.96	1600	1410	
42	26.00	2.24	438.79	70.81	2400	1310	
43	45.00	0.52	332.13	78.92	1200	1210	
44	43.00	4.25	312.51	74.91	1600	1110	
45	49.00	2.34	253.18	74.86	2400	1070	
46	43.00	1.38	429.68	86.88	400	1200	
47	50.00	3.80	304.65	81.11	2800	800	
48	60.00	0.57	524.20	113.53	85	1220	
49	42.50	1.27	296.00	72.73	2800	1250	
50	76.90	0.00	400.98	117.45	395	810	
51	51.00	0.00	575.79	109.80	-5	1620	
53	70.00	0.00	315.44	102.21	2000	400	

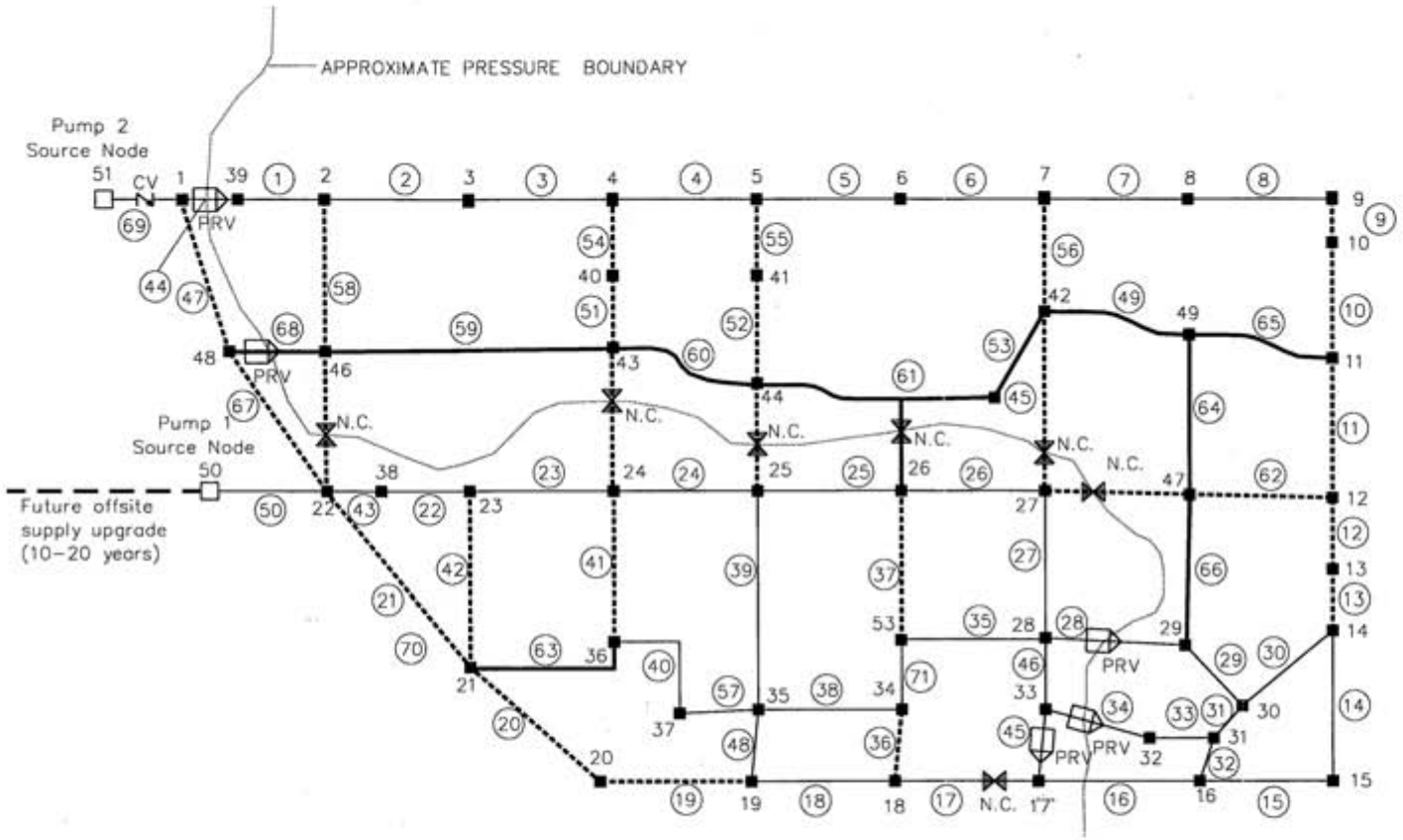
INFLOW TABLE

Node	Pumps	OpCurve	%Estimate	%Actual	Inflow
					l/s
50	1	Pump1	0.50	0.73	-251.87
51	1	Pump2	0.50	0.27	-93.13

REDUCING (PRV) TABLE

Pipe	Source	Pressure	OpenK	CKV	PRVLoss	CKVState
		kPa			m	
44	50	410.00	0.00	Yes	18.75	Open
28	50	450.00	0.00	Yes	8.06	Open
34	50	450.00	0.00	Yes	7.73	Open
45	50	400.00	0.00	Yes	8.82	Open

PUMP1		PUMP2	
Flow	Head	Flow	Head
l/s	m	l/s	m
0	40.95	0	58.80
50	40.95	50	58.80
100	40.95	100	58.80
150	40.95	150	58.80
200	40.95	200	58.80
250	40.95	250	58.80
300	40.95	300	58.80
350	40.95	350	58.80
400	40.95	400	58.80
450	40.95	450	58.80
500	40.95	500	58.80
550	40.95	550	58.80
600	40.95	600	58.80



Note:

Normally closed interconnections between pressure zones were not modelled and they are shown on the schematic for clarity purposes only.

Pipe Number	Pipe Length (m)	Pipe Diameter (mm)	Pipe Number	Pipe Length (m)	Pipe Diameter (mm)	Pipe Number	Pipe Length (m)	Pipe Diameter (mm)	Pipe Number	Pipe Length (m)	Pipe Diameter (mm)
1	380	300	21	650	350	41	410	300	61	850	300
2	400	300	22	380	350	42	500	300	62	400	300
3	400	300	23	400	350	43	20	350	63	450	300
4	400	300	24	400	350	44	20	300	64	450	300
5	400	300	25	400	300	45	200	300	65	450	300
6	400	300	26	400	300	46	200	300	66	400	300
7	400	300	27	410	300	47	420	300	67	420	300
8	400	300	28	375	350	48	200	300	68	315	300
9	120	250	29	275	350	49	450	300	69	5	300
10	300	250	30	400	350	50	5	450	71	200	350
11	380	250	31	140	300	51	200	300			
12	200	250	32	140	250	52	300	300			
13	170	300	33	210	250	53	340	300			
14	420	300	34	210	250	54	200	300			
15	370	350	35	400	350	55	200	300			
16	450	200	36	200	200	56	300	300			
17	400	200	37	380	200	57	200	300			
18	400	200	38	400	350	58	400	300			
19	420	300	39	580	350	59	800	300			
20	400	300	40	400	300	60	450	300			

Project:
City of Surrey
South Newton Neighbourhood Concept Plan

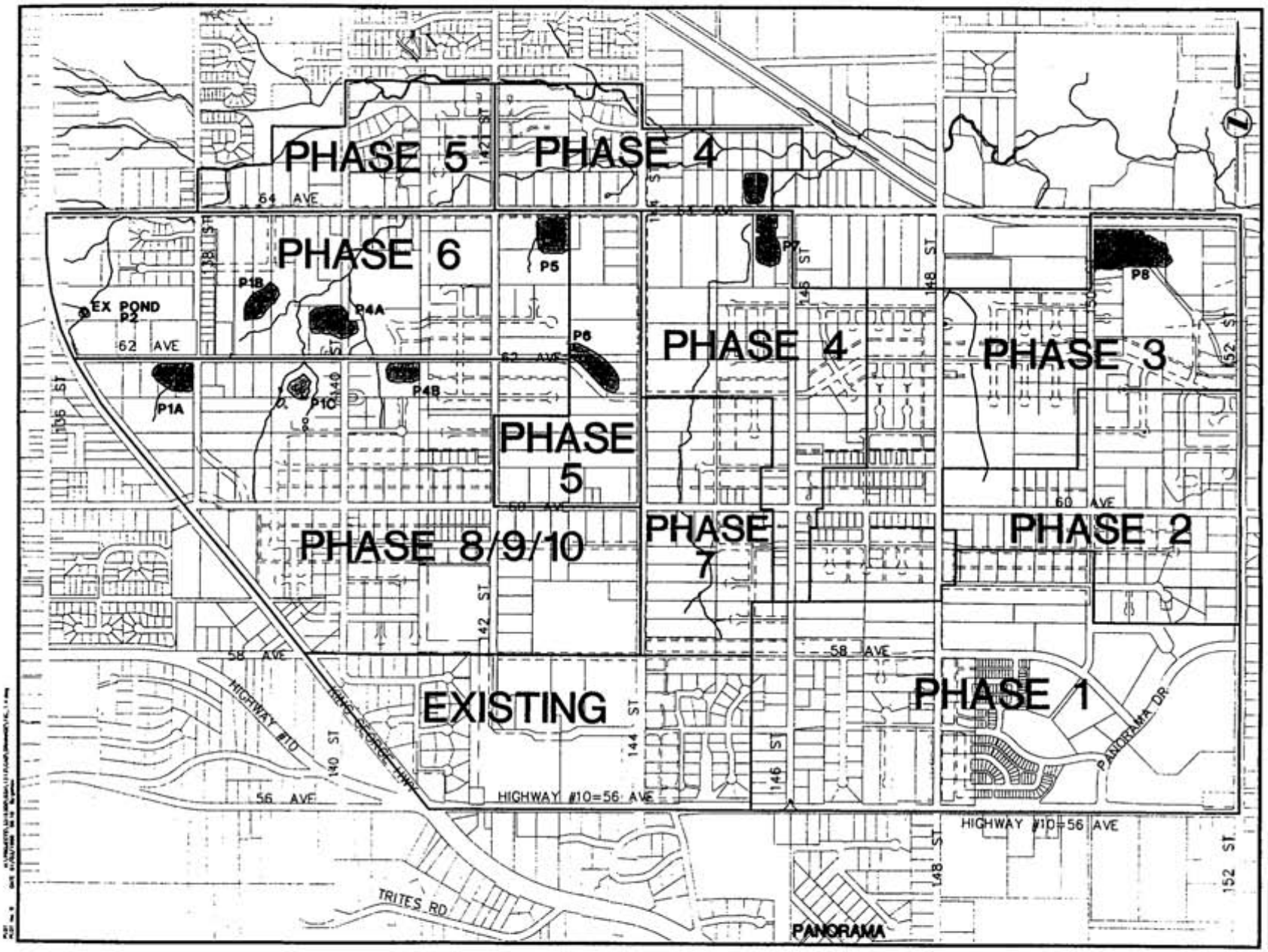
LEGEND

- PRV — Pressure Reducing Valve
- Pump 1 — Simulated Pump At Source Node
- ■ 35 — Node Number
- (54) — Pipe Number
- CV — Check Valve
- N.C. — Proposed Valve Normally Closed
- Existing Pipe
- Replacement/ Upsizing of Existing Pipe
- New Pipe

Reid Crowther

Title:
City of Surrey
Figure 6.2
Proposed Network Schematic

APPENDIX F
FINANCIAL ANALYSIS



Project:

City of Surrey

South Newton Neighbourhood Concept Plan

NOTES:

1. PHASING BOUNDARIES ARE CONCEPTUAL ONLY.
2. EACH PHASE IS EXPECTED TO TAKE SEVERAL YEARS AND OVERLAP.

SCALE 1:10000

Reid Crowther

Title:

City of Surrey

SERVICING PLAN PHASES

TABLE A

Projected Estimate of DCC Revenues
South Newton Neighbourhood Concept Plan
Assumptions: - Sub Areas, as per Map B (Appendix B)
- Land Use, as per Table A (February, 1999)
- New Units Added Only

	New Units	Number	Sanitary Rate $	Sanitary Revenue	Water Rate $	Water Revenue	Storm Rate $	Storm Revenue	Collector Rate $	Collector Revenue
Sub Area 1										
Suburban	Lot	12	950	11,400	1,020	12,240	4,740	56,880	1,370	16,440
Single Family	Lot	103	950	97,850	1,020	105,060	2,370	244,110	1,370	141,110
Small Lot	Lot	95	950	90,250	1,020	96,900	1,400	133,000	1,370	130,150
Townhouse	Area	335,412	0.55	184,477	0.59	197,893	0.92	308,579	0.61	204,601
Apartments	Area	433,205	0.60	259,923	0.64	277,251	0.59	255,591	0.77	333,568
Commercial	Area	104,544	300	31,363	320	33,454	1,540	160,998	620	64,817
Institutes	Area	479,378	300	143,813	320	153,401	925	443,425	210	100,669
Public School (m2)	Area	28.00	300	8,400	320	8,960	950	26,600		0
Total				**827,476**		**885,159**		**1,629,182**		**991,356**
Sub Area 2										
Single Family	Lot	159	950	151,050	1,020	162,180	2,370	376,830	1,370	217,830
Small Lot	Lot	0	950	0	1,020	0	1,400	0	1,370	0
Townhouse	Lot	346,402	0.55	190,521	0.59	204,377	0.92	318,690	0.61	211,305
Mixed (Retail)	Area	34	300	10,200	320	10,880	1,540	52,360	620	21,080
(Townhouse)	Area	33,518	0.55	18,435	0.59	19,776	0.92	30,837	0.61	20,446
Total				**370,206**		**397,213**		**778,716**		**470,661**
Sub Area 3										
Single Family	Lot	268	950	254,600	1,020	273,360	2,370	635,160	1,370	367,160
Small Lot	Lot	232	950	220,400	1,020	236,640	1,400	324,800	1,370	317,840
Townhouse	Lot	529,254	0.55	291,090	0.59	312,260	0.92	486,914	0.61	322,845
Mixed (Retail)	Area	35	300	10,500	320	11,200	1,540	53,900	620	21,700
(Townhouse)	Area	34,696	0.55	19,083	0.59	20,471	0.92	31,920	0.61	21,165
Public School (m2)	Area	28.00	300	8,400	320	8,960	950	26,600		0
Total				**804,073**		**862,891**		**1,559,294**		**1,050,710**
Sub Area 4										
Single Family	Lot	161	950	152,950	1,020	164,220	2,370	381,570	1,370	220,570
Small Lot	Lot	112	950	106,400	1,020	114,240	1,400	156,800	1,370	153,440
Townhouse	Lot	294,030	0.55	161,717	0.59	173,478	0.92	270,508	0.61	179,358
Commercial	Area	17	300	5,100	320	5,440	1,540	26,180	620	10,540
Mixed (Retail)	Area	25	300	7,500	320	8,000	1,540	38,500	620	15,500
(Townhouse)	Area	25,000	0.55	13,750	0.59	14,750	0.92	23,000	0.61	15,250
Sec. School (m2)	Area	104.00	300	31,200	320	33,280	950	98,800		0
Total				**478,617**		**513,408**		**995,358**		**594,658**
Sub Area 5										
Single Family	Lot	6	950	5,700	1,020	6,120	2,370	14,220	1,370	8,220
Small Lot	Lot	84	950	79,800	1,020	85,680	1,400	117,600	1,370	115,080
Townhouse	Lot	975,744	0.55	536,659	0.59	575,689	0.92	897,684	0.61	595,204
Sec. School (m2)	Area	28.00	300	8,400	320	8,960	950	26,600		0
Total				**630,559**		**676,449**		**1,056,104**		**718,504**
Sub Total										
Sub Areas 1 - 5				**3,110,930**		**3,335,119**		**6,018,655**		**3,825,889**
Sub Area 6										
Single Family	Lot	50	950	47,500	1,020	51,000	2,370	118,500	1,370	68,500
Small Lot	Lot	60	950	57,000	1,020	61,200	1,400	84,000	1,370	82,200
Townhouse	Lot	1,080,288	0.55	594,158	0.59	637,370	0.92	993,865	0.61	658,976
Commercial	Area	26	300	7,800	320	8,320	1,540	40,040	620	16,120
Mixed (Retail)	Area	16	300	4,800	320	5,120	1,540	24,640	620	9,920
(Townhouse)	Area	16,670	0.55	9,169	0.59	9,835	0.92	15,336	0.61	10,169
Total				**720,427**		**772,845**		**1,276,381**		**845,884**
Sub Area 7										
Single Family	Lot	125	950	118,750	1,020	127,500	2,370	296,250	1,370	171,250
Small Lot	Lot	48	950	45,600	1,020	48,960	1,400	67,200	1,370	65,760
Townhouse	Lot	226,512	0.55	124,582	0.59	133,642	0.92	208,391	0.61	138,172
Total				**288,932**		**310,102**		**571,841**		**375,182**
Sub Area 8 - 11										
Single Family	Lot	339	950	322,050	1,020	345,780	2,370	803,430	1,370	464,430
Small Lot	Lot	216	950	205,200	1,020	220,320	1,400	302,400	1,370	295,920
Townhouse	Lot	670,824	0.55	368,953	0.59	395,786	0.92	617,158	0.61	409,203
Apartments	Area	378,972	0.60	227,383	0.64	242,542	0.59	223,593	0.77	291,808
Commercial	Area	584	300	175,200	320	186,880	1,540	899,360	620	362,080
Mixed (Retail)	Area	123	300	36,900	320	39,360	1,540	189,420	620	76,260
(Townhouse)	Area	368,358	0.55	202,597	0.59	217,331	0.92	338,889	0.61	224,698
Total				**1,538,283**		**1,647,999**		**3,374,251**		**2,124,399**
TOTAL REVENUES										
Sub Areas 1-11				**5,658,572**		**6,066,066**		**11,241,128**		**7,171,355**