

CITY OF BURNABY

ENVIRONMENT AND WASTE MANAGEMENT COMMITTEE

HIS WORSHIP, THE MAYOR  
AND COUNCILLORS

RE: STONEY CREEK STORM WATER MANAGEMENT PLAN

RECOMMENDATIONS:

1. **THAT** Council approve, in principle, the recommended management strategy outlined in section 5.1 in this report.
2. **THAT** Council authorize staff to proceed with steps 2 to 5 outlined in section 6.0 in this report.
3. **THAT** a copy of this report be forwarded to all members of the Stoney Creek Project Steering Committee.

REPORT

The Environment and Waste Management Committee, at its meeting held on 1999 April 13, received and adopted the *attached* report providing an overview of the principles, elements and recommendations of a storm water management plan proposed for the Stoney Creek watershed. The Committee advised that the recommended strategy for the Stoney Creek watershed comprises a two-tier approach with the stream preservation goal serving as the main management strategy in the 20 year horizon and the stream enhancement goal serving as the long term vision for the watershed.

Respectfully submitted,

Councillor D. Johnston  
Chair

Councillor C. Redman  
Member

: COPY - CITY MANAGER  
- DIRECTOR ENGINEERING  
- DIRECTOR FINANCE  
- DIR. PLNG. & BLDG.  
- DIR. PARKS, REC. & CULT.

Councillor D. Lawson  
Member

**TO:** CHAIRPERSON & MEMBERS  
ENVIRONMENT & WASTE  
MANAGEMENT COMMITTEE

**DATE:** 1999 04 06

**FROM:** DIRECTOR ENGINEERING

**FILE:** 40-05-07

**SUBJECT:** STONEY CREEK STORM WATER MANAGEMENT PLAN

**PURPOSE:** To provide the Committee and Council with an overview of the principles, elements and recommendations of a storm water management plan proposed for the Stoney Creek watershed

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**RECOMMENDATION:**

THAT the Committee recommend to Council that:

1. Council approve, in principle, the recommended management strategy outlined in section 5.1 in this report.
2. Staff be authorized to proceed with steps 2 to 5 outlined in section 6.0 in this report.
3. A copy of this report be forwarded to all members of the Stoney Creek Project Steering Committee.

## EXECUTIVE SUMMARY

As a part of the Brunette watershed planning process, a project was initiated to develop a storm water management plan for the Stoney Creek watershed. The purpose of the project is to establish a management strategy and action plan for the Stoney Creek watershed to guide future storm water and environmental programs.

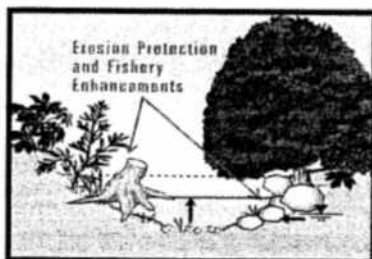
The Stoney Creek project was funded jointly by Burnaby, Coquitlam, Port Moody, SFU, GVRD and the Stoney Creek Environment Committee. The detailed work was conducted by an engineering and environmental consultant team. The study is now complete and a draft report has been produced. The purpose of this staff report is to provide an overview of the key elements and findings of the plan and to seek Council approval in principle of the management strategy that has been developed for the watershed. The associated action plan in support of the management strategy includes details on specific actions and improvements that can be undertaken to achieve the goal of the plan. Subject to Council approval of the strategy, the action plan will be used as the guide for future program implementation. Capital projects recommended in the study will be brought forward for Council approval in the future as part of the capital budget evaluation process.

The recommended management strategy for the Stoney Creek watershed is outlined in section 5.1. It comprises a two-tier approach with the stream preservation goal (option 3) serving as the main management strategy in the 20 year horizon and the stream enhancement goal (option 4) serving as the long term (50 year) vision for the watershed. Action programs associated with the recommended strategy are presented in Tables 1 and 2 in section 5.2.

A five-step process is outlined in section 6.0 for the development of a public review process and an implementation plan. This staff report provides a brief overview of the key findings and recommendations contained in the draft report prepared by the consultant. A copy of the full consultant report is available in the Engineering Department.

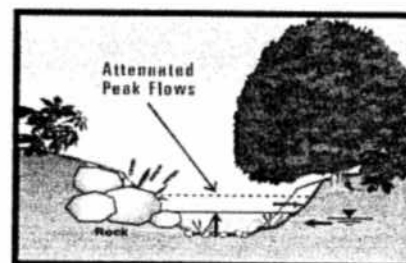
The Stoney Creek project has given the City an excellent opportunity to involve watershed stakeholders in shaping the best possible plan that will provide effective management of urban runoff and protection of the natural environment while accommodating growth and development in the watershed.

Preservation  
(Option 3)



20 Year Vision

Enhancement  
(Option 4)



50 Year Vision

## REPORT

### **1.0 BACKGROUND**

In 1997, the Brunette Basin Task Group was formed under the GVRD's Liquid Waste Management Planning process to develop a watershed management strategy for the Brunette basin. The Task Group includes representatives from the cities of Vancouver, Burnaby, Coquitlam and New Westminster; B.C. Ministry of Environment; Federal Department of Fisheries and Oceans; GVRD; BCIT; UBC/Westwater Research and the Sapperton Fish and Game Club.

Arising from the Brunette basin plan development process, short term action programs and projects were identified for implementation while the broader management plan is being developed. One of the short term projects that had been advanced was the Stoney Creek Storm Water Management Project. The Stoney Creek catchment is located within the Brunette basin. It was selected as a pilot for an urban storm water management study because of the watershed's significant and diverse ecological resources and the multitude of stakeholders who have interest in preserving the watershed.

The Stoney Creek catchment includes tributary areas in Port Moody, Coquitlam, Burnaby and SFU. To facilitate the storm water management study for the catchment that would meet the requirements of the stakeholders, a project steering committee comprised of representatives from the cities, GVRD and SFU as well as UBC/Westwater, BCIT and the Stoney Creek Environment Committee was formed. The project work was awarded to a team of engineering and environmental consultants in April 1998. The study is now complete and a draft report has been produced for municipal review before the final report is published for general distribution.

The purpose of this staff report is to summarize the key findings and recommendations and to present the principles and management strategy for Council's approval. Implementation of specific capital improvements recommended in the consultant's report will be the subject of future staff reports for consideration under the capital budget approval process.

### **2.0 COUNCIL POLICY**

In 1995, Council approved a staff report which outlined the concept of storm water management alternatives utilizing detention facilities, sedimentation control and wetland biofiltration. The concept has since been applied to development projects and storm water management studies in the City.

### **3.0 WHAT IS AN INTEGRATED STORM WATER MANAGEMENT PLAN?**

Flood protection and efficient storm runoff conveyance were the focus of past urban runoff management practice. Although the traditional practice provided a sound technical solution to control drainage flow, its impact on water quality and stream preservation has created environmental concerns that prompted the need to develop a more balanced approach to manage urban runoff that integrate drainage conveyance, land use planning and environmental protection into a seamless plan. This integrated approach has gradually evolved to become the preferred management practice for present day watershed planning work.

The basic strategy of an integrated storm water management approach has several broad objectives that are:

1. Protect property from flooding
2. Control stream erosion and sedimentation
3. Protect the ecosystems within the stream corridors
4. Reduce post development drainage impact on the receiving environment
5. Enhance storm runoff quality for aquatic life
6. Increase public awareness of the role of stewardship

In the storm water management planning process, the most important factor that is common to objectives 1 to 5 above is the changes in hydrology in a watershed. Changes in hydrology can be defined as runoff changes result from alteration in land use. In a watershed plan, addressing the hydrology issue would have direct and indirect environmental benefits in terms of water quality and ecosystem protection.

## **4.0 FRAMEWORK FOR THE STONEY CREEK STORM WATER MANAGEMENT PLAN**

### **4.1 Goal and Principles**

*The goal of the Stoney Creek storm water management plan is to develop a detailed drainage plan that protects property and enhances water quality while accommodating growth and sustaining the stream systems.*

Based on the above goal, guiding principles were developed that form the framework of the Stoney Creek plan. The guiding principles are:

1. The plan should be designed to provide reliable and efficient conveyance of storm runoff in a cost effective and environmentally acceptable manner.

2. The stream corridors and their biodiversity should be protected by mitigating development impact.
3. The recommended approach must be able to be integrated into the land use, development, community stewardship and public education plans.
4. All the municipalities within the catchment (Port Moody, Coquitlam and Burnaby) and the GVRD should share the common goal and endorse the principles of the plan.
5. Future development and redevelopment within the catchment should conform to the principles and recommendations of the plan.
6. Each municipality and the GVRD should review and prioritize the recommended improvements identified within the plan as part of the future capital program planning process.

#### 4.2 Key Elements of the Plan

There are several key elements that need to be considered in order to develop an effective strategy that would meet the watershed objectives. For the Stoney Creek watershed, four key elements were identified that form the foundation of the plan to address the technical, environmental and land use issues.

##### ELEMENT 1 - HYDROLOGY

*Strategy to mitigate flood and erosion damage resulting from peak flows during major storm events.*

The main purpose of this element is to formulate a flood risk management strategy with specific focus on culvert/storm sewer improvements. The total area of the Stoney Creek catchment is approximately 750 ha of which about 218 ha are within the Burnaby Mountain Park Conservation Area. For the purpose of hydrologic analysis, the study area was divided into 3 sections, the western sector, the main stem of Stoney Creek and the eastern sector as shown in Figure 1. The western sector comprises the area west of Stoney Creek including parts of the SFU campus and the future SFU development site. The main stem, as the name suggests, comprises the principle creek channel which is maintained by the GVRD. The eastern sector comprises the remaining drainage area including the upper catchment area in Port Moody and Coquitlam.

Recent research in Washington State concluded that when the total watershed imperviousness is about 30% to 35%, the changes in hydrology are usually so significant that the watershed may be unable to sustain abundant self-supporting cold water fish

populations. When the total watershed imperviousness reaches 60%, the pollutant loading would be a significant factor in fish survivability. The present total impervious area in the Stoney Creek watershed is approximately 29%, reflecting the beneficial contribution of the forested area in Burnaby Mountain Park.

In order to mitigate the impact of hydrology changes on the stream system, hydraulic analysis was conducted as part of the study to address flood protection and storm water storage requirements. Results of the analysis were used to develop a strategy for better runoff management and impervious area reduction targets.

## ELEMENT 2 - RIPARIAN CORRIDORS

*Strategy to bridge the hydrology and aquatic habitat components.*

This element is a key building block in the management plan that shapes the stream corridor preservation strategy. The effective width of a riparian habitat buffer zone is a strong indicator of the environmental health of the watershed and stream corridors.

Critical issues that need to be addressed include land acquisition, revegetation and protection of the ecosystem within the stream corridors.

## ELEMENT 3 - AQUATIC HABITAT

*Strategy to preserve and support the aquatic habitat.*

Although the stream networks within the catchment have been subjected to erosion and sedimentation caused by both the natural process and development activities, the watershed supports an ecosystem that is vital to the fish and wildlife resources of the Brunette basin. The presence of steelhead and cutthroat trout in the lower reaches of Stoney Creek is significant because of their rare occurrence in urban streams. The rich and diverse ecosystem in the stream corridor enhances the natural capacity of the stream to absorb and break down many pollutants conveyed by the runoff. The presence of a healthy population of aquatic bacteria, plants and invertebrates plays a major role in sustaining the fish populations. Therefore, the overall management strategy must recognize the physical and biochemical processes of the ecosystem in order to continue to support the aquatic population.

Critical issues that need to be addressed under the plan include erosion, sedimentation, barriers to fish movement and point source pollution. All of the issues were examined as part of the aquatic habitat assessment for the purpose of identifying opportunities for habitat protection.

## ELEMENT 4 - WATER QUALITY

*Strategy to link the hydrology component with the runoff quality component to mitigate the impact of pollutants in stream flow.*

The water quality element is an integral part of the storm water management plan. Recent research in the U.S. indicates that watershed imperviousness is directly proportional to runoff pollutant loading. Runoff quality can be improved with enhanced stream corridor protection, reduction in impervious area and better community awareness on watershed issues.

As part of the Stoney Creek study, runoff samples were collected during several storm events in 1998. The water quality data results were within acceptable federal-provincial water quality guidelines for the protection of aquatic life. The only exception was the high concentration of nitrate nitrogen which may be attributed in part to the use of lawn fertilizer. The long term implications of high nitrate nitrogen may be an increase in spring and summer algal blooms. The overall water quality results indicate pollutants that are characteristics of urban runoff and improvements can be achieved through better education, source controls and impervious area management.

## 5.0 KEY RECOMMENDATIONS OF THE PLAN

The purpose of the study is to develop a management strategy for an integrated approach to storm water and environmental matters and to identify improvement opportunities to achieve the goal. The recommendations developed in the study extend to all stakeholders and require the commitment of all contributing partners in order to effect the program recommended.

This staff report focuses on the elements that pertain to Burnaby. Other partners in the program (SFU, Port Moody, Coquitlam and GVRD) will be presenting reports to their respective Councils/Committees in order to gain acceptance of the overall management strategy and direction of the plan. This section highlights the management and action program strategies to bring the City towards the achievement of the vision developed for the watershed.

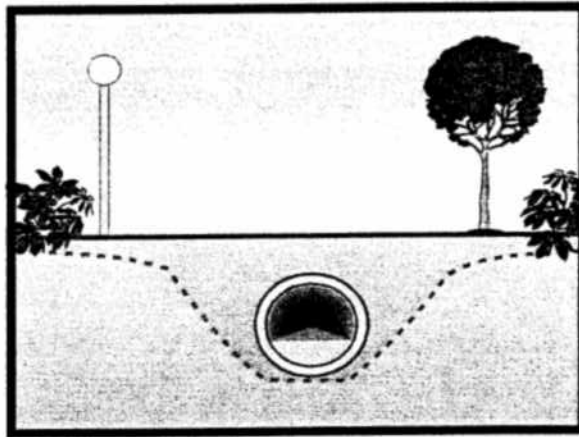
### 5.1 Recommended Management Strategy

The four key elements discussed in Section 4.2 provided the basis for the watershed management strategy for the Stoney Creek catchment. Having established the inter-relationship between watershed imperviousness, aquatic biodiversity and runoff quality, a total of six management alternatives were identified for the watershed. Some options are difficult to achieve or unable to meet the community vision, however, they are presented for comparison and evaluation purposes.



**OPTION 1 - STORM SEWERS**

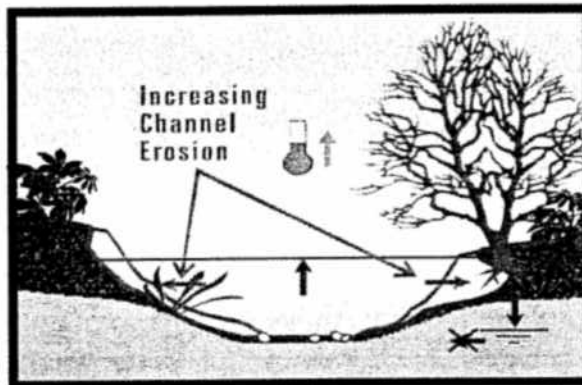
*Goal:* Convey Drainage  
*Description:* Replace streams and channels with storm sewers for more efficient drainage conveyance



*Environmental Impact:* Eliminates aquatic habitat and biodiversity  
*Watershed vision:* Not acceptable

**OPTION 2 - STORM SEWERS AND CHANNELS**

*Goal:* Convey drainage and protect channels  
*Description:* Retain stream channels to convey runoff

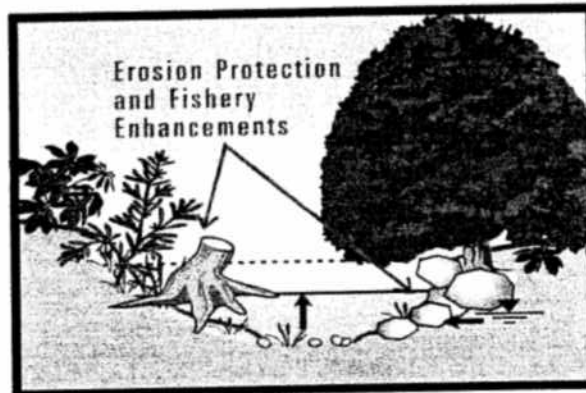


*Environmental Impact:* Severe channel erosion and decrease in aquatic habitat and biodiversity  
*Watershed Vision:* Not acceptable

### OPTION 3 - STREAM PRESERVATION

*Goal:* Preserve streams and the surrounding ecosystem with storm water management practice

*Description:* Construct in-stream enhancement work to protect existing habitat and to reduce runoff from new development

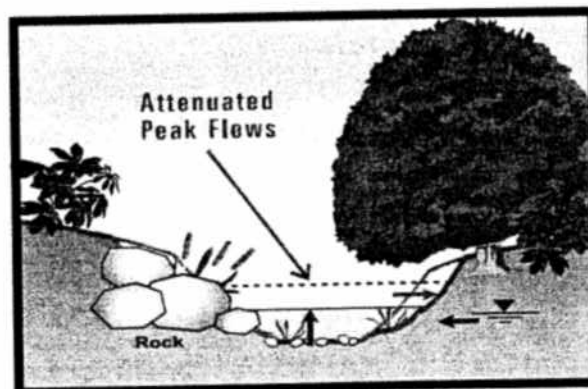


*Environmental Impact:* Maintains existing habitat and biodiversity and no further loss  
*Watershed Vision:* Acceptable

### OPTION 4 - STREAM ENHANCEMENT

*Goal:* Enhance streams to improve aquatic habitat with storm water management practice and impervious area reduction

*Description:* Reduce imperviousness in the watershed to modify runoff from existing and new development and provide in-stream enhancement. Establish riparian protection zone.



*Environmental Impact:* Enhances existing habitat and biodiversity  
*Watershed Vision:* Desirable

### OPTION 5 - STREAM RESTORATION

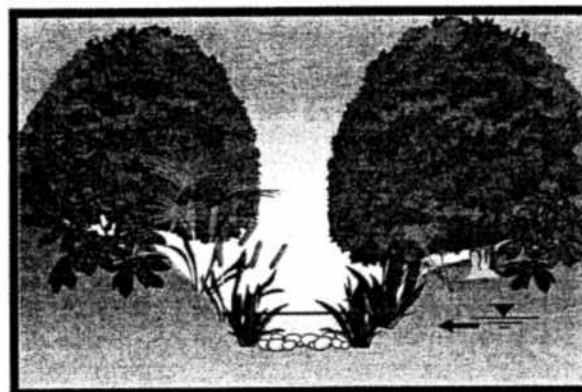
*Goal:* Restore aquatic habitat to pre-development condition  
*Description:* Establish riparian protection zone for all stream corridors and restore corridors for aquatic habitat. Reduce imperviousness further and provide significant storm water storage to modify stream flows.



*Environmental Impact:* Increases existing biodiversity and habitat to pre-development level  
*Watershed Vision:* Desirable but may be beyond affordability threshold

### OPTION 6 - STREAM CORRIDOR/WATERSHED RESTORATION

*Description:* Restore the stream corridor ecology and fully restore the ecological health of the watershed



*Environmental Impact:* Full restoration  
*Watershed Vision:* Not achievable and not compatible to community plan

The management alternatives outlined present a broad picture to correlate the environmental goal with land use and storm water management practice.

Options 1 and 2 represent the common approaches used in the past where the focus of a storm water management plan is on drainage conveyance and flood protection. Their primary purpose is to protect property by ensuring that significant storm events can be contained within the channels and culverts. Many urban watersheds in North America are moving beyond Options 1 and 2 in recognition of the importance to sustain a healthy ecosystem and biodiversity in the watersheds.

In contrast to Options 1 and 2, Options 5 and 6 strongly reflect their focus on restoring the environment to pre-development condition to achieve abundant biodiversity. For most, if not all urban watersheds, Options 5 and 6 are difficult to achieve and would require significant changes to the land use policy and community growth strategy. However, they serve as excellent goals for rural watersheds where many environmental restoration opportunities are available.

Options 3 and 4 have gained much acceptance in recent years as the preferred approach to an integrated and balanced watershed management plan. Option 3 basically is to preserve the existing environment and to implement environmental initiatives to mitigate impact due to new development. Option 4 would involve a higher level of storm water management strategy than Option 3 not only to sustain existing habitat but to improve the habitat through stream corridor acquisition, flow diversion, existing imperviousness reduction, etc.

The shaping of an urban storm water management plan is guided by any one or two of the strategies presented above. Council adopted a staff report in 1995 that outlined the framework for urban runoff control in Burnaby. The adopted principles are similar to those outlined in Option 3 described in this report and have been applied to master drainage plans for Hollis Creek, Byrne Creek and several significant development projects in recent years. The selection of an appropriate strategy for the Stoney Creek catchment was guided by Council previously adopted principles and the Brunette watershed vision. With the input of the project steering committee members during the course of the study, a consensus was reached that Option 3 is the preferred management strategy for Stoney Creek with Option 4 serving as the guiding vision for the long term watershed management goal. While this report is being advanced to Burnaby Council for approval of the recommended strategy, Coquitlam and Port Moody staff are pursuing their Council approval of same so all municipal stakeholders within the catchment share a common goal and vision for the watershed.

## 5.2. Recommended Action Plan

To implement the recommended storm water management strategy outlined in Section 5.1, a comprehensive action program has been developed for the watershed and is outlined in Tables 1 and 2.

TABLE 1 - PROPOSED ACTION PROGRAM - WESTERN SECTOR

Storm Water Management Elements	20 Year Plan (Option 3)	Long Term Vision (50 year) (Option 4)
Hydrology	<ul style="list-style-type: none"> <li>• Maintain effective impervious area at 1998 level of 29% *</li> <li>• Provide on-site detention for new development</li> <li>• Undertake improvements to replace undersized storm sewers and culverts</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce effective impervious area to below 20%</li> <li>• Provide regional detention to reduce existing flows</li> <li>• Consider flow diversion to reduce stream erosion problem</li> </ul>
Riparian Corridor	<ul style="list-style-type: none"> <li>• Replant disturbed portions of corridors to restore native vegetation</li> <li>• Promote community stewardship program</li> </ul>	<ul style="list-style-type: none"> <li>• Consider acquiring right-of-way for stream corridors</li> <li>• Increase effective width of undisturbed vegetation to a minimum 30 m (each side) for at least 60% of corridor length</li> </ul>
Aquatic Habitat	<ul style="list-style-type: none"> <li>• Remove fish barrier through the culvert improvement program</li> <li>• Implement stream enhancement projects through stream stewardship groups</li> </ul>	<ul style="list-style-type: none"> <li>• Replace all culverts with bridge crossings to improve fish passage</li> <li>• Place the highest enhancement priority on Tributary 3.</li> </ul>
Water Quality	<ul style="list-style-type: none"> <li>• Invest in public education and monitoring program</li> <li>• Provide better link between spill response and stewardship program</li> </ul>	<ul style="list-style-type: none"> <li>• Consider the use of regional detention for runoff treatment</li> <li>• Meet federal/provincial water quality guidelines</li> </ul>
<p>* 17% including the area within the limits of Burnaby Mountain Park</p>		

TABLE 2 - PROPOSED ACTION PROGRAM - EASTERN SECTOR

Storm Water Management Elements	20 Year Plan (Option 3)	Long Term Vision (50 year) (Option 4)
Hydrology	<ul style="list-style-type: none"> <li>• Maintain effective impervious area at 1998 level of 31%</li> <li>• Provide on-site detention for new development</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce effective impervious area to below 20%</li> <li>• Provide regional detention to reduce existing flows (2 sites)</li> <li>• Consider flow diversion to reduce stream erosion problem</li> </ul>
Riparian Corridor	<ul style="list-style-type: none"> <li>• Develop community stewardship program (Port Moody, Coquitlam)</li> </ul>	<ul style="list-style-type: none"> <li>• Consider acquiring rights-of-way for stream corridors</li> <li>• Increase effective width to a minimum of 30 m (each side) for native vegetation within the buffer zone for at least 60% of the corridor length (Port Moody, Coquitlam and the GVRD)</li> </ul>
Aquatic Habitat	<ul style="list-style-type: none"> <li>• Implement stream enhancement projects through stream stewardship group (Coquitlam and Port Moody)</li> </ul>	<ul style="list-style-type: none"> <li>• Investigate the feasibility of day lighting the channel in the upper reaches (Port Moody)</li> </ul>
Water Quality	<ul style="list-style-type: none"> <li>• Invest in public education and monitoring program</li> <li>• Provide better link between spill response and stewardship program (All three municipalities and the GVRD)</li> </ul>	<ul style="list-style-type: none"> <li>• Consider the use of regional detention for runoff treatment</li> <li>• Meet federal/provincial water quality guidelines</li> </ul>

In addition to the above proposed improvements, culvert replacements and habitat enhancement were also identified for the main stem of Stoney Creek which is maintained by the GVRD. To obtain full benefit of the recommended program, commitment to the plan and strategy is needed from all three municipalities and the GVRD. This report is not intended to seek Council approval of the action plan but rather to provide an overview of the framework of the action program. As the City proceeds toward the implementation stage, the proposed capital improvements will be brought back for Council's approval under the capital program approval process. The potential financial implication to the City related to the 20 year vision plan is approximately \$0.6M for the culvert work and approximately \$14.5M for water quality and storm water storage work under the 50 year vision plan. In addition, a program of \$5.5M for culvert upgrading is identified for the main Stoney Creek (GVRD) under the 20 year plan.

The above costs reflect the engineering improvement work only and do not include costs for stream enhancement and land acquisition programs.

**6.0 NEXT STEPS**


With the completion of the draft report, the following steps are recommended for the development of an implementation plan:

<i>STEP 1</i>	Council approve, in principle, the storm water management strategy outlined in section 5.1 in this report
<i>STEP 2</i>	Burnaby to work with the GVRD, Port Moody, Coquitlam and SFU to share a common vision for the watershed and stream corridor management.
<i>STEP 3</i>	Raise community awareness of the plan direction. A third public workshop on the Brunette Watershed Management Plan is scheduled for 1999 June 10. An opportunity will be available at the meeting to present the Stoney Creek study to the workshop participants for input.
<i>STEP 4</i>	Use the recommendations outlined in the study with respect to habitat enhancement, culvert replacement, runoff control and water quality monitoring to develop future work programs in the watershed.
<i>STEP 5</i>	Complete the draft report after the Council and public review process is complete and integrate the strategy with the City land use planning process.

## 7.0 CONCLUSIONS

This report provides an overview of the key components and main recommendations contained in the Stoney Creek Storm Water Study draft report. The study is one of the many products produced under the Brunette Basin watershed planning partnership and is focussed on developing a management strategy and action plan to achieve the vision articulated through the Brunette process. The study has also crystallized a drainage planning philosophy, established hydrologic design criteria, developed elements of the plan and provided order of magnitude financial implications. A full copy of the complete report prepared by the consultants is available in the Engineering Department.

With Council's commitment to the protection of the environment in Burnaby, it is recognized that the traditional drainage management is not an acceptable watershed vision anymore. Through the Stoney Creek watershed planning process, it has become clear that a balanced approach integrating flood risk management and environment management is the preferred approach. The guiding vision and principles that have been advanced for Council's approval in this staff report also reflect the policy that was approved by Council in 1995 and the Brunette vision. The Stoney Creek watershed planning process has given the City an opportunity to involve watershed stakeholders in shaping the future and vision of a balanced plan that will provide effective management of urban runoff and protection of the natural environment while accommodating growth and development.

  
DIRECTOR ENGINEERING

LSC;jh  
Attach.

cc: City Manager  
Director Planning & Building  
Director Parks, Recreation & Cultural Services  
Director Finance



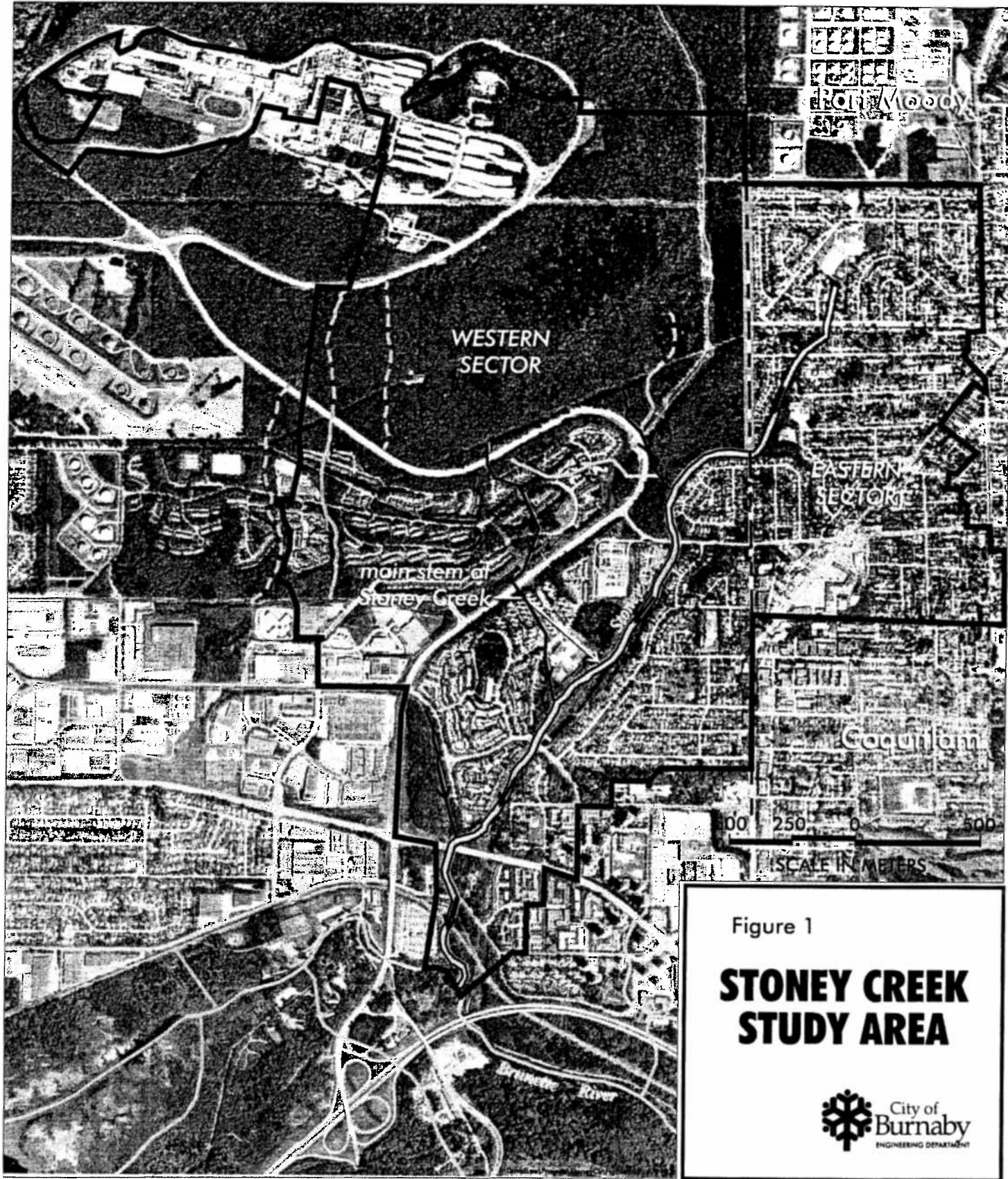


Figure 1

# STONEY CREEK STUDY AREA



