

CITY OF BURNABY

CIVIC DEVELOPMENT COMMITTEE

*HIS WORSHIP, THE MAYOR  
AND COUNCILLORS*

**RE: BURNABY FIRE DEPARTMENT FUTURE NEEDS STUDY**

**RECOMMENDATIONS:**

1. **THAT** Council approve in principle the construction of a new #2 Fire Hall (Edmonds) at its existing expanded location.
2. **THAT** Council authorize staff to prepare a report leading to the acquisition of the specific site for a new #7 Fire Hall in the vicinity of Burnaby General Hospital/BCIT with the intention of proceeding with the acquisition as a concurrent priority to Recommendation 1.
3. **THAT** Council direct staff to prepare a further report detailing the specific program and steps associated with the implementation of Recommendations 1 and 2 for the consideration of the Committee and Council.
4. **THAT** Council authorize initiation of a facility needs study for #1 Fire Hall (Canada Way/Sperling) following resolution of future plans for the City's Court House and RCMP responsibilities and space requirements.
5. **THAT** the remaining improvements proposed in the Fire Department Future Needs Study (i.e. upgrades to #4 Fire Hall (Duthie) and #6 (Brighton) and the construction of new Fire Halls at SFU and the Big Bend) be the subject of a future report to the Committee and Council identifying specific sites where necessary, as well as relative priorities.

**REPORT**

The Civic Development Committee, at its Open meeting held on 2002 May 23, received and adopted the attached report providing an overview of the Burnaby Fire Department Future Needs Study and recommending a staged fire station improvement program for the City.

Respectfully submitted,

Councillor D.R. Corrigan  
Chairman

Councillor G. Begin  
Vice Chairman

Councillor D. Evans  
Member

Copy - City Manager  
Deputy City Manager  
Director Engineering  
Director Planning & Building  
Director Finance  
City Clerk  
Fire Chief

**TO:** CHAIR AND MEMBERS  
CIVIC DEVELOPMENT COMMITTEE

2002 April 24

**FROM:** MAJOR CIVIC PROJECTS  
COORDINATING COMMITTEE

OUR FILE: 10.430

**SUBJECT: BURNABY FIRE DEPARTMENT FUTURE NEEDS STUDY**

**PURPOSE:** To present recommendations relating to the findings of the Future Needs Study for the Burnaby Fire Department.

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**RECOMMENDATIONS:**

1. **THAT** the Committee recommend that Council approve in principle the construction of a new #2 Fire Hall (Edmonds) at its existing expanded location.
2. **THAT** the Committee recommend to Council that staff be authorized to prepare a report leading to the acquisition of the specific site for a new #7 Fire Hall in the vicinity of Burnaby General Hospital/BCIT with the intention of proceeding with the acquisition as a concurrent priority to Recommendation 1.
3. **THAT** staff be directed to prepare a further report detailing the specific program and steps associated with the implementation of Recommendations 1 and 2 for the consideration of the Committee and Council.
4. **THAT** Council be requested to authorize a facility needs study be initiated for #1 Fire Hall (Canada Way/Sperling) following resolution of future plans for the City's Court House and RCMP responsibilities and space requirements.
5. **THAT** the remaining improvements proposed in the Fire Department Future Needs Study (i.e. upgrades to #4 Fire Hall (Duthie) and #6 (Brighton) and the construction of new Fire Halls at SFU and the Big Bend) be the subject of a future report to the Committee and Council identifying specific sites where necessary, as well as relative priorities.

## REPORT

### 1.0 BACKGROUND

At its meeting of 2001 July 23, Council approved a recommendation to undertake a future needs study for the Burnaby Fire Department. The purpose of the study was to recommend a staged fire station improvement program for the City.

SMG/Columbia Consulting Group, in association with Gordon C. Routley, were retained by the City to conduct the study. The specific tasks of the consultants were to: 1) specify the number, location and sequencing of fire station additions, renovations and replacements; 2) determine the associated personnel and apparatus resources required; and 3) estimate the resultant capital and operating costs. A draft report prepared by the consultants was forwarded to the Civic Development Committee for its meeting on 2002 February 28. The consultant also presented a summary of the report at the meeting. The consultants have now completed the study.

Throughout the study, the consultants worked in close collaboration with a Steering Committee comprised of staff from the Fire, Planning, Building and City Manager's departments, as well as the President of Burnaby Firefighters Local 323.

This report summarizes the consultants' findings and provides recommendations from the Major Civic Project Coordinating Committee for the first priority phase of a multi-year fire station improvement program.

### 2.0 STUDY APPROACH

The consultant employed a three phase process in carrying out the Fire Department Future Needs Study. These are:

- Phase 1 - assessment of the present status of the Burnaby Fire Department's existing resources including the physical condition and suitability of Burnaby's existing fire stations; apparatus functionality and deployment; and staffing and deployment.
- Phase 2 - identification of potential fire hall location and resource deployment options in response to existing and planned growth and risk scenarios, including multiple station location alternatives and associated travel times, and
- Phase 3 - development of recommendations as to relative priorities.

### 3.0 KEY FINDINGS

*Figure 1* illustrates the location of Burnaby's six Fire Stations. The Executive Summary of the consultant's report has been included as *Appendix 1* to this report. The consultant's full report is provided to the Committee under separate cover.

#### 3.1 Existing Status of Fire Department

While the conditions of the existing 6 halls are variable, the consultant has ranked them as follows:

Fire Hall	Condition Rating	Comment
Fire Hall #1	Marginally adequate for current operations	Will require significant upgrading and additional space in the future, particularly for administrative and support functions
Fire Hall #2	Inadequate	Should be replaced
Fire Hall #3	Excellent	
Fire Hall #4	Marginally adequate for current operations	Will require significant upgrading and additional space in the future
Fire Hall #5	Excellent	
Fire Hall #6	Adequate	Would benefit from some minor upgrades

The consultants have concluded that the quality, condition and functionality of the Fire Department's fire fighting apparatus appears to be very good. It is also their view that the apparatus is well suited to the needs of the Department and the area it serves.

Given the location of the existing fire stations and the City's topography, the consultants also support the deployment and response policies employed by the Department.

#### 3.2 Response Times

As indicated in the Executive Summary, the consultant concluded that most built up areas in Burnaby can be reached within the acceptable industry standards. There is however, three areas where response times were deficient.

These areas where response times consistently exceeded the desired standard ( 4 minutes for first response - see *Figure 2*) include:

- a triangle extending east from Boundary Road to the Willingdon corridor between Canada Way and Moscrop Street;
- the Big Bend area; and
- the northeast of Burnaby including Burnaby Mountain and the Simon Fraser University Campus.

The size of the gaps suggests that three additional fire stations would be needed to fill the three coverage gaps.

In regard to full assignment response times, the industry standard specifies eight minutes as the target for assembling an effective operational fire suppression force at the scene of a structure fire. The computer model analysis indicated that this requirement can be met in most of the fully built-up areas of Burnaby, where units from several fire stations can converge within eight minutes. In terms of fire risk for the entire city, however, these objectives cannot currently be met in 3 perimeter areas, including a portion of Burnaby Heights and adjacent foreshore lands, parts of Burnaby Mountain and the southern portion of the Big Bend area (see *Figure 3*).

### 3.3 Recommended New Fire Halls

To address the major coverage gaps, the consultants concluded that new stations will be required in the Burnaby General Hospital/BCIT area, the Big Bend area and at SFU over a multi-year staged program. To provide this coverage, the consultants developed a number of fire station location options and City staff identified potential sites to be considered. The computer model was then used to evaluate the ability to provide initial response coverage to all built-up areas of Burnaby with different numbers of fire stations, different combinations of locations and different response time objectives. Emphasis was placed on covering the three existing coverage gaps, however the possibility of relocating or eliminating existing fire stations to develop a more efficient overall plan was also considered.

The initial analysis was based on providing four minute travel time coverage to all areas, which would require three additional fire stations to cover the gaps. Significant improvement to the deficient coverage areas identified in Figure 2 can be achieved through the addition of the 3 fire stations (see *Figure 4*). Full response coverage was then evaluated based on a future deployment plan designed to cover first due coverage gaps. This deployment plan also concluded that the same three additional fire stations would be required resulting in nine stations in total. The evaluation indicated a significant improvement in full response coverage of most areas of the City (see *Figure 5*).

The consultant has noted that it should be recognized that it is never possible to provide coverage that meets ultimate standards in all instances and that all plans need to provide the best possible coverage while balancing such factors as affordability, impediments created by topography, site availability, the condition and suitability of the road system and traffic congestion levels.

#### 4.0 CONSULTANT'S RECOMMENDATIONS

The consultants worked with the Steering Committee to assess the potential projects and determine those that should be acted upon and the sequencing of the projects. The following priorities were identified:

##### *Priority 1 - Add a Fire Station in the Burnaby General Hospital/BCIT area*

This area has the greatest need as it is highly developed and contains many high risk occupancies. The addition of a station in this area will also reduce some of the excess service demand being experienced by #3 and #5 Fire Halls. It will also reduce the deficiency in full response coverage identified in the #5 Fire Hall coverage area. The consultants have recommended that the engine and required crew for this station be obtained by moving staff and equipment from #3 Fire Hall. The capital cost of the new station is estimated at \$3.9 million but there would be no associated apparatus capital costs since this would be obtained from #3 Fire Hall. The consultants estimate that the addition of a new #7 Fire Hall would add \$63,000 to the annual operating expenses of the Fire Department.

Since the City will need to acquire the land on the recommended site for this station and the timing with this has considerable uncertainty, the consultants have suggested that priority 2, the construction of a new #2 Fire Hall at its existing location, could be interchanged with priority 1. The City already owns the land adjacent to its existing site so construction of a new, larger #2 Fire Hall could proceed more quickly.

##### *Priority 2 - Rebuild Fire Hall 2 at the Existing Location*

Fire Hall 2 was identified as being inadequate in its functionality and in poor physical condition. For these reasons, the consultants have recommended its replacement as the second priority. Since the City owns the land adjacent to the existing station, it will be possible to build a larger facility to meet Burnaby's normal fire station specifications at the existing location. This additional land was specifically obtained from the School District for the future redevelopment of the Fire Hall as part of its comprehensive land exchange in 1990. The capital cost of a new #2 Fire Hall is estimated at \$3.6 million. There would be no additional capital costs for apparatus or land acquisition. The consultants estimate that there would be an incremental addition to annual operating costs of \$37,000 for a new #2 Fire Hall but there would be no additional personnel expenses required.

***Priority 3 - Facility Needs Study for #1 Fire Hall***

The consultants have noted a pressing need for additional administrative and training space and upgrading at #1 Fire Hall. They have recommended that this project proceed in advance of new fire stations in the Big Bend and SFU areas. In order to identify facility requirements and the associated capital costs for the upgrade, the consultants recommend that a facility needs study of #1 Fire Hall be conducted.

***Priority 4 - Add a Fire Station in the Big Bend area***

The consultants have noted that although the Big Bend area constitutes a gap in coverage, it is still undergoing development and the necessary thresholds have yet to be met. They also note that hazards in the area will be mainly industrial rather than people-focused. For these reasons, construction of a new station in the Big Bend area is considered the fourth priority.

The capital cost of a new station in the Big Bend is estimated at \$3.6 million and the estimated cost of new apparatus is \$670,000. There would be no capital costs for land acquisition since the recommended site for the station is owned by the City. New crews would be required for the new station resulting in an increase in annual operating expenses of \$1,517,000 for personnel and an incremental addition to annual operating costs of \$63,000 for the new station.

***Priority 5 - Add a Fire Station in the SFU area***

The consultants have recommended that a station be constructed at SFU once the construction of dwelling units for the new community reaches the appropriate level. The SFU OCP commits the University to provide the City with a site. Prior to the construction of the new station, the consultants recommend that a first-due response time target of 5 minutes be set for the SFU. A longer response time can be justified on the basis that the SFU complex is concrete construction and is fully sprinklered and the low rise residences are also sprinklered so fire risk is reduced. In addition, the high concentration of young people that congregate at SFU means that cardiac-related emergency medical services should be proportionately lower than that for the general population. The consultants state that as development of the new community progresses, fire risk and emergency service demand will need to be monitored and the situation re-evaluated.

The consultants have not included capital and operating cost estimates for a new station at SFU since its construction is projected for the longer term.

## **5.0 RECOMMENDED PRIORITIES**

### **5.1 Construction of a new #2 Fire Hall and Acquisition of Land for #7 Fire Hall**

The Steering Committee for the Fire Department Future Needs Study has worked closely with the consultants in developing the final report and its recommendations. Based on the recommendations contained in the report, the Steering Committee recommends that the construction of a new #2 Fire Hall, as well as acquisition of the site for a new #7 Fire Hall in the vicinity of Burnaby General Hospital/BCIT, proceed concurrently as first priorities in addressing identified needs of the Fire Department.

The functionality and physical condition of #2 Fire Hall were identified in the report as being inadequate for the present operations of the Fire Department. Since the City owns the land adjacent to the existing station, the design and construction of a new larger station built to current standards could begin once approval is obtained from Council. In contrast, a level of uncertainty is associated with the acquisition of the recommended site for #7 Fire Hall which could delay its construction. For these reasons, it is recommended that the construction of a new #2 Fire Hall proceed prior to the construction of a new #7 Fire Hall. At the same time, however, it is recommended that the acquisition of the recommended site for a new #7 Fire Hall be pursued.

The capital cost of constructing a new #2 Fire Hall, as noted previously, is \$3.6 million. There would also be a one-time expense of \$225,000 to cover the cost of setting up a temporary fire station during construction of the new facility. There would be no additional increase in operating costs for personnel.

By proceeding in this order, it would allow the City to budget for the capital costs of constructing a new #7 Fire Hall in a time frame as determined by Council. During this time, it would also be possible to determine more accurately whether existing personnel and apparatus could be used to equip the new station. The Fire Department has stated that, in the interim, coverage of the Burnaby General Hospital/BCIT area can be managed with existing resources.

### **5.2 Facility Needs Study for #1 Fire Hall**

In recognition of the pressing need for additional space and upgrading at #1 Fire Hall, as identified by the consultants, the Steering Committee recommends that the renovation and expansion of the training ground at #1 Fire Hall proceed in advance of new stations in the Big Bend and SFU areas. It is recommended that the facility space needs study be conducted for #1 Fire Hall only after a decision has been reached regarding future plans for City's Court House and RCMP facilities.



### 5.3 Future Stations and Improvements to Existing Stations


The remaining improvements proposed in the Fire Department Future Needs Study (i.e. upgrades to #4 Fire Hall (Duthie) and #6 (Brighton)) and the construction of new Fire Halls at SFU and the Big Bend, will be the subject of a future report to the Committee and Council to identify specific sites where necessary and establish relative priorities.

### 6.0 CONCLUSION

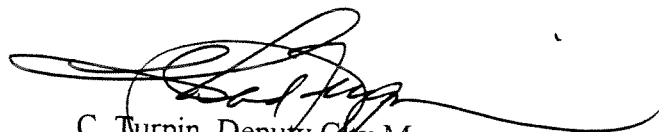
The Burnaby Fire Department has a staff of 261, of which 235 are frontline fire suppression/emergency services personnel. A key requirement for the provision of effective fire suppression and emergency medical response services is the ability to quickly deliver an appropriate number of properly trained and equipped personnel to the scene of an emergency incident. To this end, this report has presented a staged fire station improvement program for the City. It is the view of the Major Civic Projects Coordinating Committee that the recommendations of this report will provide the City with a sound framework to ensure that the City continues to be well served by an effective fire suppression and emergency medical response service. With Committee and Council approval of the recommendations of this report, further reports detailing specific programs and associated implementation steps will be forwarded to the Committee and Council for approval.

The President of Burnaby Fire Fighters Local 323 concurs with the recommendations of this report.

  
J. Stewart, Fire Chief  
FIRE DEPARTMENT

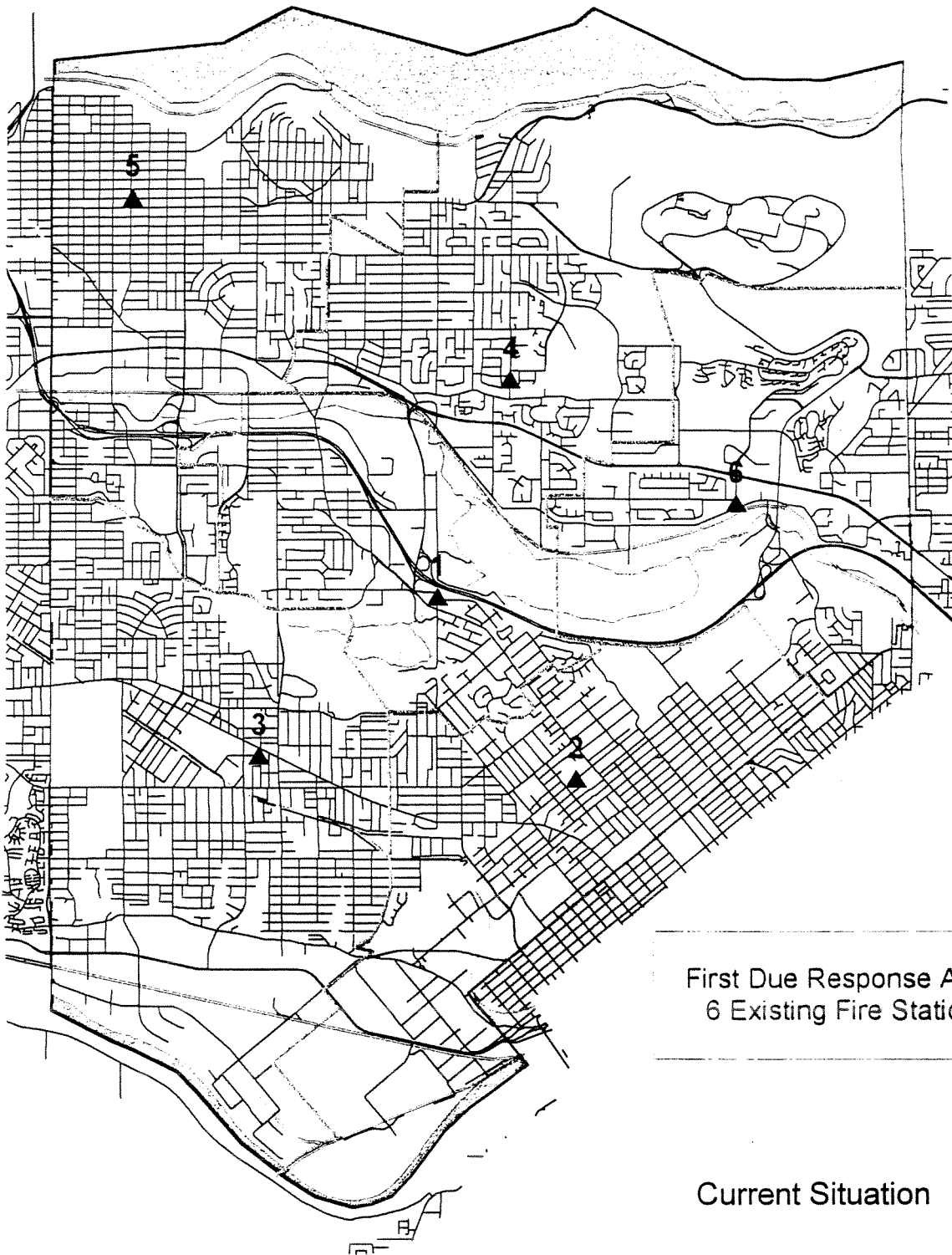
  
J.S. Belhouse, Director  
PLANNING AND BUILDING

  
C. Sinclair, Director  
ENGINEERING

  
C. Turpin, Deputy City Manager  
CITY MANAGER'S OFFICE

BLS:MM\mw  
Attachments(5)

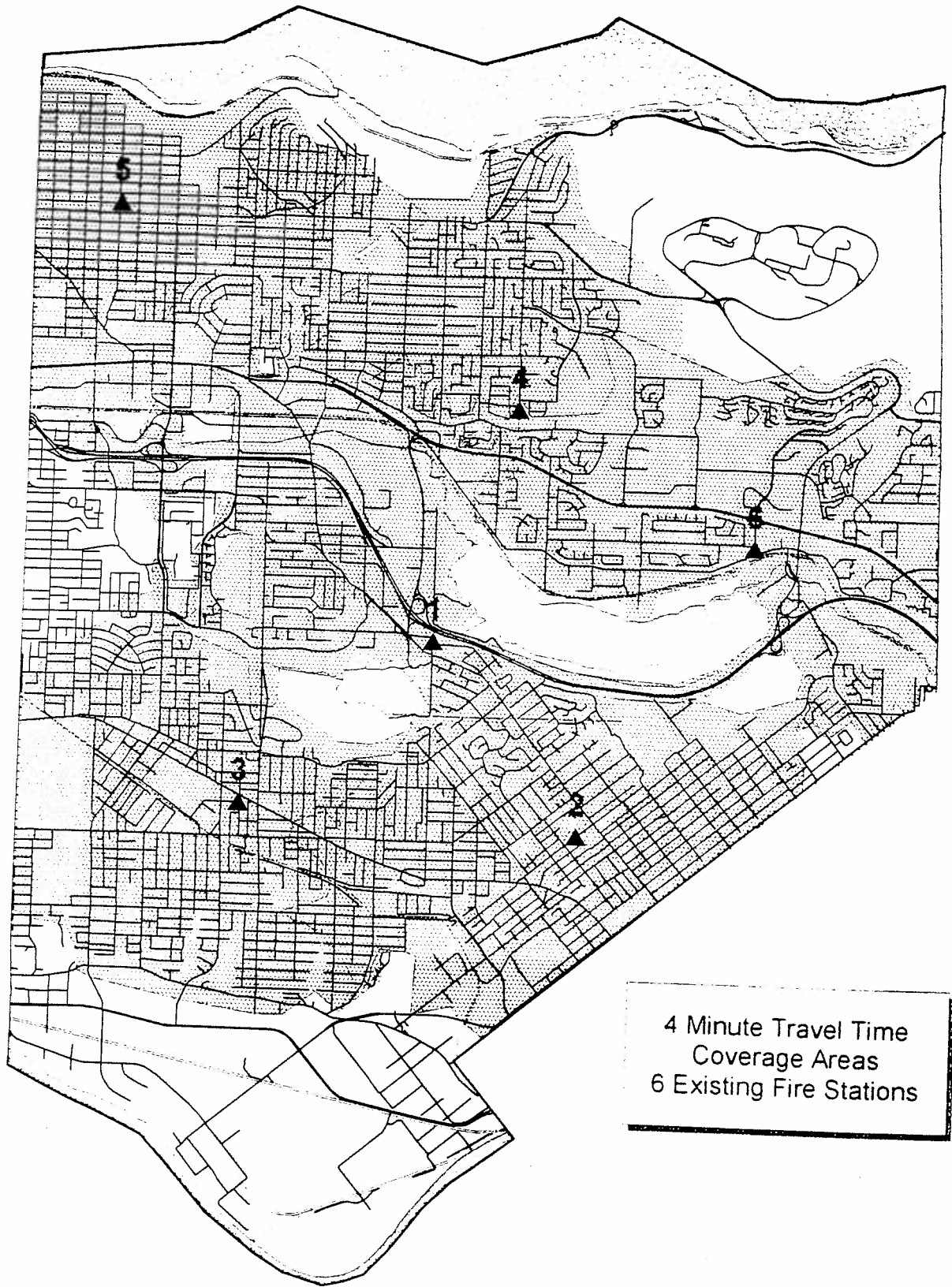
cc: City Manager  
Director Finance  
President Burnaby Fire Fighters Local 323



First Due Response Areas  
6 Existing Fire Stations

Current Situation

Figure 1



4 Minute Travel Time  
Coverage Areas  
6 Existing Fire Stations

Current Situation

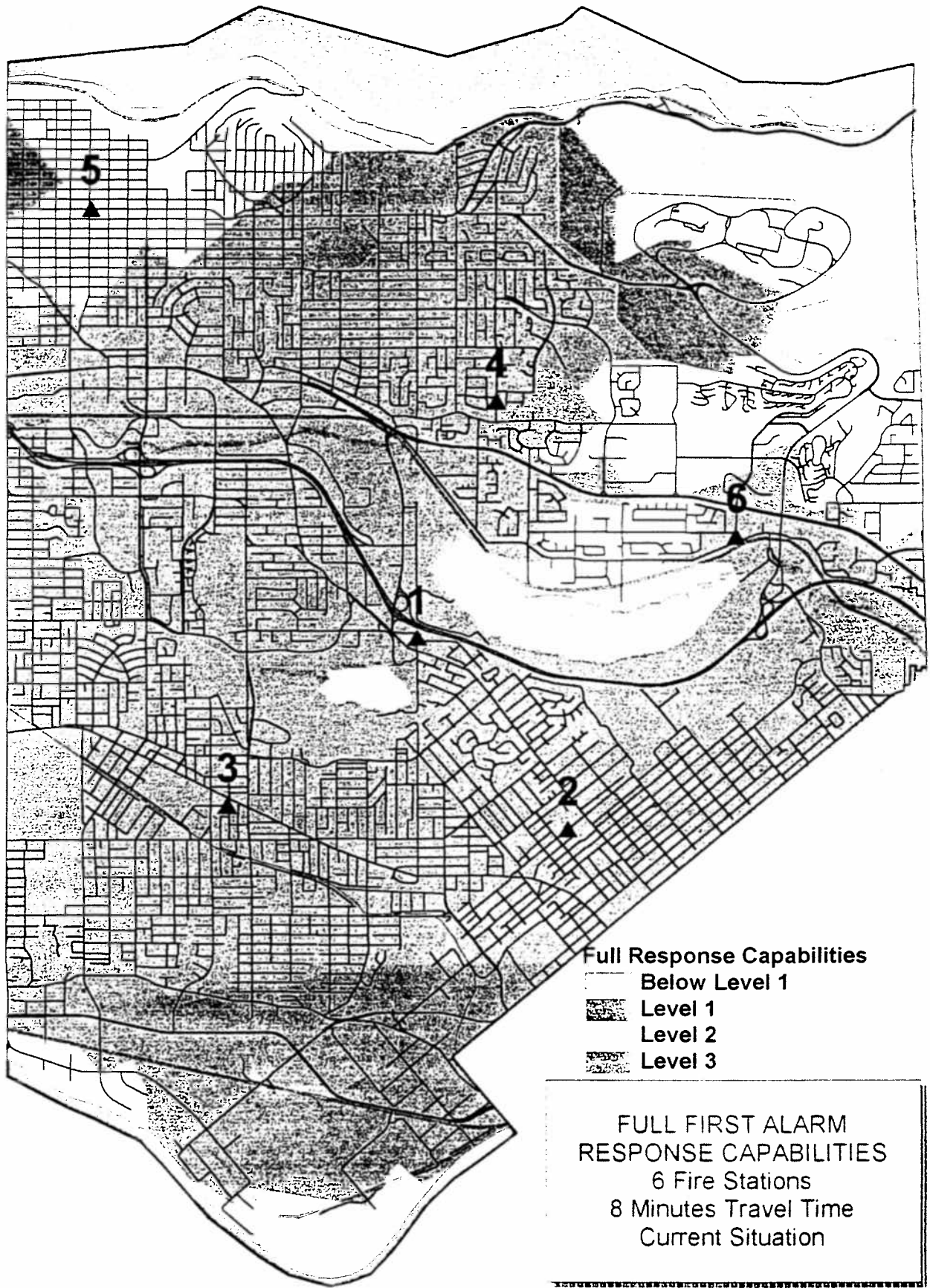


Figure 3

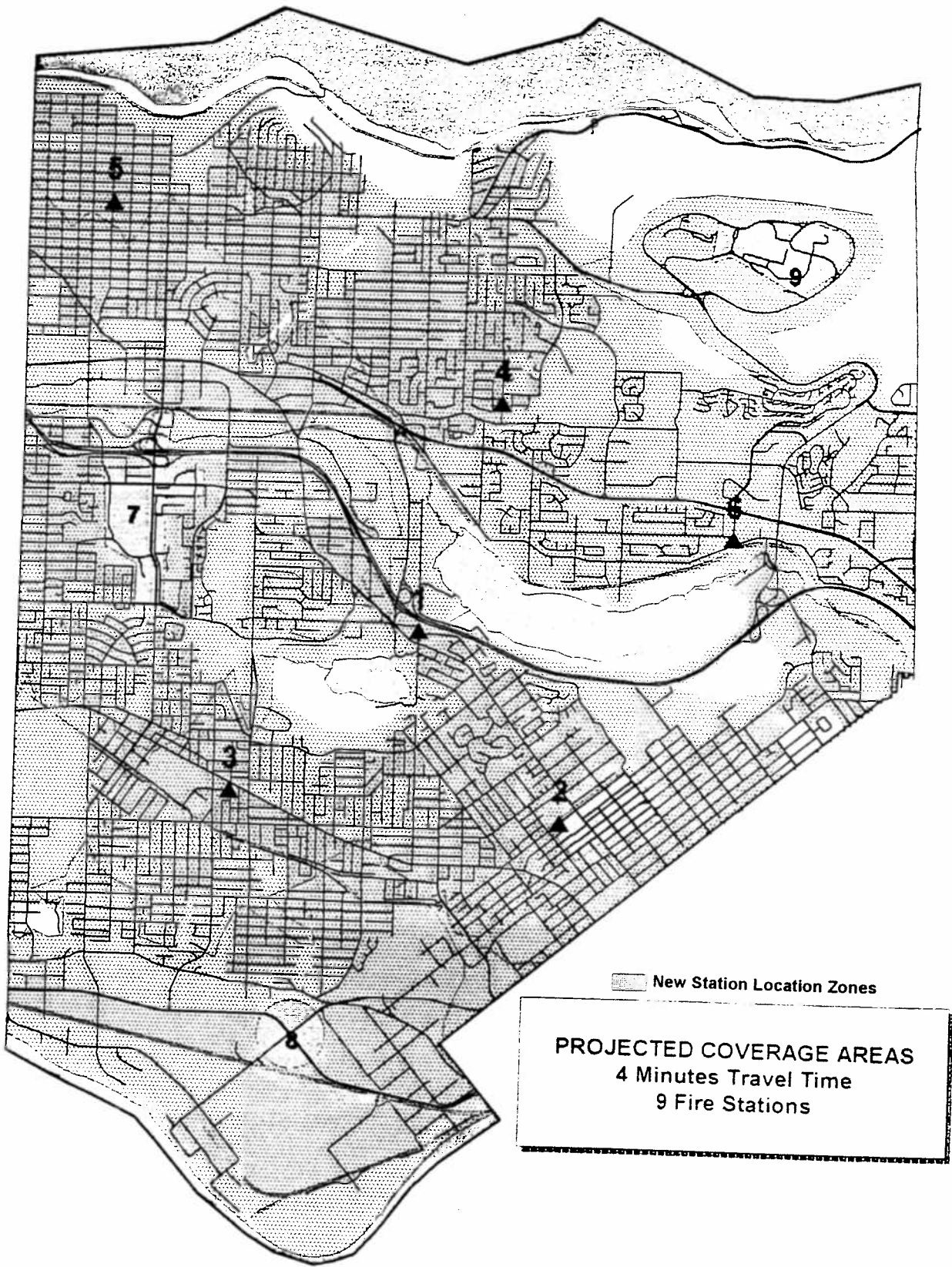


Figure 4

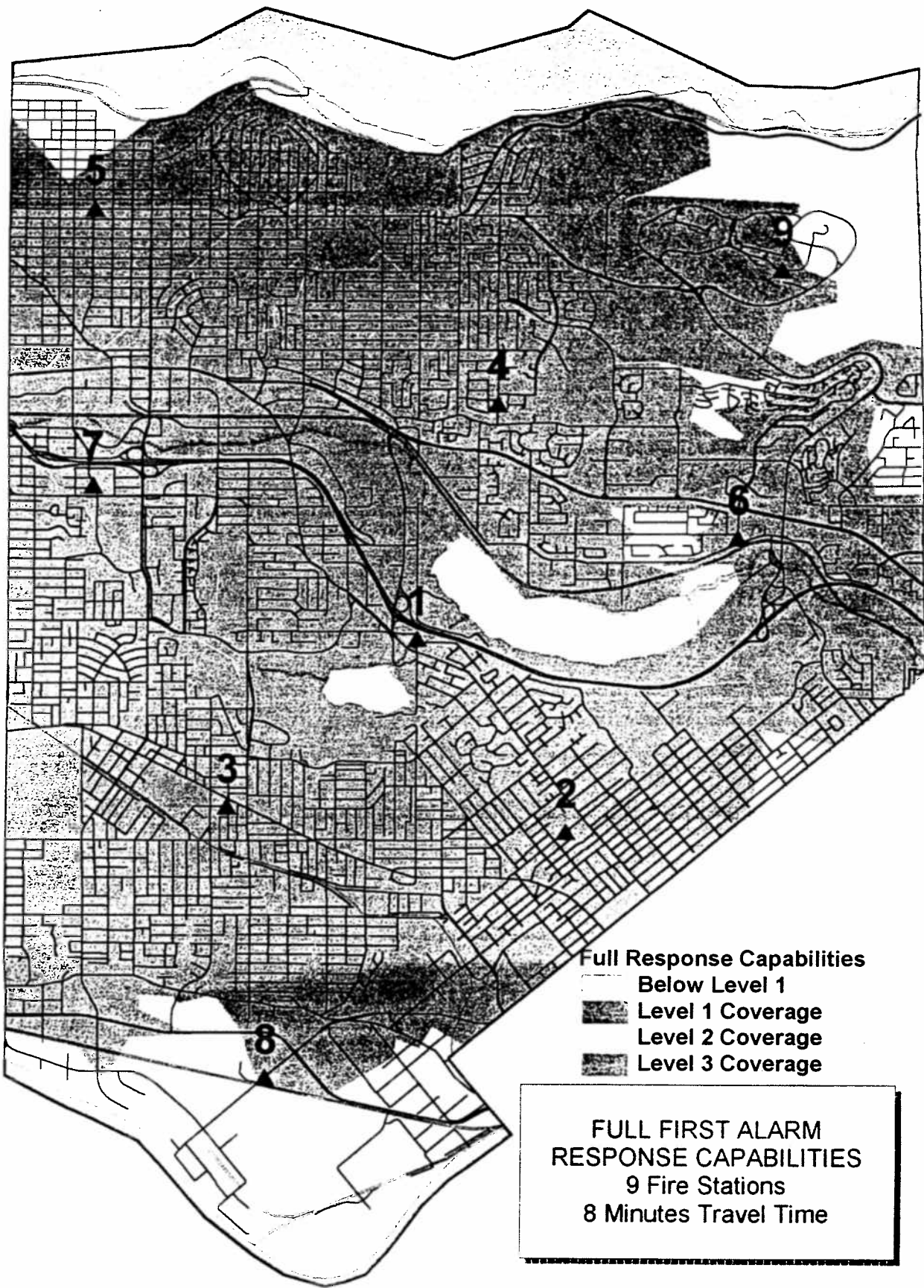


Figure 5



**FIRE DEPARTMENT  
FUTURE NEEDS STUDY  
FOR THE  
CITY OF BURNABY**

**EXECUTIVE SUMMARY**

**SMG/Columbia Consulting Group**  
in association with

**J. Gordon Routley**

**April 24, 2002**

## **EXECUTIVE SUMMARY**

The SMG/Columbia Consulting Group ("SMG"), in association with Gordon C. Routley, was retained by the City of Burnaby ("the City") "to carry out a study to recommend a staged fire station improvement program that both identifies the locations and numbers of any additional fire stations and addresses deficiencies in existing emergency response coverage and facilities". The study was to specify the number, location and sequencing of fire station additions, renovations and replacements; determine the associated personnel and apparatus resources required; and estimate the resultant capital and operating costs.

A three phase process was employed to carry out the Fire Department Future Needs Study:

- Phase 1 consisted of a situation assessment to identify the specific problems and issues which the future needs study must address;
- Phase 2 identified potential fire station location and resource deployment options focused on the identified issues; and
- Phase 3 developed a comprehensive recommendation regarding the most appropriate resourcing option for the City to pursue in the future.

### **THE PRESENT BURNABY FIRE DEPARTMENT RESOURCES**

The Burnaby Fire Department ("BFD") utilizes the following resources to deliver fire/rescue services within the City of Burnaby:

- The BFD has a staff of 261, of which 235 are frontline fire suppression/emergency services personnel. The minimum on shift strength is 47 fire fighters.
- The BFD operates 14 staffed frontline fire/rescue apparatus as well as 3 unstaffed units with 4 units in reserve.
- The BFD operates out of six fire stations strategically located about the city. The present fire station locations are:
  - Fire Station 1 4867 Sperling Avenue
  - Fire Station 2 7578 Edmonds Street
  - Fire Station 3 6511 Marlborough Ave.
  - Fire Station 4 2326 Duthie Avenue
  - Fire Station 5 4211 Hastings Street
  - Fire Station 6 3620 Brighton Avenue
- The BFD operating budget for the current year is \$23.1 million of which 92% goes to salaries and expenses.

### **SERVICES PROVIDED BY THE BFD**

The BFD provides a comprehensive range of emergency services. Its capability to provide the specific elements in the service mix has been tailored to the needs of the city, the demands placed upon it and the budget allotment. The present services by level of capability are:

- Full Service Capability - able to deal with the emergencies usually experienced in Burnaby (i.e. to the first alarm level)
  - Land-based Fire Suppression
  - First Responder Emergency Medical Service (EMS)
  - Rescue Associated with Motor Vehicle Accidents (MVAs)



## EXECUTIVE SUMMARY

- High Angle Rescue/Rope Rescue (Technical Rescue)
  - Hazardous Materials Response
  - Fire Suppression on Water
- Partial Service Capability - service level that limits the Department to stabilizing an emergency situation until specialized assistance arrives
    - Water Rescue
    - Confined Space/Trench Rescue
  - No Service Capability - no emergency capability; totally reliant on outside assistance
    - Shipboard Fire Fighting
    - Heavy Urban Rescue/Urban Search and Rescue
    - Underwater Rescue

Changes to the service mix anticipated by BFD management are expected to have little impact on resourcing requirements during the next five to ten years. However, plans for adding or rebuilding fire stations should ensure that they allow sufficient flexibility to accommodate any service upgrades or additions in the long term.

The demand for the services provided by the BFD is measured in the number of emergency incidents to which it responds. During the past five years the BFD responded to an average of approximately 10,000 emergency incidents per year.

Incident Type	1996 -2000	
	Incidents	%
Structure Fires	2,443	4.8%
Vehicle Fires	1085	2.1%
Outdoor Fires	1670	3.3%
Total Fires	5198	10.2%
False Alarms	10,084	19.8%
<b>TOTAL FIRE-RELATED</b>	<b>15,282</b>	<b>30.0%</b>
Emergency Medical	23,577	46.3%
Motor Vehicle Accidents	7,952	15.6%
Technical Rescue	18	LT 0.1%
Hazardous Materials	646	1.3%
Mutual Aid	n/a	-
Public Service	3,042	6.0%
Follow Up	398	0.8%
Fire Boat	24	LT 0.1%
<b>TOTAL NON-FIRE</b>	<b>35,657</b>	<b>70.0%</b>
<b>TOTAL RESPONSES</b>	<b>50,939</b>	<b>100.0%</b>

Although the number of incidents declined over this period, the reduction was mainly due to a change in interpretation of the First Responder protocols governing the calling out of fire

## EXECUTIVE SUMMARY

departments by British Columbia Ambulance Service dispatchers. The interpretation issue is expected to stabilize in the future so that the BFD service levels are generally expected to grow at a similar rate to the city's population.

## THE KEY ELEMENTS OF EFFECTIVE EMERGENCY RESPONSE

The key requirements for provision of effective fire suppression and emergency medical response services are the ability to quickly deliver an appropriate number of properly trained and equipped personnel to the scene of an emergency incident. In order to perform effectively, they must operate in a system that provides effective co-ordination and supervision, as well as the required types and quantity of physical resources, including apparatus, equipment and water supply. The key elements are then:

- Rapid response;
- The number of fire fighters on the scene at an emergency incident;
- The training, skills and capabilities of the fire fighters;
- Availability of the appropriate number and type of apparatus and equipment; and
- The operational systems and procedures used by the organization.

Within the above, the first two elements are generally the most critical. The location of fire stations and the deployment of personnel and apparatus to the stations are the key determinants of the ability to provide rapid response and the ability to get a fire fighter team of the required size to be effective to the incident.

## THE STATUS OF EXISTING RESOURCES

One of the main components of the Phase 1 situation assessment involved review of the present status of the existing BFD resources. This covered:

- The physical condition and suitability for present operations of the fire stations;
- Apparatus functionality and deployment; and
- Staffing and deployment.

The assessment of the physical condition of the existing fire stations by the consultants determined the following:

Fire Station	Condition Rating	Comment
Station 1	Marginally Adequate for Current Operations	Will require significant upgrading and additional space in the future, particularly for administrative and support functions
Station 2	Inadequate	Should be replaced
Station 3	Excellent	
Station 4	Marginally Adequate for Current Operations	Will require significant upgrading and additional space in the future
Station 5	Excellent	
Station 6	Adequate	Would benefit from some minor upgrades

## EXECUTIVE SUMMARY

The assessment of the BFD apparatus by the consultants concluded that the quality, condition and utility of the BFD apparatus is very good.

Given the resources available to the BFD and the constraints imposed by existing fire station locations and the city's topography, the consultants concluded that they support the deployment and resource policies presently employed by the Department.

## RESPONSE COVERAGE AREAS

Each fire station is responsible for primary coverage in a geographic area of the city, identified as a "First-Due" area. The primary fire engine assigned to each fire station is expected to be first on the scene for emergency incidents in that area, unless it has already been assigned to an incident or is unavailable for any other reason (in which case the next closest available apparatus responds).

The coverage areas for each of the fire stations are as follows:

Fire Station	General Coverage Area
1	The central portion of the city including the City Hall area, Deer Lake and Forest Lawn
2	The southeast portion of the city, including Edmonds Town Center and half of the Big Bend area
3	The southwest portion of the city, including Metrotown and half of the Big Bend area
4	The north centre portion of the city, including SFU
5	The northwest portion of the city, including Brentwood Town Centre, BCIT and Burnaby General Hospital
6	The north west portion of the city, including the Lougheed Town Centre but excluding SFU

In reviewing the coverage areas for the existing fire stations, the consultants emphasized the fact that there is a high correlation between the level and growth of population in an area and the level of demand for and growth of emergency services within the area. They determined that there is presently a significant imbalance between Burnaby's fire stations and the proportion of population each covers and the resultant level of emergency incident activity.

Fire Station	Proportion of Present Population	Index of Fire Station Population Coverage *	Proportion of Total Emergency Incidents
1	6%	0.42:1	8%
2	20%	1.40:1	19%
3	30%	2.11:1	31%
4	13%	0.93:1	10%
5	20%	1.41:1	22%
6	12%	0.90:1	10%
Total	100%	1.19:1	100%

\* The index is the ratio of the population per Burnaby fire station compared to the average for Canadian urban fire departments. The average population covered per Canadian central city fire hall = 25,000.

## EXECUTIVE SUMMARY

The demographic and development elements taken together create the risk profile of the city. Because fire station locations, resourcing decisions and response policies must properly take into account and provide for the pattern of risk in its coverage areas the consultants conducted a fire risk assessment of the City and the fire station coverage areas. They utilized a modification of a risk categorization system developed by the U. S. National Fire Academy. This system specifies four categories of fire risk, ranging from "zero" for undeveloped areas to "three" for high risk areas, such as high-rise buildings, industrial occupancies and large commercial outlets.

The assessment found that:

- The high fire risk situations within Burnaby are not concentrated in any specific area or small number of areas but are scattered throughout the city. The distribution of the high fire risk high-rises and industrial areas throughout the city means that all fire stations must be prepared to deal with high fire risk hazards within their coverage areas. Because the high risk areas are not concentrated within any specific areas it is not possible to "stack" manpower or apparatus in close proximity to deal with this.
- Most of the built-up area within Burnaby falls within the two lowest risk categories. This is a profile which is typical of urban communities.

## CURRENT RESPONSE PERFORMANCE

Response time is one of the key performance indicators for a fire department and one of the primary factors that must be considered in selecting sites for fire stations. Fire station locations are generally determined in relation to risk levels in different areas of a community and desired response times. Effective response time performance depends on the *distribution* of resources throughout the city and the *concentration* of resources in different areas, depending on risk levels and workloads.

- The distribution must allow for rapid response for initial unit(s) from the closest station. This determines the number and location of fire stations.
- The concentration must allow for delivery of sufficient personnel and equipment to assemble a safe and effective fire suppression team. This requires units from multiple stations and it determines the staffing and equipment required at each station.

Rapid initial response refers to the ability of the first arriving engine or ladder to be on the scene quickly before the fire grows out of control. This is designated as the first-due unit and the industry standard which has been used in this study specifies a four minute travel time or less. The response time for the first arriving fire or rescue unit at any type of emergency incident is directly related to the geographic distribution of fire stations throughout the city. In order to meet any response time objective set by the fire department there must be a fire station sufficiently close to the location of the emergency incident. This assumes that the first arriving unit will almost always come from the closest fire station and that travel distance and traffic conditions are the major factors that must be considered.

## EXECUTIVE SUMMARY

The assembling of an effective operational fire suppression force at the scene is known as full response coverage. The industry standard for this (which was also utilized in this study) is eight minutes. The assignment of fire fighters and vehicles to the individual fire stations must provide for the ability to assemble a force of the required number of fire fighters and equipment at the scene of a structure fire within a desired time. The actual size of the required fire fighter team varies with the level of risk involved but the industry benchmark stipulates a crew of fifteen for a fire in a single family dwelling. The level of fire risk in each area is used to determine the number of personnel and the combinations of vehicles that must be included in this force and units from two or more fire stations are usually required.

Although travel time is only one component of the total response time achieved by a fire department, it is the main measure for which standards are set and for which data are available for most fire departments.

The fire response effectiveness provided by the existing fire station coverage was evaluated by the consultants using two different approaches:

- Data from incident records collected by the BFD between 1997 and 2001 was used to determine average response times for first arriving units for each area of the city (full assignment data is not collected).
- A computer model of the street network was used to compare the capabilities of existing fire stations and alternative fire station sites and resource deployment plans for both first arriving units and full first alarm assignments.

The data indicates that *average* travel times in Burnaby vary from 3:00 minutes for Emergency Medical Service calls to 4:06 minutes for fire calls, with a combined average of 3 minutes and 34 seconds for all emergency responses. This suggests that the existing distribution of six fire stations results in times of between 3 and 4 minutes to most of the built-up areas of Burnaby.

Geographic analysis of the actual response data indicates that there are three significant areas where response times consistently exceed four minutes:

1. A triangle extending east from Boundary Road to the Willingdon corridor, between Canada Way and Moscrop Street.
2. The Big Bend area in the southern part of Burnaby.
3. The north-eastern area, including Burnaby Mountain and the Simon Fraser University Campus.

The presence of these coverage gaps had previously been identified in two prior studies of fire station locations in Burnaby (i.e. the *Report on Fire Hall Needs in Burnaby* of 1961 and the *Fire Prevention and Control Plan* of 1982). This was confirmed using the computer model to analyze anticipated response times on the existing road network. These three areas are beyond the four-minute travel time range of the six existing fire stations. The sizes of the gaps suggest that three additional fire stations would be needed to fill the three coverage gaps.

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In regard to full assignment response times, the industry standard set by the National Fire Protection Association ("NFPA") specifies eight minutes as the target for assembling an effective operational fire suppression force at the scene of a structure fire. Compliance with the NFPA standard requires approximately 15 personnel with three to four companies, including a command officer, for a fire in a single family dwelling. This requirement would apply to the areas classified as Risk Level 1 in the fire risk analysis of Burnaby. The computer model analysis indicates that this requirement can be met in most of the fully built-up areas of Burnaby, where units from several fire stations can converge within eight minutes. These objectives cannot be met in several perimeter areas, where units from only one fire station can arrive within eight minutes.

In summary, the gaps within the coverage provided by the existing fire stations are:

Area	Coverage Concern*		
	First In	Full Response Based on Current Response Practice	Full Response Based on Level of Fire Risk**
<b>MAJOR COVERAGE GAPS</b>			
Burnaby General Hospital/BCIT	✘		
SFU	✘	✘	✘
Big Bend	✘		✘
<b>OTHER COVERAGE GAPS</b>			
Top of Cariboo Road (i.e. south end)	✘		✘
A strip along the Burrard Inlet shoreline from Confederation Park to (and into) the Shellburn Refinery that extends south along the refinery property to Hastings Street and slightly beyond	✘	✘	✘
Fire Station 5 coverage area		✘	✘

\* the "Xs" indicate areas with coverage deficiencies.

\*\* *Full Response Based on Level of Fire Risk* refers to the ability to put different numbers of fire fighters and apparatus on the scene for different levels of risk. This calls for 15 to 18 fire fighters for Risk Level 1, 19 to 22 for Risk Level 2 and 23 to 28 for Risk Level 3.

The NFPA standards document states that additional personnel and equipment would be required for higher risk areas, such as commercial, industrial and high rise zones. However, these additional resources are not specifically identified in the document. For the purposes of this project, equivalent objectives for medium and high-risk areas (Levels 2 and 3) were developed by the consultants and the ability to meet the objectives within 8 minutes was evaluated. The ability of the BFD to deliver the appropriate resources for each area was then calculated, based on the current fire station locations, staffing and deployment. This analysis indicated that the requirements for Risk Level 3 can be met in most of the central areas of the city, however there

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are reduced capabilities in the perimeter areas, particularly in the north-east and north-western parts of Burnaby and in the Big Bend area.

The alternative of accepting longer response times was considered to determine if reasonable coverage could be provided with fewer fire stations. The option of a five minute first arriving/ten minute full assignment travel time objective was evaluated to determine whether these benchmarks could be achieved with fewer than nine fire stations (six existing plus three to fill the gaps). The analysis of initial response coverage (five minutes versus four minutes) confirmed that the three gaps would still exist and only one of the gaps would be significantly reduced in size. On this basis, the option of a five minute initial response time objective does not offer any significant cost savings.

The ten minute allowance for assembling resources rather than eight minutes would allow the higher risk level objectives to be met in larger areas, however this is an intangible benefit. The longer time to assemble resources would allow a fire to grow significantly and ultimately reduce the effectiveness of the fire attack force. Also, it would be difficult to justify acceptance of a standard different than the industry benchmark.

## EXPECTED FUTURE IMPACTS

An effective resource plan must also take into account expected changes in the future in the elements that drive or impact fire service demand and the locations of fire stations.

The population of Burnaby is expected to grow by almost two-thirds in the next twenty years so demand for the emergency services provided by the BFD can be expected to increase in a similar manner. Much of the population growth is expected to occur within the four town centres. If additional fire stations are not added, the imbalance will be even more significant in the future.

Fire Station	Expected 2021 Population	Proportion of 2021 Population	Index of Fire Station Population Coverage
1	12,232	4%	0.49:1
2	59,725	21%	2.39:1
3	67,699	24%	2.71:1
4	42,613	15%	1.70:1
5	65,202	23%	2.62:1
6	32,043	12%	1.28:1
Total	279,514	100%	1.86:1

The following observations and conclusions can be drawn from expectations regarding population and development provided by the Planning Department:

- The growth of population, employment and development expected in the future will not change the present fire department resources need pattern. That is, with the possible exception of the SFU area, it will not create new deficiency areas or areas that require additional fire stations beyond those identified based on the current situation.

## **EXECUTIVE SUMMARY**

- It will be very important that the BFD continue to maintain response capabilities that appropriately serve the four town centre areas.
- The high fire risk areas within Burnaby will continue to not be concentrated in any specific area but will remain scattered throughout the city. As a result, all fire stations will need to continue to be prepared to deal with high fire risk hazards within their coverage areas.
- Most of the built-up areas within Burnaby will continue to fall within the two lowest fire risk categories.
- The fire risk profile of Burnaby will remain virtually unchanged in the foreseeable future. The reason there is expected to be so little change in the future fire risk profile results from the fact most of the future development is expected to fall within areas that already contain similar risks. For example, the Metrotown town centre area is already rated "Fire Risk Level 3" (High Risk) because of the existing concentration of high-rise, institutional and large commercial occupancies. The expected addition of numerous high-rise buildings in the next ten or twenty years will not change the rating of the area as it already denotes the highest risk category.

## **RECOMMENDATIONS**

To address the major coverage gaps the consultants concluded that:

1. A new fire station will be required in the vicinity of Burnaby General Hospital/BCIT;
2. A new fire station will be required in the Big Bend area; and
3. A new fire station will be required in close proximity to SFU.

To provide this, the consultants developed a number of fire station location options. Based on the identified coverage requirements, they developed site need criteria and potential sites were identified by the City.

Five main options which incorporated sixteen different potential new fire station sites were evaluated. This included:

- Adding a new fire station in the vicinity of Burnaby General Hospital/BCIT;
- Adding a new fire station in the Big Bend area;
- Adding a new fire station at SFU;
- Relocating Fire Station 2 or Fire Station 6 to improve coverage at the top of Cariboo Road; and
- Relocating Fire Station 4 to improve coverage to SFU and the Shellburn Refinery.

The Network Analyst computer model was used to evaluate the ability to provide initial response coverage to all built-up areas of Burnaby with different numbers of fire stations, different combinations of locations and different response time objectives. Emphasis was placed on covering the three identified significant coverage gaps, however the possibility of relocating or eliminating existing fire stations to develop a more efficient overall plan was also considered. Potential three-minute, four-minute and five-minute coverage areas were determined for the six existing fire stations, as well as each of sixteen candidate sites that were identified by the City.



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Various combinations of sites were then evaluated to determine effective and efficient coverage plans at each performance level.

The initial analysis was based on providing four-minute travel time coverage to all areas, which would require three additional fire stations to cover the three gaps.

The option of a five-minute objective was also considered in order to determine if a reasonable coverage plan could be developed with fewer than nine fire stations. It was determined that it was not possible to develop a plan that would provide reliable performance at this service level.

After considering various alternative locations for additional and/or relocated fire stations, the ability to meet the eight-minute objective was re-evaluated based on an assumed future deployment plan. This assumed that there will be nine fire stations, with Stations 2 and 4 remaining in their current locations. This evaluation indicated a significant improvement in coverage with most areas meeting the Level 3 standard and only very small areas failing to meet the requirements for Level 1.

The assessment determined that the three new halls were required to address the gaps but the two fire station relocations considered did not provide sufficient benefits to be worthwhile (and appropriate sites were not available).

It was also determined that the replacement of Fire Station 2 and the renovation of Fire Station 1 were sufficiently pressing that they needed to be included among the high priority projects.

The consultants worked with the Steering Committee to assess the potential projects and determine those that should be acted upon and the sequencing of the projects. The decisions were as follows:

### *Priority 1 - Add a Fire Station in the Burnaby General Hospital/BCIT area*

- This area has the greatest need as it is highly developed and contains many high risk occupancies. The addition of a station in this area will also reduce some of the excess service demand being experienced by stations 3 and 5.
- The addition of a fire station in the BGH/BCIT area will also reduce the deficiency in full response coverage identified in the Fire Station 5 coverage area.
- It will likely take a considerable amount of time to acquire the land needed to build this station. In view of the fact that the need to replace Station 2 is so pressing combined with the fact that the City already owns the land on which Station 2 sits so that the rebuilding could proceed much more quickly, it may well be appropriate to interchange priorities 1 and 2.

### *Priority 2 - Rebuild Fire Station 2 at the Existing Location*

- Fire Station 2 is inadequate and is in relatively poor physical condition so this should be corrected as soon as realistically possible.

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- Additional land is already owned by the City adjacent to the Fire Station 2 site so it will be possible to build a larger facility to Burnaby's normal fire station specifications on the existing property.
- Rebuilding Fire station 2 on the present site will require utilization of a temporary facility elsewhere during construction.
- Retaining Fire Station 2 at the present site means that there will remain a small coverage deficiency at the top of Cariboo until the planned Stormont-McBride Connector is built. However, first-in coverage is still provided in less than five minutes to this area from Fire Stations 2 and 6.

### *Priority 3 - Renovate Fire Station 1 and Expand the Training Ground*

- The need for additional space and upgrading at Fire Station 1 is pressing and will only grow with time. It is recommended that this project proceed in advance of new fire stations in the Big Bend and SFU areas because it will be quite some time before development will generate sufficient need in both these areas.
- A comprehensive space needs study of Fire Station 1 should be conducted as soon as possible to determine the specific needs at Fire Station 1.

### *Priority 4 - Add a Fire Station in the Big Bend area*

- Although the Big Bend area presently constitutes a gap in BFD coverage, it is sparsely developed and will remain so for some time. In addition, the hazards will be mainly industrial rather than people-focused so the BGH/BCIT gap must be assigned higher priority.

### *Priority 5 - Add a Fire Station in the SFU area*

- The SFU area fire service need encompasses two elements: the present situation and the situation once the planned Simon Fraser University Village development goes forward.
- The SFU complex is concrete construction that is fully sprinklered and the low-rise residences are also fully sprinklered, so the fire risk is lower than that of most other areas in Burnaby. Also, the new construction in the Simon Fraser University Village development will be sprinklered so this makes it a lower priority than the west side.
- Development of the Simon Fraser University Village has commenced within the University ring road area. As it progresses, the fire risk and emergency services demand will increase. As the level of demand progresses, it will need to be monitored and the situation re-evaluated.

The consultants recommended against relocating Fire Station 4 to improve coverage to the SFU and Shellburn Refinery areas. The improvement that this relocation would produce is not sufficient to justify the large capital expenditure required.

Upon completion of the fire station addition and rebuilding projects the major identified coverage gaps will be filled and only very small pockets of areas beyond four minute coverage

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will remain. These gaps are very small and most fall within undeveloped areas so they are judged to be acceptable.

The full response coverage will also be improved. The proportion of the city for which Risk Level 3 coverage can be met will be increased in the northwest, the south and in the east. Also, the coverage of the Big Bend area will be upgraded from Risk Level 1 to a combination of Risk Levels 2 and 3.

