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CORPORATE REPORT

NO: R075 COUNCIL DATE: May 9, 2011

REGULAR COUNCIL

TO:	**Mayor & Council**	DATE:	**May 3, 2011**
FROM:	**General Manager, Planning and Development** **General Manager, Engineering**	FILE:	**4520-20** **5225-30 (slope)**
SUBJECT:	**Geotechnical Considerations for Development on Steeply Sloped Areas**		

RECOMMENDATION

The Engineering Department and the Planning & Development Department recommend that Council:

1. Receive this report as information; and

2. Endorse the preparation and distribution of information to the owners of and the residents who live on properties that are in the vicinity of steeply sloped areas of the City about practices and activities that these individuals can take that will assist in ensuring that the use of the land does not compromise the stability of the sloped areas.

INTENT

The purpose of this report is to provide Council with information about minor landslides that occurred this past winter along the bluff area in South Surrey and on actions that have been taken to address these minor landslides. The report also provides information about the processes that staff follows to address slope stability concerns in relation to the South Surrey bluff in the context of reviewing applications for new land development, building construction and tree removal permits and in the context of installing and maintaining City engineering infrastructure that is located along the bluff.

BACKGROUND

Significant rainfall events this winter resulted in a number of minor landslides along the South Surrey bluff, which resulted in the public voicing concerns over the public safety related to such slides. Council requested that staff report on the slope stability issues in South Surrey, particularly along the bluff overlooking the Burlington Northern Sante Fe Railway.

The illustration attached as Appendix I to this report, shows the location of the South Surrey bluff lands that are a predominant focus of this report.

DISCUSSION

The South Surrey bluff sits immediately above the Burlington Northern Sante Fe (BNSF) Railway and follows the shore line of Semiahmoo Bay. It is at an elevation of between 30 to 35 metres above sea level and has an average slope (grade) of approximately 2 horizontal to 1 vertical or 50%. In many areas, the upper scarp along the bluff has a slope closer to 1 horizontal to 1 vertical, or 100%, which is considered to be very steep.

The soil profile of the bluff is described as a thin layer of topsoil overlying intermixed sand, silt and gravel over dense glacial till of the Vashon Drift Formation. The inherent strength of this glacial till is what enables the material to withstand the forces of nature so well and why such a high bluff exists in the first place; however, wind, rain, and other forces of nature are relentless and regardless of precautions, the bluff is subject to erosion.

Recent Landslide Events

Over the course of this past winter there were several minor landslides along the bluff, the location of which are illustrated on the map attached to this report as Appendix I. All of these landslides were on private property. The City retained geotechnical experts to analyze two of these slides, labelled Site "A "and Site "B", respectively, in Appendix I, as they were located adjacent to City of Surrey stormwater conveyance infrastructure.

At Site A (near 2175 – 123 Street) an existing stormwater pipe was damaged by the slide and related debris, which flowed down the slope and crossed the BNSF rail line. Thurber Engineering Ltd., a geotechnical consultant studied this slide and concluded that the slide occurred as a result of an oversteepened slope toward the top of the bluff and not as result of the City's stormwater pipe. The City's stormwater pipe was damaged as a result of tree roots and a soil mass around the pipe sliding downslope and dragging the pipe with it. The consultant provided the opinion that the slope which failed would not regress further. To address the loss of the stormwater pipe, the Engineering Department installed a temporary stormwater pipe and is working with the owners of the properties to develop a permanent solution.

At Site B (near 13188 – 13 Avenue) debris flowed down the slope and crossed the BNSF rail line. Thurber Engineering Ltd. concluded that the slide was the result of an oversteepened slope at the top of the bluff and not as a result of the existing City stormwater system in the area, which was located near but not within the area of the slope failure. The consultant has advised that there is no imminent threat that the failure area will regress on the west but that some sloughing is expected to continue until a naturally stable slope is achieved. The consultant advised that any sloughing that may occur will be on private property and is not expected to significantly increase the slide area or to cause damage to City infrastructure.

Geotechnical Considerations during the Development Process

When applications for the development of land or for building permits are received by the City for areas like the bluff area of South Surrey, staff focus on ensuring that the land is developed and the buildings are constructed in such a way that the land and buildings may be safely used for their intended purpose and that works are undertaken so that they will not be compromised by nor affect the stability of adjacent slopes. Measures that are commonly taken to address slope stability concerns include geotechnical studies, increased building setbacks, deep foundations, the control and conveyance of stormwater, and the planting and maintenance of vegetative cover on the slope itself. Appendix II contains a summary of the processes that are followed by staff in addressing applications for building permits in areas on or near steep slopes. This process is considered to provide an acceptable standard for safe and responsible development on lots adjacent to the bluff areas in Surrey.

Geotechnical Considerations in Relation to Properties that are not Involved in any Development Process

There are many developed lots that are located on or near slopes in Surrey and on which building construction preceded implementation of the procedures documented in Appendix II. Regardless of whether the lots were developed before or in accordance with the City's current procedures, the responsible stewardship of each lot rests with the owner of the lot. This same responsibility also extends to the BNSF Railway with respect to its lands in Surrey. Most owners of property along the bluff in South Surrey take this responsibility quite seriously; however, there are also properties where unauthorized construction or soil filling has taken place. It is difficult for the City to become aware of and take action against such activities as the works generally involve the movement of soil from within the property, or the importing of small quantities of soil to the property. The City is not generally notified of these activities.

Tree Removal

The Tree Protection By-law stipulates that a property owner must obtain a permit to remove any tree that is larger than 0.3 m (12 inches) in diameter and in steep sloped areas, a tree removal permit is required to remove any vegetation. The Tree Protection By-law does not allow for the topping of trees as this practice can lead to rot within the tree and "double tops", making such trees more susceptible to breakage.

Trees on the bluff in South Surrey have been topped or removed for view purposes. It is difficult to control unauthorized tree removal or tree topping, but even more so in this area because the cutting and topping of trees often takes place in remote areas of the Burlington Northern Sante Fe Railway lands. When staff is able to identify the person responsible for unauthorized topping or removal of trees, penalties of up to $10,000 per infraction can be levied and depending on the circumstance tree replacement is normally pursued.

Watercourses & Erosion Protection

Several natural watercourses cross the bluff in South Surrey and discharge to the ocean. Open watercourses are always a concern due to the potential for erosion that they create and the effect that such erosion has on the stability of their banks. The Engineering Department completes a ravine stability assessment every two years for ravines that are located in the bluff area of South Surrey. As part of this assessment, all ravines are inspected and all erosion zones are documented

and classified. Any sites that have significant erosion are further examined by a Professional Engineer to assess the likelihood and possible consequences of a failure at the site. Protective and remedial actions are promptly taken by staff where recommended.

Utility Protection

Whenever possible, the Engineering Department designs engineering services such that they are located away from steeply-sloped areas. Utilities in the area of the South Surrey bluff are designed taking into account groundwater, stormwater exfiltration, slope disturbance, pipe anchoring, and vegetation.

With respect to the design of stormwater connections from private property, under no circumstances does the City permit stormwater to be discharged directly onto steeply-sloped areas. Generally, stormwater is discharged by way of a connection to a City stormwater system at the front of the lot.

Public Education

In an effort to educate owners of the properties and residents of properties that are in the vicinity of steep slopes including those along the South Surrey bluff staff are preparing for distribution a brochure about practices that should be followed by private property owners to maintain the stability of steeply sloping areas. This same information will be posted as a page on the City's website. A copy of this information will be forwarded to Council as information when it is completed and ready for distribution.

SUSTAINABILITY CONSIDERATIONS

The processes that the City follows in addressing development applications for land near steeply sloped areas in the City including those lands in the vicinity of the South Surrey bluff as articulated in this report support the Economic and Environmental Pillars of the City's Sustainability Charter; particularly the following goals:

- EC3: Sustainable Infrastructure Maintenance and Replacement;
- EC4: Sustainable Fiscal Management Practices;
- EN9: Sustainable Land Use Planning and Development Practices; and
- EN16: Land, Water and Air Quality Management>

CONCLUSION

The City has a robust set of policies and practices focused on ensuring that land and building development that is proposed for steeply-sloped areas of the City are undertaken so that the buildings and related accessory uses are safe and that the slopes remain stable. The Engineering Department and the Planning & Development Department recommend that Council endorse the preparation of information and distribution of this information to the owners of and the residents who live on properties that are in the vicinity of steeply sloped areas of the City about practices and activities that these individuals can take that will assist in ensuring that the use of the land does not compromise the stability of the sloped areas.

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VL/GMc/JA/brb/jkb

Appendix I - Location Map
Appendix II - Established Requirements and Considerations for Development Applications in Geotechnically Susceptible Areas

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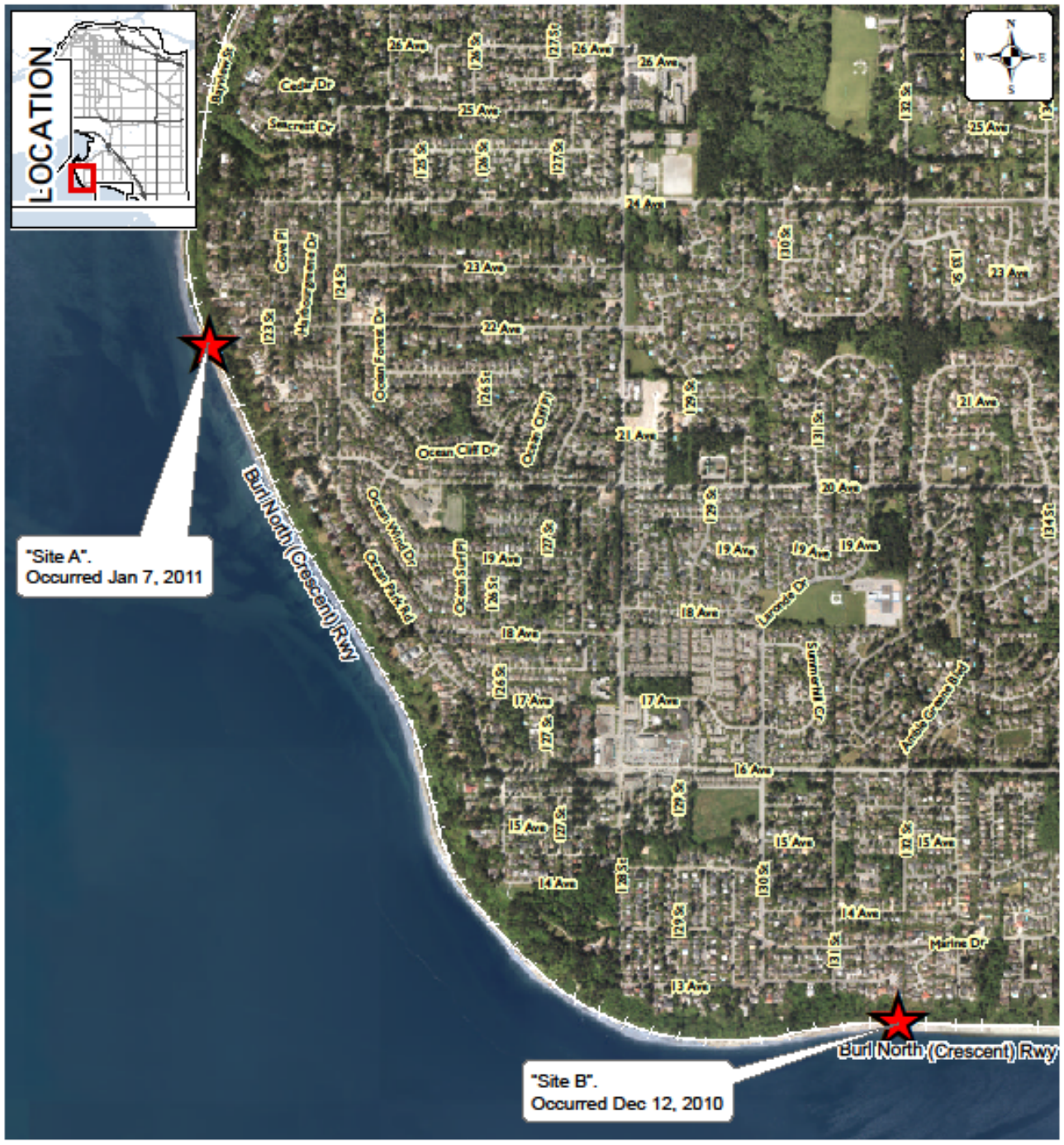
APPENDIX I



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Slide Location Map

ENGINEERING DEPARTMENT

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APPENDIX II

Building Permit Requirements and Considerations
Related to Properties in the Vicinity of Steep Slopes

1. Applications for building permit for construction on steeply sloping sites must include a geotechnical report by a Professional Engineer that comprehensively addresses the stability of the proposed development in relation to the slope. Aspects to be addressed in these reports include soil bearing capacity, recommendations on foundation types, provisions in relation to the permanent / temporary placement of soil, stipulations on storm water management – both during and after construction and recommendations related to vegetation and slope maintenance. Where Building Division staff has concerns with the recommendations of the proponent's geotechnical Engineer, the City will commission an independent third party review by a second Professional Engineer to provide an opinion on the recommendations of the proponent's engineer. Depending on the outcome of this review process, the Building Division may require changes to the proposal or refuse to issue the building permit.

2. Prior to the issuance of a building permit, the owner of the property for which the building permit is being issued is required to register a restrictive covenant on the title to the property, which attaches the Professional Engineer's geotechnical report to the title and legal binds the current and future owners of the property to adhere to the recommendations in the report.

3. As a condition of the building permit the owner of the property must retain the Professional Engineer who prepared the geotechnical report related to the building permit to carry out field inspections during the construction of the project to confirm that the construction is in compliance with the recommendations of the geotechnical report. The Professional Engineer must provide the building inspector with field reports related to the geotechnical aspects of the project. At the time of Final Inspection of the completed building project by the building inspector, the Professional Engineer must certify in writing that all aspects of the construction have been completed in compliance with his /her design and recommendations.

4. As part of an application for a building permit on an infill lot (i.e. any lot that is not part of a recent subdivision for which a tree survey was submitted) the applicant is required to submit a tree survey and related report prepared by a certified arborist. The tree survey identifies trees that are to be protected under the City's Tree Protection By-law while the report identifies those trees that are proposed for removal to accommodate the construction. The information from the arborist is compared to the information from the geotechnical engineer for any identified conflicts and resolution of such conflicts is achieved before a building permit is issued.

5. During the construction phase, City building inspection staff pays close attention to building permit conditions related to slope stabilization.