

# City of Nanaimo

## *An Introduction to Updated and New Geotechnical Guidelines*

## Intent of the Presentation

Introduce and field questions on:

1. Guidelines for the Completion of Geotechnical Reports (this is an update); and
2. Guidelines for Geotechnical Assessments Above Abandoned Mine Workings (these are new)

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COMMUNITY DEVELOPMENT

**Building Inspections**

**Guidelines for the Preparation of Geotechnical Reports**

A geotechnical report (the "Report") is required to confirm that the land may be used safely for the intended use without undue risk of hazards. The Report shall be prepared at the cost of the applicant by a professional engineer registered in British Columbia with qualifications and experience in geotechnical engineering (the "Engineer").

The Engineer shall inspect the property, supervise the geotechnical site investigations and the Report shall clearly state all relevant restrictions, conditions and/or limitations to the proposed development of the land. The geotechnical site investigations and the Report shall be completed in accordance with good engineering practice. The Report shall address the following minimum criteria:

1. Identify any hazards which may affect the safe development of the land including, but not limited to:
 

a) flooding	g) ground water flows
b) mud flows	h) rock falls
c) debris flows	i) subsidence
d) debris torrents	j) avalanche
e) erosion	k) earthquake
f) land slip	

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**Subdivision**

Guidelines for the Preparation of Geotechnical Reports

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## Difficulties with the Previous Guidelines

- Did not fully capture the development approval process, the legislative framework or the need for different levels of detail and types of information at different stages in the process
- Included a scope of requirements beyond geotechnical engineering
- Awkward in terms of defined design criteria
- No consideration to a change in conditions with time and the need to set surveillance and maintenance expectations

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## Updated Geotechnical Guidelines

- Guidelines relate to the City's expectations for legislated geotechnical assessments and reports related to the development of private lands within the City.
- Recognize the development approval process and the legal framework under which the Approving Officer/Building Official is bound.
- Recognize that several geotechnical reporting documents may be required during the development process.
- Update the City's geotechnical design criteria.
- Introduce a timeframe for considering changed site conditions.
- Identify key items to be included in reports submitted to the City in support of development.

## Updated Guidelines and the Development Approval Process

- Re-zoning– Local Government Act
- Development Permit – Local Government Act
- Subdivisions – Land Tittle/Local Government Act
- Building Permit – Community Charter

The geotechnical information required to support an approval may vary widely from a report focussed on natural hazards, to a report in support of a civil grading plan to a highly technical document in support of structural design.

## Geotechnical Design Criteria

- Natural and Mining Induced Geological Hazard Risk (references EGBC landslide and flood guidelines as well as new international mining guidelines)
- Seismic design (referenced BCBC; EGBC landslide and EGBC retaining wall guidelines)
- Level of landslide safety – FOS for rotational and translational soil landslides – other types references procedures in EGBC landslide guidelines
- Considerations of changed conditions, maintenance and surveillance

## Report Content Requirements

- Property identification – civic and legal
- Reason for the report – in support of what stage of the project ?
- Provision of reliance on the report by the Approving Officer/Building Official
- Statement related to the safe use of the land using the required language



**GUIDELINES FOR GEOTECHNICAL ASSESSMENTS ABOVE  
ABANDONED MINE WORKINGS**

**These guidelines are new**

## The Guidelines

- Falls under the broader scope of the City Guidelines for the Completion of Geotechnical Reports
- The assessment of mining induced geological hazards is a relatively specialized area of practice, and this guideline identifies the City's minimum expectations of duty of care
- To provide proponents of land development with background information and context on historical mining activities within the City
- To support the recently created Development Permit Area 4

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**18.4 DPA4: ABANDONED MINE WORKINGS HAZARDS GUIDELINES**

Application

18.4.1 Abandoned mine workings are identified on Schedule 9 – DPA4: Abandoned Mine Workings Hazards of the *City Plan*.

18.4.2 A development permit is required for any proposed development within DPA4: Abandoned Mine Workings Hazards.

Guidelines

18.4.3 The following may be required to be provided to support the DPA4 development permit application:

- a) A geotechnical report that provides an assessment and recommendations to protect the development from hazardous conditions in relation to the abandoned mine workings. The geotechnical report must be completed by *Qualified Registered Professional* experienced with abandoned mine working hazards in conformance with the City of Nanaimo *Guidelines for Geotechnical Assessments Above Abandoned mine workings* and the City of Nanaimo *Guidelines for the Completion of Geotechnical Reports*. Where the *Qualified Registered Professional* is not able to verify that the land may be used safely for the use intended, the assessment report shall identify the further investigations required to assess the site and/or present recommendations under which the land may be used safely for the use intended.
- b) To ensure that geotechnical recommendations are adhered to for the long term, a *Land Title Act* Section 219 covenant with the geotechnical report may be required to be registered on the title of the property.



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  - +  Area & Neighbourhood Planning
  - Development Permit & Heritage Conservation Areas
    - +  DPA 1: Environmentally Sensitive Areas
    - +  DPA 2 : Hazardous Slopes
    - +  DPA 3: Sea Level Rise
    - +  DPA 4: Abandoned Mine Workings Hazard

Outline of recorded workings plus a buffer of 75 m

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200 m deep Protection shaft on Protection Island.

Slope into the shallow Fitzwilliam Mine on Protection Island

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Mine roof

Timber mine prop

Collapsed timber mine prop

Roof collapse

BEDROCK W/ COAL WALL

BEDROCK FAULT

TIMBER SUPPORTS

COAL SPOIL PILE

LARGE BOULDER

Closed circuit camera into Old Douglas workings at a depth of 10 m

Closed circuit camera into HBC Free Level workings under Hecate St. at a depth of 5 m.  
Photo Courtesy LEA

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1000 BAY STREET

Right: Migrating void related to temporary dewatering of abandoned mine shaft in the Horth Road area.  
Photo Courtesy of TetraTech

Above: Roof collapse of Old Douglas Mine into till migrating up to Pine Street/OVR.

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Below: Subsidence on Victoria Road as a result of the collapse of shallow mine workings

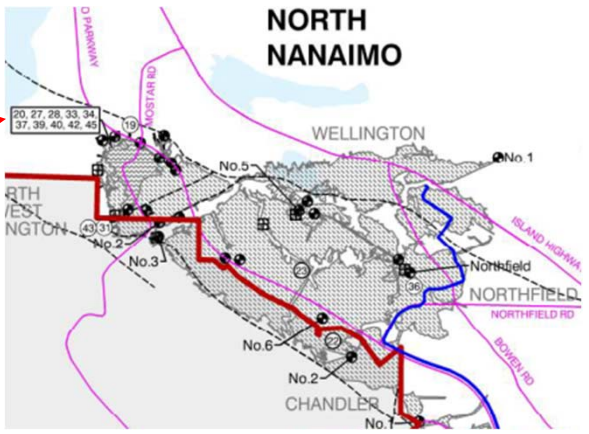


Above: Investigation and grouting to mitigate immediate area of subsidence.



# Historical Information

Each number relates to a mine or mining activity as summarized in Table 1 of the Guidelines.



## Hazards, Consequence and Risk

Within the Guideline information has been compiled to summarize:

- Different types of mining induced geological hazards that should be considered; and
- To differentiate, at a planning level, areas of Nanaimo that are inferred to be at different levels of risk to subsidence/collapse to assist the City in discussions with land development proponents.

## Preliminary Risk Assessment



## Preliminary Risk Assessment

High risk classification for:

- Potential for sudden collapse associated with openings to mine workings. Study identified 55 vertical shafts and 35 inclined or level slopes with the City;
- Roof rock failure leading to a crown or sink hole at ground surface. The study identified high risk areas above portions of the New and Old Douglas mine, Fitzwilliam Mine and Wellington Mines.

## Site Investigation and Reporting

Section 6 of the Guideline deals with the City's expectations of the assessment process and of reporting needs.

- Phased approach from desktop to various levels of detail depending on site conditions
- Geotechnical report that includes the findings of the mining risk assessment
- Potentially a detailed geotechnical report describing measures to mitigate or remediate unacceptable mining legacy risks
- Potentially a completion/validation report to describe the mitigative/remedial measures that were undertaken.

Thank you.

Questions