



**ECOLOGICAL HAZARDS ASSESSMENT: LOT 146**

Date: April 3, 2009

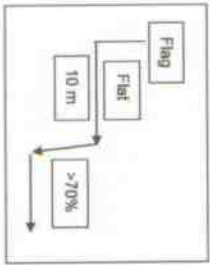
Assessor(s): Rob Buchanan, M.A., P.Geo. – Senior Geoscientist  
Neil Goeller, M.Sc., G.I.T. – Geomorphologist

General Comments: End of bedrock ridge with steep slopes to north and moderate slopes to east and west. Flat area to south.

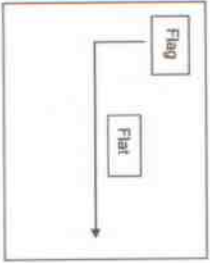
Hazard Type(s): No observable hazards

**SLOPES**

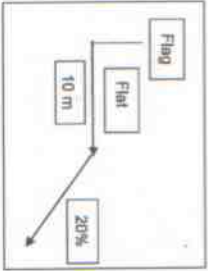
North



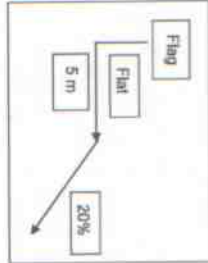
South



East



West



**PHOTOS**

North



South



East



West



N:\AS\4232061-420709-1409-0000\map\slps 310.dwg

April 18, 2009  
Project No. 00-1435-0006



**EOLOGICAL HAZARDS ASSESSMENT: LOT 147**

Date: April 3, 2009

Assessor(s): Rob Buchanan, M.A., P. Geo. – Senior Geoscientist  
Neil Goeller, M.Sc., G.L.T. – Geomorphologist

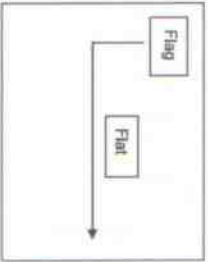
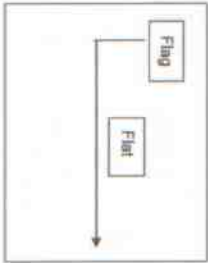
General Comments: Flat building site with wetlands downlope.

Hazard Type(s): No observable hazards

**SLOPES**

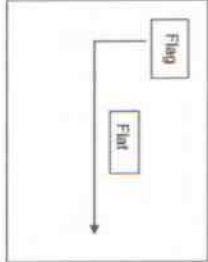
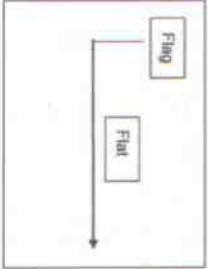
North

South



East

West



n:\2008\2008147\03\147\03\147\03\147\03\147.dwg

April 14, 2009  
Project No. 09-1425-0006

**PHOTOS**

North

South



East

West







### EEOLOGICAL HAZARDS ASSESSMENT: LOT 149

Date: April 3, 2009

Assessor(s): Rob Buchanan, M.A., P. Geo. – Senior Geoscientist

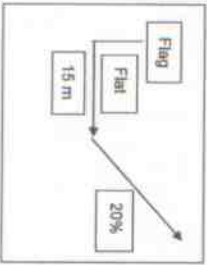
Neil Goeller, M.Sc., G.I.T. – Geomorphologist

General Comments: Flat area on top of bedrock ridge with a veneer of soil over bedrock. Moderate slopes to the north and south.

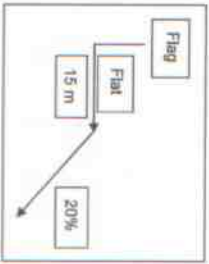
Hazard Type(s): No observable hazards

#### SLOPES

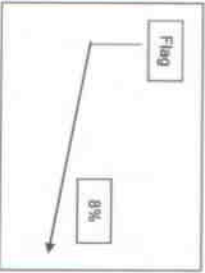
North



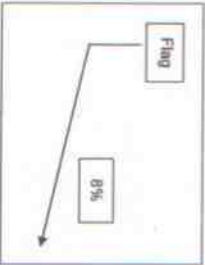
South



East



West



\\sdr\er\2009\149\001-149-0000\er\plan 107.dwg

April 15, 2009  
Project No. 09-149S-0000

#### PHOTOS

North



South



East



West





**EIOLOGICAL HAZARDS ASSESSMENT: LOT 150**

Date: April 3, 2009

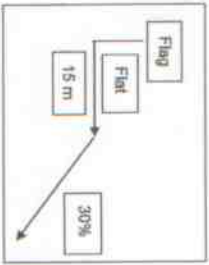
Assessor(s): Rob Buchanan, M.A., P.Geo. - Senior Geoscientist  
Neil Goeltzer, M.Sc., G.I.T. - Geomorphologist

General Comments: Bedrock outcrop with steep slopes within 5 m of flag to the southeast, south and southwest.

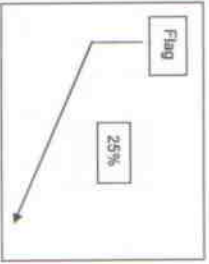
Hazard Type(s): No observable hazards

**SLOPES**

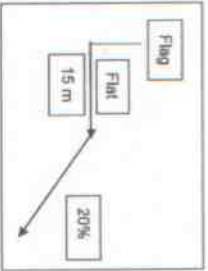
North



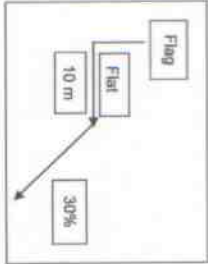
South



East



West



**PHOTOS**

North



South



East



West



\\na\4-2009\1452\1452-0000\m\p\p\1452\_0000.dwg

April 15, 2009  
Project No. 08-1452-0000



### EEOLOGICAL HAZARDS ASSESSMENT: LOT 151

Date: April 3, 2009

Assessor(s): Rob Burchanan, M.A., P. Geo. - Senior Geoscientist

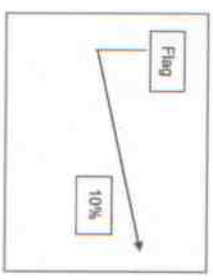
Neil Goeller, M.Sc., G.I.T. - Geomorphologist

General Comments: Bedrock ridge with undulating surface. Site slopes to east and west with little or no cover over the bedrock surface.

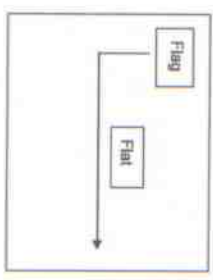
Hazard Type(s): No observable hazards

#### SLOPES

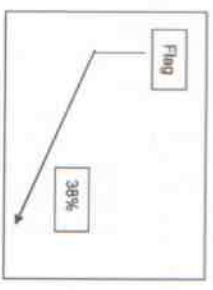
North



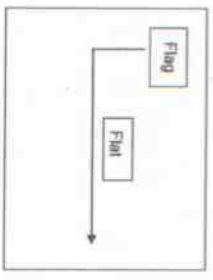
South



East

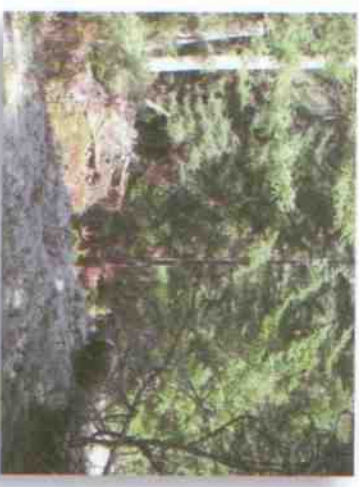


West



#### PHOTOS

North



South



East



West



s:\4267\2009\14267\14267-0000\img\plan\_091.dwg

April 15, 2009  
Project No. 09-14267-0000



**EOLOGICAL HAZARDS ASSESSMENT: LOT 152**

Date: April 3, 2009

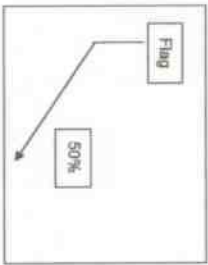
Assessor(s): Rob Buchanan, M.A., P.Geo. – Senior Geoscientist  
Neil Goeller, M.Sc., G.I.T. – Geomorphologist

General Comments: Bedrock outcrop that slopes in all directions. No soil cover over bedrock.

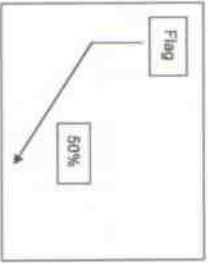
Hazard Type(s): No observable hazards

**SLOPES**

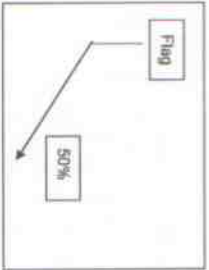
North



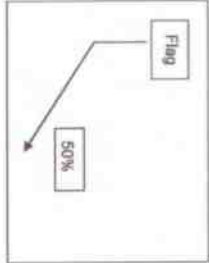
South



East



West



**PHOTOS**

North



South



East



West



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**EIOLOGICAL HAZARDS ASSESSMENT: LOT 153**

Date: April 3, 2009

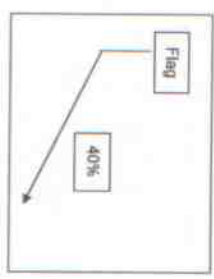
Assessor(s): Rob Buchanan, M.A., P. Geo. – Senior Geoscientist  
Neil Goeller, M.Sc., G.I.T. – Geomorphologist

General Comments: Bedrock outcrop with steep slopes in all directions. Flat areas to north, east, west and south. Second outcrop to west.

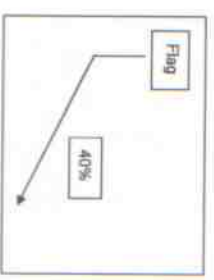
Hazard Type(s): No observable hazards

**SLOPES**

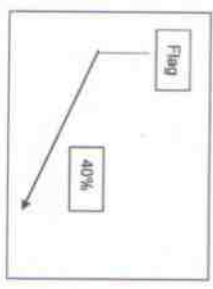
North



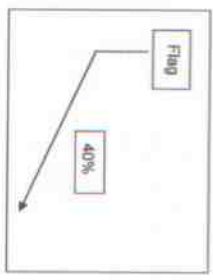
South



East



West



1:100000000 1:200000 1:400000 1:600000 1:800000 1:1000000 1:1200000 1:1400000 1:1600000 1:1800000 1:2000000 1:2200000 1:2400000 1:2600000 1:2800000 1:3000000 1:3200000 1:3400000 1:3600000 1:3800000 1:4000000 1:4200000 1:4400000 1:4600000 1:4800000 1:5000000 1:5200000 1:5400000 1:5600000 1:5800000 1:6000000 1:6200000 1:6400000 1:6600000 1:6800000 1:7000000 1:7200000 1:7400000 1:7600000 1:7800000 1:8000000 1:8200000 1:8400000 1:8600000 1:8800000 1:9000000 1:9200000 1:9400000 1:9600000 1:9800000 1:10000000

April 15, 2009  
Project No. 08-1435-0006

**PHOTOS**

North



South



East



West





**GEOLOGICAL HAZARDS ASSESSMENT: LOT 154**

Date: April 2, 2009

Assessor(s): Rob Buchanan, M.A., P. Geo. - Senior Geoscientist

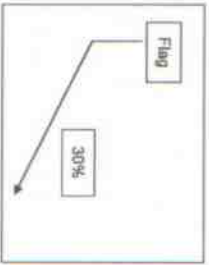
Neil Goeller, M.Sc., G.I.T. - Geomorphologist

General Comments: Bedrock ridge that slope to west after 15 m that  
Ridge slopes down to north and south.

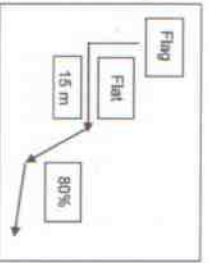
Hazard Type(s): No observable hazards

**SLOPES**

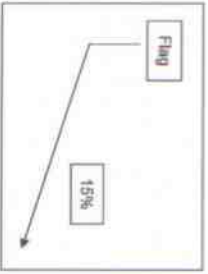
North



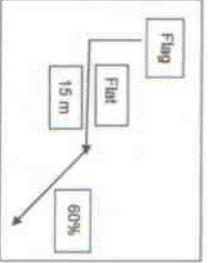
South



East



West



North



**PHOTOS**

South

Not Available

East

Not Available

West



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April 15, 2009  
Project No. 09-1435-0006



### GEOLOGICAL HAZARDS ASSESSMENT: LOT 155

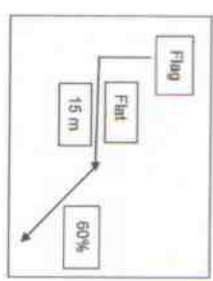
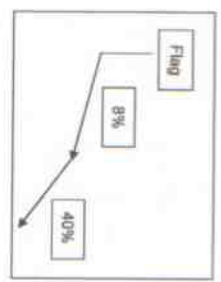
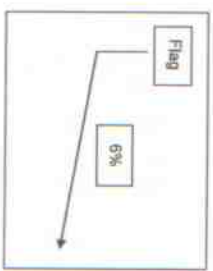
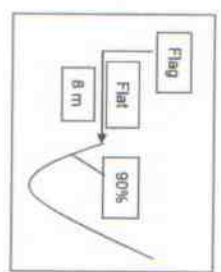
Date: April 2, 2009

Assessor(s): Rob Burchanan, M.A., P.Geo. - Senior Geoscientist  
Neil Goeller, M.Sc., G.I.T. - Geomorphologist

General Comments: Bedrock ridge which slopes down to the north. Steep slopes away from building site to east, west and south.

Hazard Type(s): No observable hazards

#### SLOPES



#### PHOTOS





**EEOLOGICAL HAZARDS ASSESSMENT: LOT 156**

Date: April 3, 2009

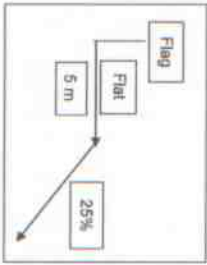
Assessor(s): Rob Buchanan, M.A., P. Geo. - Senior Geoscientist  
Neil Goeller, M.Sc., G.I.T. - Geomorphologist

General Comments: Bedrock outcrop approx. 10 m in diameter with exposed bedrock surface.

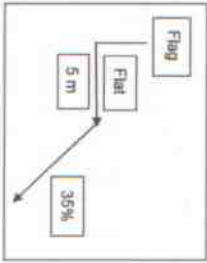
Hazard Type(s): No observable hazards

**SLOPES**

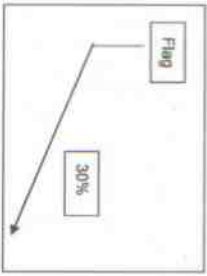
North



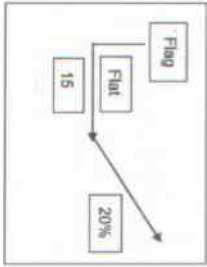
South



East



West



**PHOTOS**

North



South



East



West



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### EIOLOGICAL HAZARDS ASSESSMENT: LOT 157

Date: April 3, 2009

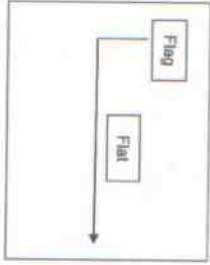
Assessor(s): Rob Buchanan, M.A., P. Geo. - Senior Geoscientist  
Neil Goeller, M.Sc., G.I.T. - Geomorphologist

General Comments: Located in a flat area with a thin veneer of soil over bedrock.

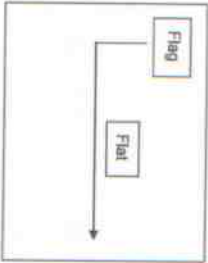
Hazard Type(s): No observable hazards

#### SLOPES

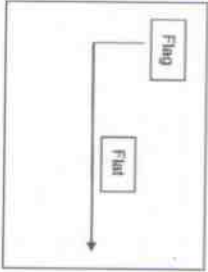
North



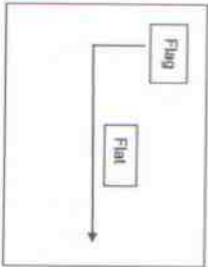
South



East



West



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#### PHOTOS

North



South



East



West





**EIOLOGICAL HAZARDS ASSESSMENT: LOT 158**

Date: April 3, 2009

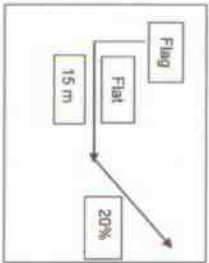
Assessor(s): Rob Buchanan, M.A., P.Geo. - Senior Geoscientist  
Neil Goeller, M.Sc., G.L.T. - Geomorphologist

General Comments: Building site slopes westward with thin veneer of soil over bedrock. Steep slopes to west (>20 m) from flag.

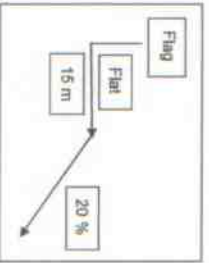
Hazard Type(s): No observable hazards

**SLOPES**

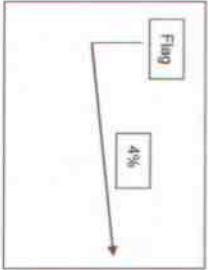
North



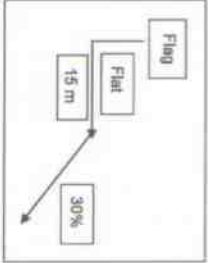
South



East



West



**PHOTOS**

North



South



East



West



15/04/2009 1:02:03 PM 1435-0006/158 101.dwg

April 15, 2009  
Project No. 09-1435-0006



**EIOLOGICAL HAZARDS ASSESSMENT: LOT 159**

Date: April 3, 2009

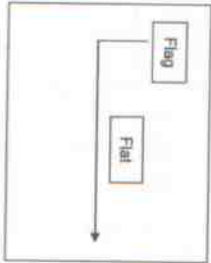
Assessor(s): Rob Buchanan, M.A., P.Geo. - Senior Geoscientist  
Neil Goeller, M.Sc., G.I.T. - Geomorphologist

General Comments: Building site on bedrock ridge with thin veneer of soil over bedrock.

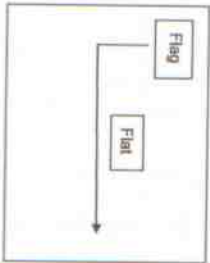
Hazard Type(s): No observable hazards

**SLOPES**

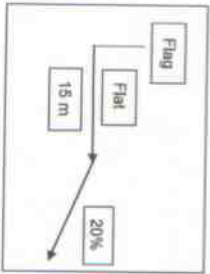
North



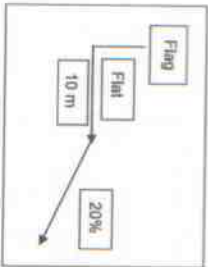
South



East



West



**PHOTOS**

North



South



East



West



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April 15, 2009  
Project No. 08-1435-0000



## APPENDIX II

### Landslide Assessment Assurance Statement

## APPENDIX D: LANDSLIDE ASSESSMENT ASSURANCE STATEMENT

Note: This Statement is to be read and completed in conjunction with the "APEGBC Guidelines for Legislated Landslide Assessments for Proposed Residential Development in British Columbia", March 2006/Revised September 2008 ("APEGBC Guidelines") and the "2006 BC Building Code (BCBC 2006)" and is to be provided for *landslide assessments* (not floods or flood controls) for the purposes of the Land Title Act, Community Charter or the Local Government Act. Italicized words are defined in the APEGBC Guidelines.

To: The Approving Authority

Date: MAY 19, 2009

BOWEN ISLAND MUNICIPALITY

Jurisdiction and address

With reference to (check one):

- Land Title Act (Section 86) – Subdivision Approval
- Local Government Act (Sections 919.1 and 920) – Development Permit
- Community Charter (Section 56) – Building Permit
- Local Government Act (Section 910) – Flood Plain Bylaw Variance
- Local Government Act (Section 910) – Flood Plain Bylaw Exemption
- Local Government Act (Section 692 (D)) – Provincial Regulation M268, Geotechnical Slope Stability (Seismic) Regulation

For the Property:

REFERRED TO AS "CAPE ROGER CURTIS"

Legal description and civic address of the Property

The undersigned hereby gives assurance that he/she is a *Qualified Professional* and is a *Professional Engineer* or *Professional Geoscientist*.

I have signed, sealed and dated, and thereby certified, the attached *landslide assessment* report on the Property in accordance with the *APEGBC Guidelines*. That report must be read in conjunction with this Statement. In preparing that report I have:

Check to the left of applicable items

- 1. Collected and reviewed appropriate background information
- 2. Reviewed the proposed *residential development* on the Property
- 3. Conducted field work on and, if required, beyond the Property
- 4. Reported on the results of the field work on and, if required, beyond the Property
- 5. Considered any changed conditions on and, if required, beyond the Property
- 6. For a *landslide hazard analysis* or *landslide risk analysis* I have:
  - 6.1 reviewed and characterized, if appropriate, any *landslide* that may affect the Property
  - 6.2 estimated the *landslide hazard*
  - 6.3 identified existing and anticipated future *elements at risk* on and, if required, beyond the Property
  - 6.4 estimated the potential *consequences* to those *elements at risk*
- 7. Where the *Approving Authority* has adopted a *level of landslide safety* I have:
  - 7.1 compared the *level of landslide safety* adopted by the *Approving Authority* with the findings of my investigation
  - 7.2 made a finding on the *level of landslide safety* on the Property based on the comparison
  - 7.3 made recommendations to reduce *landslide hazards* and/or *landslide risks*
- 8. Where the *Approving Authority* has not adopted a *level of landslide safety* I have:
  - 8.1 described the method of *landslide hazard analysis* or *landslide risk analysis* used
  - 8.2 referred to an appropriate and identified provincial, national or international guideline for *level of landslide safety*
  - 8.3 compared this guideline with the findings of my investigation

- 8.4 made a finding on the level of landslide safety on the Property based on the comparison  
8.5 made recommendations to reduce landslide hazards and/or landslide risks  
9. Reported on the requirements for future inspections of the Property and recommended who should conduct those inspections.

Based on my comparison between

Check one

- the findings from the investigation and the adopted level of landslide safety (Item 7.2 above)  
 the appropriate and identified provincial, national or international guideline for level of landslide safety (Item 8.4 above)

I hereby give my assurance based on the conditions<sup>18</sup> contained in the attached landslide assessment report

Check one or more where appropriate

- for subdivision approval, as required by the Land Title Act (Section 86), "that the land may be used safely for the use intended"

Check one

- with one or more recommended registered covenants.  
 without any registered covenant.  
 for a development permit, as required by the Local Government Act (Sections 919.1 and 920), my report will "assist the local government in determining what conditions or requirements under [Section 920] subsection (7.1) it will impose in the permit"  
 for a building permit, as required by the Community Charter (Section 56), "the land may be used safely for the use intended"

Check one

- with one or more recommended registered covenants.  
 without any registered covenant.  
 for flood plain bylaw variance (for debris flows only), as required by the "Flood Hazard Area Land Use Management Guidelines" associated with the Local Government Act (Section 910), "the development may occur safely."  
 for flood plain bylaw exemption (for debris flows only), as required by the Local Government Act (Section 910), "the land may be used safely for the use intended."

ROBERT G. BUCHANAN

Name (print)

MAY 18, 2009.

Date

[Signature]  
 Signature C/O GOLDER ASSOCIATES LTD.

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(Affix Professional seal here)

If the Qualified Professional is a member of a firm, complete the following.

I am a member of the firm GOLDER ASSOCIATES LTD.  
 and I sign this letter on behalf of the firm. (Print name of firm)

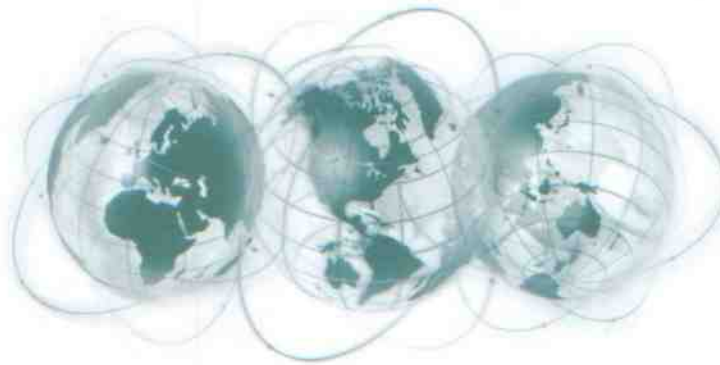
<sup>18</sup> When seismic slope stability assessments are involved, level of landslide safety is considered to be a "life safety" criteria as described in the National Building Code of Canada (NBCC 2005), Commentary on Design for Seismic Effects In the User's Guide, Structural Commentaries, Part 4 of Division B. This states:

"The primary objective of seismic design is to provide an acceptable level of safety for building occupants and the general public as the building responds to strong ground motion; in other words, to minimize loss of life. This implies that, although there will likely be extensive structural and non-structural damage, during the DGM (design ground motion), there is a reasonable degree of confidence that the building will not collapse nor will its attachments break off and fall on people near the building. This performance level is termed 'extensive damage' because, although the structure may be heavily damaged and may have lost a substantial amount of its initial strength and stiffness, it retains some margin of resistance against collapse".

At Golder Associates we strive to be the most respected global group of companies specializing in ground engineering and environmental services. Employee owned since our formation in 1960, we have created a unique culture with pride in ownership, resulting in long-term organizational stability. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees now operating from offices located throughout Africa, Asia, Australasia, Europe, North America and South America.

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