SC6.5 Geotechnical assessment

SC6.5.1 Application

1. This planning scheme policy applies to development where an applicable code identifies Planning Scheme Policy 4 Geotechnical assessment as supporting an outcome of the Steep land overlay code.
2. The Steep land overlay map used in the planning scheme has been compiled from a LiDAR derived digital elevation model. For more information about Steep land overlay methodology, see Section SC6.5.7 below.

SC6.5.2 Relationship to the Planning Scheme

1. This planning scheme policy is to be read in conjunction with the assessment provisions specified in the Planning Scheme and applies when development is proposed in an area identified on OM11 Steep land overlay. This Policy specifically relates to the assessment of 8.11 Steep land overlay code and ensuring development is consistent with the overall outcomes and performance outcomes specified in the code.

SC6.5.3 Purpose

1. The purpose of this planning scheme policy is to:
   a. identify the qualifications required to be held by the author of a geotechnical assessment and management plan;
   b. identify requirements for site assessments and management plans;
   c. provide supporting technical information, where relevant;
   d. provide supporting information on who should be consulted regarding adjoining landowners;
   e. identify other relevant guidelines, standards, and information sources, where relevant.
2. This planning scheme policy aims to:
   a. ensure that development in any area of steep or potential landslip has proper regard to factors affecting land stability.
   b. provide guidance on the preparation and assessment of geotechnical assessments.
3. An information request will be requested where the information required by this policy is not supplied when a development application is made.

SC6.5.4 Qualifications

1. The landslide risk assessment for the proposed development site should be conducted by a Registered Professional Engineer of Queensland (RPEQ) specialising in geotechnical engineering, with a minimum 5 years proven technical experience experienced in in assessing and providing advice about steep slopes, unstable land and landslide risk assessment and management.

SC6.5.5 Technical standards

1. The following references are relevant when preparing a landslide risk assessment and management plan.
2. A reference in the policy to a specific resource, guideline, standard or document means the latest version of the resource, guideline, standard or document.

SC6.5.5.1 Guidelines

1. The following guidelines are relevant when preparing a slope and stable land assessment:
   a. Australian Geomechanics Society (2007) A National Landslide Risk Management Framework for Australia AGS 2007c, Journal of the Australian Geomechanics Society, Vol. 42, No. 1, March 2007
   b. Australian Geomechanics Society (2007) Practice Note Guideline for Landslide Risk Management 2007, Journal of the Australian Geomechanics Society, Vol. 42, No. 1, March 2007
   c. Australian Geomechanics Society (2007) The Australian GeoGuides for Slope Management and Maintenance. Journal of the Australian Geomechanics Society, Vol. 42, No. 1, March 2007

SC6.5.5.2 Standards

1. The following standards are relevant when preparing a slope and stable land assessment:
   a. AS.1170.4-2007 Structural design actions Part 4: Earthquake actions in Australia

b. AS.3700:2001 Masonry structures
c. AS.3798 Guidelines for Earthworks for Commercial and Residential Developments
d. AS.4678 Earth Retaining Structures
e. AS/NZS.1170:2002 Structural design actions.
f. Australian Building Codes Board (2015) The Australian Building Codes Board (ABCB) Handbook: Landslide Hazards
g. Australian Standards Laboratory testing is required to be undertaken by a NATA certificated laboratory

SC6.5.5.3 Studies

1. The following studies are relevant to the Lockyer Valley:
   a. Willmott W.F. (1984) *Slope stability and its constraints on closer settlement in the foothills of the Toowoomba range*, Gatton Valley Geological Survey of Queensland Record Series 1984/44.

SC6.5.5.4 Information sources

1. The following information sources are relevant:
   a. Queensland Government Water Monitoring Information Portal

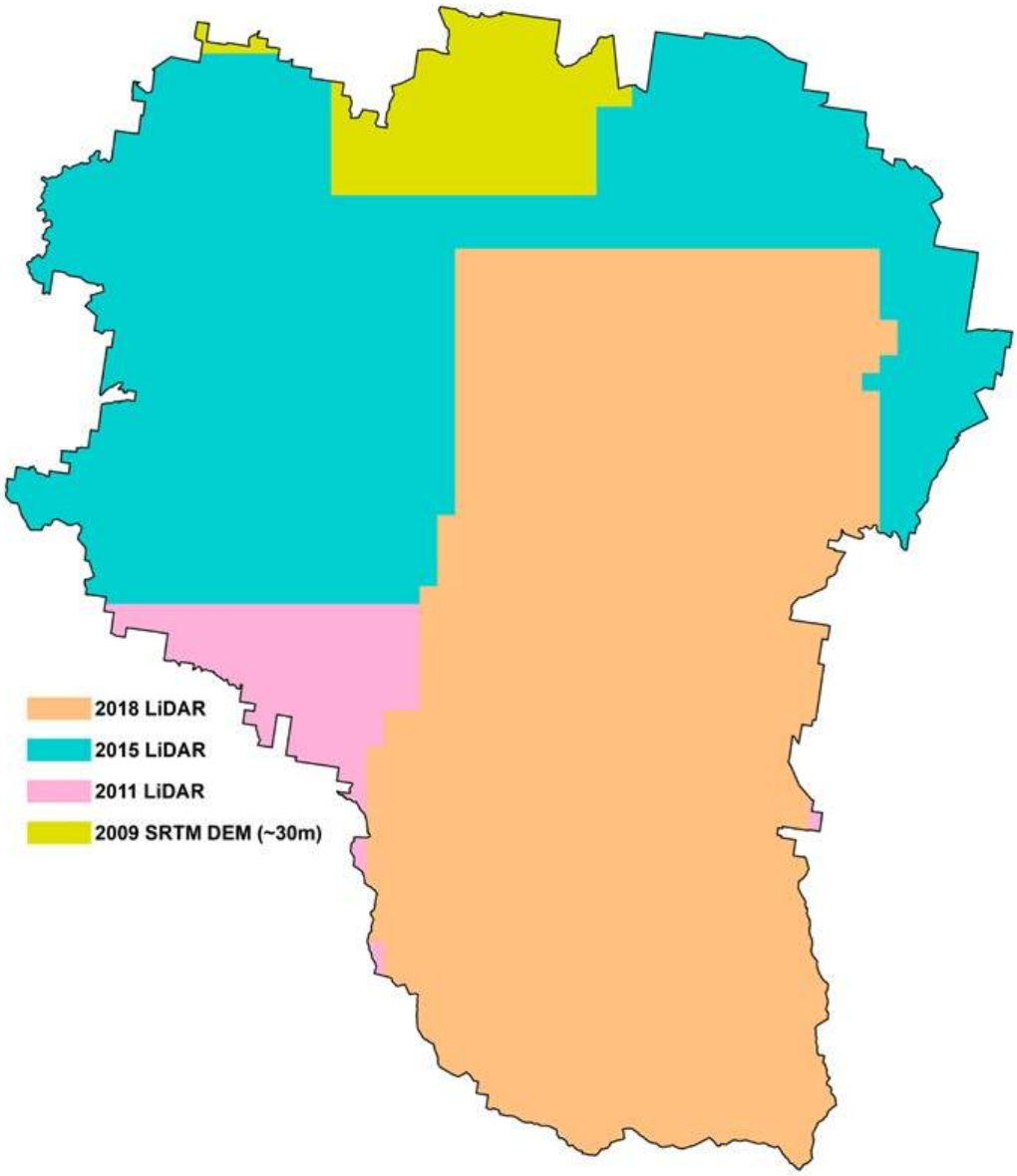
SC6.5.6 Consultation

2. Council may seek third party advice or comment about an application where:
   a. development may conflict with a code; or
   b. technical advice is required to assess the development.
3. Where technical advice is outsourced to an independent consultant an additional fee will apply

SC6.5.7 Steep land overlay methodology

1. Using a basic hazard identification process to develop a hazard identification map involved using pre-existing LiDAR information including:
   a. State Shuttle Radar Topographic Mission — 30m (2009);
   b. State LiDAR based digital elevation model (2011);
   c. State LiDAR based digital elevation model (2015);
   d. Council LiDAR based digital elevation model (2018) funded as part of Council's Local Flood Management Plan.
2. The extent of data sets used to create a complete digital elevation model for the whole region is shown in the Figure below.

Figure SC6.5-1: Data sets to create LVRC digital elevation model for slope



3. The State LiDAR data sets used have a 1m resolution capture for the digital elevation model. Whereas Council's LIDAR has an accuracy of 0.25m and used to generate flood models for the Local Flood Management Plan. The digital elevation model was used to identify slopes of:
   a. 0-5%;
   b. 5-10%;
   c. 10-15%;
   d. 15-20%;
   e. Greater than 20%.
4. The above categories are used for the following reasons:
   c. slopes greater than 5% can lead to erosion in areas with high risk soils;
   d. slopes greater than 10%, heavy vehicles struggle to access sites;

e. slopes less than 10% are suitable for effluent disposal areas;
f. slopes greater than 20%, vehicle and emergency vehicles struggle to access sites;
g. slopes greater 35% are subject to potential rapid landslide.

5. The range of slopes was generated to provide additional administrative information that will be used to inform development assessment. For example, effluent disposal sites should not be located on slopes greater than 10% and earthworks in areas with high risk soils greater than 5% are likely to have significant sediment and erosion control issues.
6. The accuracy of this data is high in areas, to the extent that slopes of waterways, road batters, swale drains, cut and fill slopes for house construction and farm dam walls have been identified. The final map that forms the Steep land overlay map has been refined to remove any 'noise' and minimise the extent of these features. A GIS script was used as part of this process to ensure there was a consistent approach across the entire region to remove noise and ensure that the administrative layers when combined with the trigger layers provide a slope picture of the region.
7. It is noted that the map is a steep slope extent and not a landslide hazard map. This means Applicants must undertake a risk assessment as part of the development assessment process.
8. Further improvements to the Slope map can be made with new LiDAR data.

SC6.5.7.1 Map data assumptions and limitations

1. The map was generate using best available data LiDAR data in 2020-2021.
2. This hazard identification was undertaken based on the following data assumptions and limitations:
   a. data sources were publicly available;
   b. digital elevation models generated have been combined to form the most current information available at the time of data processing (2021).
3. Further improvements in the accuracy of the slope map may be achieved by using a consistent LiDAR for the whole region to create a digital elevation model with a consistent level of accuracy across the region (rather than using four different data sets).

SC6.5.8 Landslide management plan parts

1. When undertaking development for a Material change of use, Reconfiguration of a Lot, and Operational works where changing the ground level or undertaking infrastructure works the following parts of the landslide management plan must be completed:
   a. Landslide risk assessment;
   b. Geotechnical stability assessment;
   c. Management and mitigation measures;
   d. Geotechnical Certification.

SC6.5.9 Landslide risk assessment

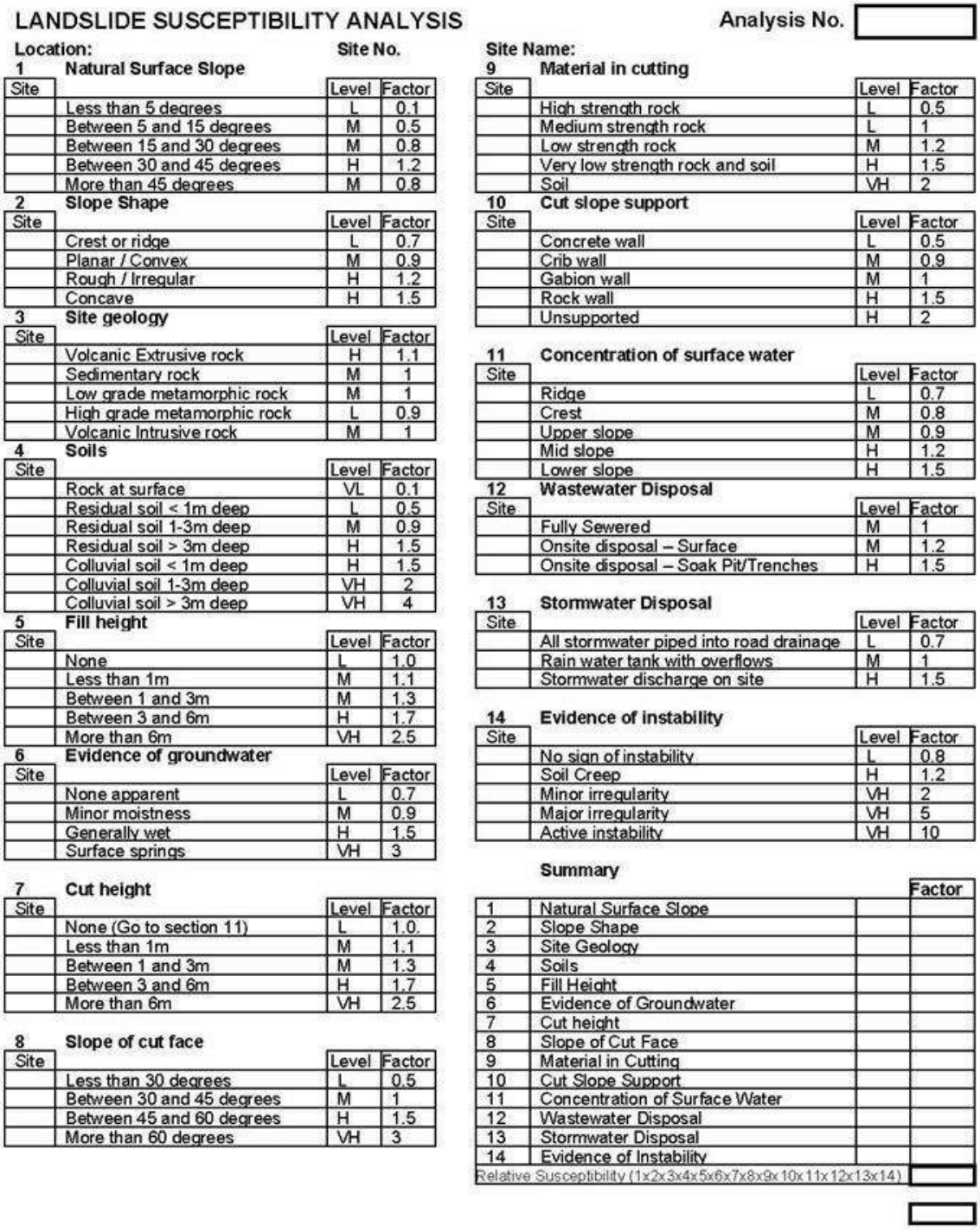
1. For any proposed development on land within Steep land areas, as identified on the Steep land overlay map, there is a risk of landslide that must be assessed by a qualified expert and submitted to Council for assessment.
2. The level of landslide risk depends on several factors including, but not limited to the following:
   a. ground slope angle and shape;
   b. characteristic geology;
   c. strength of geomaterials and its distribution within the subsurface;
   d. landslide history;
   e. presence of existing or recent past instability i.e. slips, slumps, hummocky ground etc;
   f. emergent seepages and depth of groundwater table;
   g. potential for surface runoff concentration, orientation of rock mass defects etc.
3. The applicant needs to assess the risk of landslide which may adversely affect the subject site, adjoining premises and the proposed development.

SC6.5.9.1 Requirements for Landslide risk assessment

1. The landslide risk assessment should be carried out using the following:
   a. site-specific geotechnical information;
   b. site slope gradient and shape;
   c. surface features;
   d. historical landslide information, where available;
   e. emergent seepages and groundwater table;
   f. drainage conditions; and
   g. any other relevant information of the site.
2. The landslide risk assessment results should be included in the geotechnical stability assessment report.

3. For any proposed development or redevelopment on any site or lot mapped on the Steep land overlay map, a 'landslide relative susceptibility' analysis should be carried out first using the Figure SC6.5-2: Landslide Susceptibility Analysis Form.

Figure SC6.5-2: SMEC Landslide susceptibility analysis form



LANDSLIDE SUSCEPTIBILITY ANALYSIS

Analysis No.

Location:

Site No.

Site Name:

1 Natural Surface Slope

Site		Level	Factor
	Less than 5 degrees	L	0.1
	Between 5 and 15 degrees	M	0.5
	Between 15 and 30 degrees	M	0.8
	Between 30 and 45 degrees	H	1.2
	More than 45 degrees	M	0.8

2 Slope Shape

Site		Level	Factor
	Crest or ridge	L	0.7
	Planar / Convex	M	0.9
	Rough / Irregular	H	1.2
	Concave	H	1.5

3 Site geology

Site		Level	Factor
	Volcanic Extrusive rock	H	1.1
	Sedimentary rock	M	1
	Low grade metamorphic rock	M	1
	High grade metamorphic rock	L	0.9
	Volcanic Intrusive rock	M	1

4 Soils

Site		Level	Factor
	Rock at surface	VL	0.1
	Residual soil < 1m deep	L	0.5
	Residual soil 1-3m deep	M	0.9
	Residual soil > 3m deep	H	1.5
	Colluvial soil < 1m deep	H	1.5
	Colluvial soil 1-3m deep	VH	2
	Colluvial soil > 3m deep	VH	4

5 Fill height

Site		Level	Factor
	None	L	1.0
	Less than 1m	M	1.1
	Between 1 and 3m	M	1.3
	Between 3 and 6m	H	1.7
	More than 6m	VH	2.5

6 Evidence of groundwater

Site		Level	Factor
	None apparent	L	0.7
	Minor moistness	M	0.9
	Generally wet	H	1.5
	Surface springs	VH	3

7 Cut height

Site		Level	Factor
	None (Go to section 11)	L	1.0.
	Less than 1m	M	1.1
	Between 1 and 3m	M	1.3
	Between 3 and 6m	H	1.7
	More than 6m	VH	2.5

8 Slope of cut face

Site		Level	Factor
	Less than 30 degrees	L	0.5
	Between 30 and 45 degrees	M	1
	Between 45 and 60 degrees	H	1.5
	More than 60 degrees	VH	3

9 Material in cutting

Site		Level	Factor
	High strength rock	L	0.5
	Medium strength rock	L	1
	Low strength rock	M	1.2
	Very low strength rock and soil	H	1.5
	Soil	VH	2

10 Cut slope support

Site		Level	Factor
	Concrete wall	L	0.5
	Crib wall	M	0.9
	Gabion wall	M	1
	Rock wall	H	1.5
	Unsupported	H	2

11 Concentration of surface water

Site		Level	Factor
	Ridge	L	0.7
	Crest	M	0.8
	Upper slope	M	0.9
	Mid slope	H	1.2
	Lower slope	H	1.5

12 Wastewater Disposal

Site		Level	Factor
	Fully Sewered	M	1
	Onsite disposal – Surface	M	1.2
	Onsite disposal – Soak Pit/Trenches	H	1.5

13 Stormwater Disposal

Site		Level	Factor
	All stormwater piped into road drainage	L	0.7
	Rain water tank with overflows	M	1
	Stormwater discharge on site	H	1.5

14 Evidence of instability

Site		Level	Factor
	No sign of instability	L	0.8
	Soil Creep	H	1.2
	Minor irregularity	VH	2
	Major irregularity	VH	5
	Active instability	VH	10

Summary

			Factor
1	Natural Surface Slope		
2	Slope Shape		
3	Site Geology		
4	Soils		
5	Fill Height		
6	Evidence of Groundwater		
7	Cut height		
8	Slope of Cut Face		
9	Material in Cutting		
10	Cut Slope Support		
11	Concentration of Surface Water		
12	Wastewater Disposal		
13	Stormwater Disposal		
14	Evidence of Instability		
Relative Susceptibility (1x2x3x4x5x6x7x8x9x10x11x12x13x14)			

4. The calculated relative susceptibility should then be correlated to susceptibility rating using Table SC6.5-1: Correlation between relative susceptibility and susceptibility rating.

Table SC6.5-1: Correlation between relative susceptibility and susceptibility rating

RELATIVE SUSCEPTIBILITY	SUSCEPTIBILITY RATING

Less than 0.2	Very low
0.2-0.6	Low
0.6-0.2	Moderate
2.0-6.0	High
Greater than 6.0	Very High

SC6.5.9.1.1 Landslide susceptibility rating analysis is 'low' or 'very low'

1. If the result of the landslide susceptibility rating analysis is 'low' or 'very low', then the following is required:
   a. undertake a further risk assessment of the proposed development impacting any adjoining buildings or properties; and
   b. certification from a RPEQ specialising in geotechnical engineering. This certification needs to confirm:
      i. the proposed development site or lot has been assessed with a landslide risk rating of 'low' or 'very low'; and
      ii. the proposed development will not cause any adverse impact on any adjoining buildings, properties, and infrastructure.

SC6.5.9.1.2 Landslide susceptibility rating analysis is 'moderate', 'high' or 'very high'

1. If the result of the landslide susceptibility rating analysis is 'moderate', 'high' or 'very high', a detailed landslide risk assessment following the Australian Geomechanics Society (AGS) 'Landslide Risk Management Guideline 2007' should be carried out to determine whether the risk to life and property is acceptable.
2. In this regard a 'low' or 'very low' risk to property and life is acceptable to Council. If the result of the landslide risk assessment following the AGS 2007 method is still 'moderate', 'high' or 'very high', then the following is required to be included in the report:
   a. detailed risk mitigation measures and engineering recommendations to reduce the landslide risk to 'low' or 'very low'; and
   b. certification from a RPEQ specialising in geotechnical engineering. This certification needs to confirm:
      i. the proposed development site or lots will achieve a landslide risk rating of 'low' or 'very low'; and
      ii. will not cause any adverse impact on any adjoining buildings, properties, and infrastructure, providing the risk mitigation measures and engineering recommendations (if any) of the report are followed.

SC6.5.9.2 Onsite effluent disposal (if applicable)

1. The report should examine feasibility and suitability of the proposed development about landslide risk issues for the site. If the proposed development involves onsite effluent disposal system, the risk assessment should consider potential saturation and softening of the soils within the effluent disposal areas and their impacts on the long-term stability of the site.

SC6.5.9.3 Details a landslide risk assessment must address

1. The details of landslide risk assessment must address include:
   a. **Assess the risk of landslide:**
      i. on the subject site for material change of use. This may be limited to a proposed development envelope area where on a large site; or
      ii. for each proposed lot in a subdivision. This may be limited to a proposed development envelope area on benched site/s; or
      iii. from any proposed bulk earthworks, retaining walls and proposed finished levels to achieve and maintain acceptable risk of landslide in the long-term conditions; and
      iv. on any upslope and downslope external properties which may impact the proposed development; and
      v. on driveway or road access to the development, whether internal or external to the development site.
   b. **Identify any risk mitigation measure including:**
      i. any exclusion area/s (i.e. locations on the development site) that are considered unsuitable for new development (i.e. reconfiguration or material change of use) due to an unacceptable risk to life and/or property.
      ii. any buffers to protect the proposed development (i.e. reconfiguration or material change of use) from an exclusion area/s.
      iii. proposed bulk earthworks and finished level/s.
   c. **Confirm the risk of landslide is 'low' or 'very low':**
      i. on the subject site for material change of use. This may be limited to a proposed development envelope area where on a large site; or
      ii. for each proposed lot in a subdivision. This may be limited to a proposed development envelope area on individual proposed lot/s; or

iii. after completion of any operation works, bulk earthworks and retaining walls and will not cause any adverse impact on any adjoining premise/s or structure/s.

SC6.5.10 Geotechnical stability assessment

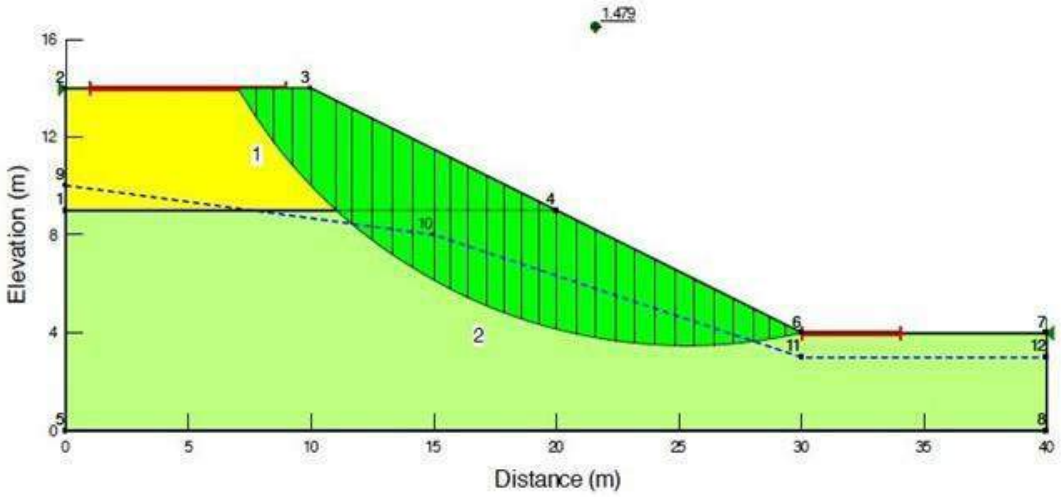
1. Where the proposed development requires significant bulk earthworks including cut or fill batters and/or retaining structures to achieve the desired finished levels, a geotechnical stability assessment is required to assess potential sliding, rotational and slip circle failure. The stability assessment of the proposed cut or fill batters and/or retaining structures should be included with the geotechnical stability assessment report.
2. This section provides guidance on the Councils requirements for stability assessment of cut or fill batters and retaining structures associated with any proposed development.

SC6.5.10.1 Stability assessment of batters

1. The stability assessment of all proposed cut or fill batters should be carried out following a conventional slip circle failure analysis method. In this type of analysis, several potential slip circles are assumed, and the factor of safety for each of the assumed slip circles is calculated. The minimum factor of safety amongst those assumed slip circles is the factor of safety for that designed batter. The accuracy of the stability assessment depends on the number of slip circles analysed and the calculation method followed.
2. One particularly important issue in the stability assessment of batters is the estimation of representative shear strengths for the constituting soil layers. In stability analysis of batters, the worst credible shear strengths of the soil layers expected during the design life of the batters should be used, rather than using the existing shear strengths of the soil layers. If there is a prolonged and heavy rainfall, the highest estimated water table and drainage conditions should be used. Another potential worst case scenario for the stability assessment of batters adjacent to any water body is sudden drawdown of the water table. In this instance, the factor of safety for the sudden drawdown case should be calculated, rather than for the temporary or short term high water level condition.
3. The stability assessment of the cut or fill batters should achieve a long term factor of safety of at least 1.5 against geotechnical instability. For rapid drawdown temporary conditions, the stability assessment of the cut or fill batters should achieve a short term factor of safety of at least 1.3 against geotechnical instability.
4. The stability analysis of batters may be carried out manually, however, the use of professional software, such as *SLOPE/W by Geoslope* (**www.geoslope.com**) would be cost effective with much less computational efforts and time. Figure SC6.5-3: Typical slope stability analysis using SLOPE/W shows an example of slope stability analysis using *SLOPE/W.*

Figure SC6.5-3: Typical slope stability analysis using SLOPE/W

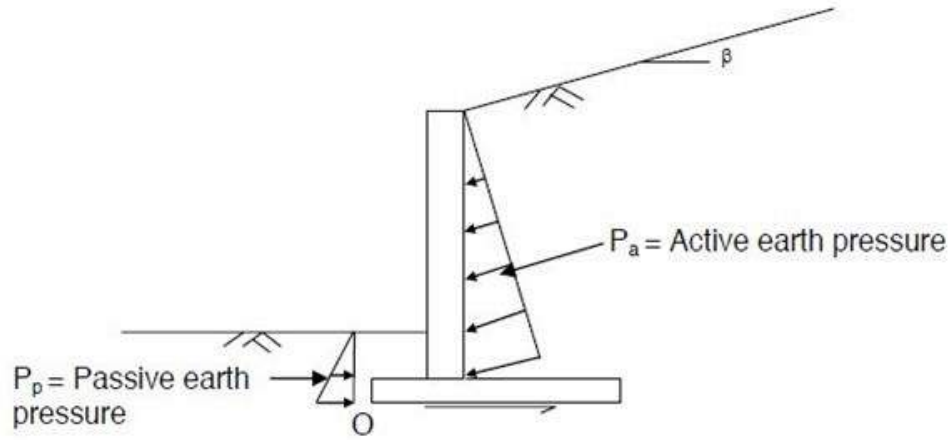
Material number 1:	Unit weight: 15	C: 5	Phi: 20	Model: MohrCoulomb
Material number 2:	Unit weight: 18	C: 10	Phi: 25	Model: MohrCoulomb



SC6.5.10.2 Stability assessment of retaining structures

1. Geotechnical stability of all proposed retaining structures should be carried out against sliding, overturning and global slope instability through the geomaterials. The proposed retaining structures should also be checked against bearing capacity failure or excessive base settlements. Furthermore, the retaining structure itself must be designed against any potential structural failure such as flexural failure or shear failure.
2. **Error! Reference source not found.** shows a typical retaining structure including lateral earth pressure distributions. The retained soil behind the retaining structure will exert active lateral earth pressure if the retaining structure allows lateral movement. Otherwise, lateral earth pressure at rest 'Ko condition' should be used during the design and stability assessments. The soil in front of the wall will provide passive earth pressure (resistance).

Figure SC6.5-4: Typical retaining structure and lateral earth pressure distributions



5. For the proposed retaining structures, the applicant should assess the factor of safety against the following:
   a. sliding caused by the active earth pressure and resistance by passive earth pressure and frictional force at the base of the retaining structure;
   b. overturning about the toe (point 'O' in Error! Reference source not found.) because of the driving moment caused by the active earth pressure and resisting moment caused by the passive earth pressure, the self-weight of the retaining structure and weight of the retained soils behind the structure; and
6. global slope instability considering several large slip circles passing below the base of the retaining structure and the retained soils.
7. The stability assessment should ensure all retaining structures will achieve a factor of safety (FOS) greater than or equal to 1.5 against sliding, overturning and global slope instability. Alternatively, the sliding and overturning stability and global stability assessments for retaining structures can be carried out using Limit State Methods as described in *4678 — Earth Retaining Structures.*
8. The global stability analysis of retaining walls may be carried out manually, however, the use of professional software, such as *SLOPE/W by Geoslope:* (**geoslope.com**) would be cost effective with much less computational efforts and time.

SC6.5.11 Geotechnical certifications

1. In addition to undertaking a landslide risk assessment, the applicant should provide a geotechnical certification from a RPEQ specialising in geotechnical engineering for any proposed development within landslide hazard areas.
2. If the landslide risk assessment determines the site OR lot OR development envelope area with a landslide risk rating of 'low' or 'very low' certification is from a RPEQ specialising in geotechnical engineering confirming the proposed development is appropriate for:
   a. the sloping nature of the site,
   b. the risk of landslide on the subject site or lot (or each of the proposed lots for reconfiguring a lot development applications) adversely affecting the proposed development and adjoining properties or structures and
   c. the risk of landslide on any upslope and downslope external properties impacting the proposed development is 'low' or 'very low'.
3. If the landslide risk assessment determines the site OR lot OR development envelope area with a landslide risk rating of 'moderate', 'high' or 'very high' certification from a RPEQ specialising in geotechnical engineering confirming the proposed development is appropriate for:
   a. the sloping nature of the site,
   b. the risk of landslide on the subject site or lot (or each of the proposed lots for reconfiguring a lot development applications) adversely affecting the proposed development and adjoining properties or structures and

c. the risk of landslide on any upslope and downslope external properties impacting the proposed development will be reduced to 'low' or 'very low', providing the risk mitigation measures and engineering recommendations of the report are followed.

4. These certifications will provide assurance of geotechnical stability for the proposed development site and a summary of the complex landslide risk assessment process. These certifications should be prepared using the Councils standard engineering certification form and should be included with the geotechnical stability assessment report.

Figure SC6.5-5: Example Subdivision landslide encumbrance form

Development Details

Development Name		**Development Stage**	
Lot & Plan Description			
Street Address			
Related Approval Number/s			
Encumbrances			

Geotechnical Engineers Details

Company Name:	
Engineers Name	

Signature: **RPEQ number:** **Date:**

Use the following abbreviations to re-categorise the SMEC landslide susceptibility rating including all encumbrances.

VH=Very High **H=High** **M=Moderate** **L=Low** **VL=Very Low**

Proposed Lots *(attach an additional schedule if there is insufficient space)*

Lot & Plan Number	Relative Susceptibility	Final land slide Susceptibility rating for:	
		Area	Development envelope area

SC6.5.11.1 Minimum requirements for landslide risk assessment and management plans

SC6.5.11.1.1 Presentation of the report

1. The geotechnical stability assessment report is to be written as a self-contained document, which does not require the reader to refer to any other documents including the Councils reference number, maps, drawings, previous applications, or other reports (if any). If the report does require the applicant to refer to any other documents, it should include a copy of those documents as attachments.
2. The report should include, but not necessarily limited to, the following:
   a. a cover page with a title of the report, revision number, property address, real property description (lot and plan numbers), report reference number, author's name, and date;
   b. the body of the report including the context within which the report was commissioned, the purpose of the report, geotechnical site investigation results, landslide risk assessment results and slope stability assessment results for cut or fill batters and/or retaining walls;
   c. any maps, plans, drawings, cross-sections referred to in the report;
   d. any relevant borehole records, laboratory, and field test results;
   e. landslide susceptibility rating calculations;
   f. slope stability calculations for batters and retaining walls;
   g. geotechnical certifications.

SC6.5.11.2 Technical Information

1. The purpose of a site assessment is to describe the values and features of the site that are relevant to the matters to be addressed in a management plan.
2. Each site assessment should comprise:
   a. standard requirements — such as site locations, address, date, etc.;
   b. detailed requirements — specific information required.

SC6.5.11.2.1 Standard requirements for site assessments

1. Each Geotechnical assessment and landslide management plan site assessment should include the following:
   a. project location and address;
   b. project title and description;
   c. the date on which the assessment and any plans were prepared, including any amendments;
   d. name and relevant professional qualifications of the person/s preparing the assessment.
   e. for all plans include a north point, scale, location of property boundaries road alignments and street names.

SC6.5.11.2.2 Detailed requirements for site assessments

1. The Geotechnical assessment and landslide management plan site assessment should also address:
   a. the existing geological and topographic conditions of the development site;
   b. the suitability of the site for the proposed development having regard to the prevailing geological and topographic conditions.
2. In particular, the site assessment should include a description of the following matters:
   a. Proposed **development** — Complete details of the proposed development and how it is to be located on the site including full description of site layout, proposed buildings, structures, excavation or fill and any other development components.
   b. **Existing site conditions**
      i. Information available from published materials, including aerial photography, geological maps, and reports (e.g. the Geological Survey of Queensland Record Series).
      ii. Existing topography, geology (surface and subsurface materials) and geomorphology (slopes, ground contours, natural features, terrain analysis, landslip features, former mining activities) both locally and regionally in locality;
      iii. A ground inspection;
      iv. Existing vegetation;
      v. Existing buildings, structures or other non-natural conditions existing on the site;
      vi. (v) Existing surface water and groundwater conditions, including water table, springs, and seepage areas in the local area of interest.
      vii. Existing surface drainage patterns and vegetation cover on and around the site.
      viii. Any other relevant features or site improvements, like existing buildings, other structures, earthworks, etc.
   c. **Evidence of Potential Instabilities**
      i. Location and classification of any existing landslip features (type, severity, and mode of failure).
      ii. Extent and type of any existing occurrences of erosion.
      iii. From field and/or laboratory testing or assessment, classification of surface and subsurface materials to determine:
         A. erosion potential;
         B. foundation conditions that could affect structural performance;
         C. suitability for wastewater disposal;

D. any other relevant characteristics.

iv. The results of all field and laboratory tests, and the location and level (including datum) of field investigations such as boreholes, trench pits and core penetrometer soundings.

v. An assessment of the existing stability of the subject land and details of geotechnical constraints on building and/or other development works on the site.

vi. An assessment of existing conditions and the effects or impacts of the development upon slope stability and landslip potential or any other geotechnical constraints to development.

vii. Conclusions about the overall suitability of the land for the proposed development, including suitability in terms of:
   A. Site Layout;
   B. Roadworks, driveways, and other pavements;
   C. Earthworks (excavation, materials usage);
   D. Foundations;
   E. Surface Drainage;
   F. Wastewater (treatment and disposal);
   G. Overall Effect of Development on Stability.

SC6.5.12 Requirements for Geotechnical assessment and landslide management plan management plans

1. The purpose of a management plan is to describe how the values and features identified in a site assessment (see section 3 — Requirements for site assessments) are to be managed to meet the outcomes of the relevant planning scheme codes.
2. Each site assessment should comprise:
   a. standard requirements — described in 4.1 below;
   b. detailed requirements — the specific management steps proposed to be implemented, described in 4.2 below.

SC6.5.12.1 Standard requirements for management plans

1. The Geotechnical assessment and landslide management plan management plan should:
   a. state the purpose, aims and objectives of the Geotechnical assessment and landslide management plan management plan;
   b. summarise the results of the Geotechnical assessment and landslide management plan assessment report;
   c. provide justification for any proposed variation from the measures outlined in the related planning scheme code for which the Geotechnical assessment and landslide management plan planning scheme policy is a supporting measure;
   d. include details of any consultation that has occurred. Examples include any discussion with council, state or federal agencies, technical consultants, and any stakeholders, including affected landowners and the public;
   e. identify the parties to be responsible for any specific actions identified in the Geotechnical assessment and landslide management plan management plan.

SC6.5.12.2 Detailed requirements for management plans

1. The Geotechnical assessment and landslide management plan management plan should also address the siting, engineering and other measures required to ensure a satisfactory form of development, including:
   a. Recommendations on appropriate measures required to avoid, minimise, or mitigate risks of instability including:
      vi. preferred locations for buildings, other structures, driveways, etc.;
      vii. foundation requirements such as bearing pressures, piling parameters, special techniques for expansive clays, etc.;
      viii. pavement types and design;
      ix. construction methods to avoid problem areas associated with loose materials and groundwater seepage;
      x. preferred excavation/retention/stabilisation techniques and suitability of excavated materials for use in on-site earthworks;
      xi. surface and subsurface drainage requirements;
      xii. preferred methods of on-site wastewater disposal;
      xiii. vegetation protection and revegetation requirements.