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1 INTRODUCTION

1. This chapter of the DCP applies to certain lands within the City of Wollongong LGA that are known or suspected to be subject to land instability. Slope instability may be initiated by the influence of human alterations of the natural landform and/or natural processes as they affect the landform. It predominantly occurs as a rockfall, landslide or debris flow on hillside land particularly after periods of prolonged or intense rainfall. It also occurs along the coastal zone through wave action or inundation.

The chapter outlines Council's specific requirements for geotechnical investigation and assessment of developments upon lands known or suspected to be subject to slope instability.

2. This policy addresses both structural and geotechnical requirements relating to geotechnical issues only. Separate structural requirements will also apply for the erection of any structure in accordance with the *Building Code of Australia* and good engineering practice.
3. The guidance for the establishment of acceptable risk criteria in this policy is based upon the contents of the Australian Geomechanics Society's *Practice Note Guidelines for Landslide Risk Management 2007* (AGS 2007), This reference publication is to be read in conjunction with:
 - AGS (2007) Guideline for Landslide Susceptibility, Hazard and Risk Zoning for Land Use Planning
 - AGS (2007) Australian GeoGuides for Slope Management and Maintenance
 - AGS (2007) Commentary on Practice Note Guidelines for Landslide Risk Management 2007

The AGS 2007 are adopted as a reference document for this DCP.

4. The level of risk for the loss of life can be determined by the methods outlined in Australian Geomechanics Society's *Practice Note Guidelines for Landslide Risk Management 2007* (AGS 2007).
5. The level of risk for loss of property can be determined by example or method as outlined in Australian Geomechanics Society's *Practice Note Guidelines for Landslide Risk Management 2007* (AGS 2007).

2 OBJECTIVES

1. The objectives of this Chapter are:
 - a) To outline the procedure to be followed when Council is considering applications for the development of sites that may be subject to slope instability;
 - b) To ensure geotechnical and related structural matters are appropriately investigated and documented by applicants prior to the lodgement of any Development Application to carry out development;
 - c) To establish whether or not the proposed development is appropriate to be carried out, either conditionally or unconditionally, having regard to the results of those geotechnical and related structural investigations;
 - d) To ensure all geotechnical and related structural engineering conditions, are identified by applicants of the Development Application including all appropriate constraints and remedial actions required prior to, during and after the carrying out of the development;

- e) To ensure the level of risk to property and/or life posed by slope instability on the site or related land is equal to or less than the level of acceptable risk as defined by the Australian Geomechanics Society's Practice Note Guidelines for Landslide Risk Management 2007.

3 DEFINITIONS

Acceptable risk: Acceptable risk for loss of life is taken as one order of magnitude lower than the tolerable risk for the person most at risk, as shown in the risk matrix as published in AGS 2007. Acceptable risk for loss of property is taken as low or very low in the risk matrix as published in AGS 2007 as amended. NOTE: This does not preclude development on sites where the risk has been identified as being moderate provided that measures are taken as described in the above-mentioned risk matrix as published in AGS 2007 as amended (refer to clause 5.3.(c)).

AGS (2007): means Australian Geomechanics Society's *Practice Note Guidelines for Landslide Risk Management 2007* (AGS 2007) originally cited in *Australian Geomechanics* Vol 42 No 1 March 2007.

Application/s: means an application for the determination of Council for development which includes an Integrated Development Application, Development Application, Section 4.55 Application or request for review of determination under Division 8.2 of the Environmental Planning and Assessment Act 1979.

Civil design: means a design where the development includes any road, drain, excavation or fill placement which has been prepared by a civil engineer.

Civil engineer: means a civil or structural engineer who is a member or is eligible for membership of a professional engineering institution, is university degree qualified with a minimum of five years relevant professional practice during the last ten years as a civil engineer, and is listed on the National Professional Engineers Register, and either has or is employed by a corporation which has professional indemnity insurance to the amount required under Council's forms pertaining to Planning Building and Development Services, such insurance being evidenced to Council to be in force, for the year in which any information is submitted to the Council in accordance with this policy. The professional indemnity insurance must have retroactive cover extending back to at least the engineer's first submission to Council.

CPEng: means Chartered Professional Engineer.

CPGeo: means Chartered Professional Geologist.

Development: means the construction, alteration or demolition of buildings, including swimming pools, roads, dams, ponds and drains, and the excavation and/or filling of land or any other works that requires the prior approval of Council.

Engineering geologist: means a specialist engineering geologist who is university degree qualified, is a member or is eligible for membership of a professional institution and who has achieved chartered professional status being either CPEng or CPGeo or RPGeo with Landslide Risk Management as a core competence; with a minimum of five years practice during the last ten years as an engineering geologist in regions of the Sydney Basin underlain by Narrabeen or Coal Measures geological strata or who is able to demonstrate relevant experience with similar geology and either has or is employed by a corporation which has professional indemnity insurance to the amount required under Council's forms pertaining to Planning Building and Development Services, such insurance being evidenced to Council to be in force, for the year in which any information is submitted to the Council in accordance with this policy. The professional indemnity insurance must have retroactive cover extending back to at least the engineer's first submission to Council.

Final geotechnical certificate: means a certificate prepared by a geotechnical engineer or engineering geologist in accordance with form M11 of this Plan.

Final Structural certificate: means a certificate prepared by a structural engineer in accordance with form M16 of this policy.

Geotechnical engineer: means a specialist geotechnical engineer who is university degree qualified, is a member of or is eligible for membership of a professional engineering institution and who has achieved chartered professional status being either CPEng or CPGeo or RPGeo with Landslide Risk Management as a core competence; with a minimum of five years practice during the last 10 years as a geotechnical engineer in regions of the Sydney Basin underlain by Narrabeen or Coal Measures geological strata or who is able to demonstrate relevant experience with similar geology and either has or is employed by a corporation which has professional indemnity insurance to the amount required under Council's forms pertaining to Planning Building and Development Services, such insurance being evidenced to Council to be in force, for the year in which any information is submitted to the Council in accordance with this policy. The professional indemnity insurance must have retroactive cover extending back to at least the engineer's first submission to Council.

Geotechnical hazards: means a condition with the potential for causing the movement of soil, rock or debris which may cause injury or death to persons or damage to, or destruction of property.

Geotechnical report: means a report prepared by and/or technically verified by a geotechnical engineer or engineering geologist as defined by this DCP, which incorporates each of the elements, where applicable to the type of development, described in section 5.2 'Requirements for the preparation of geotechnical reports' of this policy.

PCA: means principal certifying authority.

Related land: means land including roads and thoroughfares that could affect or could be affected by any development proposed on a site.

Risk: means a measure of the probability and severity of an adverse effect to life and property.

RPGeo: Registered Professional Geologist.

Site/s: Is the parcel of land, whether comprising one or more allotments, to which an application for consent relates.

Site classification: means a classification of the site in accordance with the current version of Australian Standard AS 2870 - Residential Slabs and Footings.

Slope instability: means a condition with the potential for causing the movement of soil, rock or debris.

Structural design: means a design for any structure to be erected on the site (which may be in the form of drawings) having structural elements where the design makes recommendations in respect of the structural works and has been prepared by a structural engineer or civil engineer requiring certification in accordance with form M12 of this policy.

Structural engineer: means a civil engineer or structural engineer who is a member of or eligible for membership of a professional engineering institution, is university degree qualified with a minimum of five years practice during the last ten years as a structural engineer and is listed on the National Professional Engineers Register, and either has or is employed by a corporation which has professional indemnity insurance to the amount required under Council's forms pertaining to Planning Building and Development Services, such insurance being evidenced to Council to be in force, for the year in which any information is submitted to the Council in accordance with this policy. The professional indemnity insurance must have retroactive cover extending back to at least the engineer's first submission to Council.

Structural works: means the elements of any structure designed by a structural engineer or civil engineer.

Tolerable risk: means the risk which has been assessed and may be accepted provided that a treatment plan is implemented to maintain or reduce the risks.

Treatment plan: means a plan explaining how treatment options will be implemented to manage the risk.

Treatment options: means methods to control and treat the risk including but not limited to:

- Alternative forms of development such that the revised risk would be acceptable or tolerable;
- Stabilisation measures to control the initiating circumstances such that the revised risk would be acceptable or tolerable after implementation;
- Defensive stabilisation measures, amelioration of the behaviour of the hazard or relocation of the development to a more favourable location to achieve an acceptable or tolerable risk.

Verifier: means a geotechnical engineer or engineering geologist, as defined by this policy, who verifies a geotechnical report.

4 CONTROLS

4.1 Identification of land subject to potential slope instability

1. Council will consider whether the site or related land may be subject to slope instability by taking into account one or more of the following:
 - (a) The information contained in Council's property database and other relevant documents or maps held in the office of Council;
 - (b) Any inspection of the site in the opinion of Council and/or related land by a Council Officer or other person nominated by Council, which identified that the subject site to adjoining land may be subject to slope instability;
 - (c) Consideration of any geotechnical report that is relevant to the site or related land;
 - (d) Any other information available to Council; and /or
 - (e) As a precautionary approach, Council may have the information reviewed by its Geotechnical Services Branch or a third party independent geotechnical engineer or engineering geologist.

4.2 Land identified as having an acceptable risk of slope instability

If Council is satisfied, as a result of the considerations described in Section 4.1 and taking into account the total development and site disturbances proposed, that the site and related land have an acceptable risk of slope instability, the application may be processed without the need for a geotechnical report.

5 CRITERIA FOR ASSESSMENT

5.1 Development to which this policy applies

1. This policy applies to the majority of development proposals upon lands known or suspected to be subject to slope instability, as recorded in Council's property database or other relevant document or maps.

2. This policy does not however apply to the following types of development:
 - a) Exempt development as defined in clause 3.1 and Schedule 2 of *Wollongong Local Environmental Plan 2009* or any State Environmental Planning Policy or State Code;
 - b) Complying development as defined in clause 3.2 and Schedule 3 of *Wollongong Local Environmental Plan 2009*;
 - c) Building alterations comprising:
 - (i) The making of, or an alteration to the size of, any opening in a wall or roof of a building, such as a doorway, window or skylight;
 - (ii) Non-structural alterations or repairs to the exterior of a building, such as painting, plastering, cement rendering, cladding, attaching fillings and decorative work; or
 - (iii) Non-structural alterations to the interior of a building that do not result in the current load-bearing capacity of the building being exceeded;
 - d) The erection of a verandah or deck constructed of timber or steel which is articulated from the main dwelling, provided that work to an existing building does not result in the building suffering movement in excess of the acceptable level of performance described in *AS2870 – Residential Slab and Footings*; or
 - e) Minor earthworks, including landscaping involving excavations or fill not in excess of 600mm in vertical height; or
 - f) Minor construction/demolition works that do not increase the risk of slope instability on the site or related land as assessed and certified on form M14 of this policy by a geotechnical engineer or engineering geologist subject to section 4.1(e) of this policy.
3. Geotechnical reports that have been prepared in the subdivision of land will not be accepted for individual sites unless reviewed and certified on form M11 to this policy by a geotechnical engineer or engineering geologist.
4. Geotechnical reports greater than two years old will not be accepted unless reviewed and certified on form M11 to of this policy by a geotechnical engineer or engineering geologist.

5.2 Requirements for the preparation of geotechnical impact assessment reports

1. For developments to which this policy applies, Council will require the submission of a geotechnical impact assessment report with the Development Application which includes (but not is necessarily limited to) the following matters:
 - (a) A review of readily available history of slope instability upon the site or related land.
 - (b) A site plan and cross-section plans of the site and related land from survey and field measurements with existing contours and proposed finished contours (i.e. at 1 metre intervals) and key features identified.

The site plan and section plans should show the locations of the proposed development, buildings/structures on both the subject site and adjoining sites as well as the identification of all services such as stormwater drainage, sub-surface drainage, effluent disposal systems, water supply and sewerage pipelines, trees and other identifiable geotechnical hazards.
 - (c) A geotechnical model including:
 - (i) Details determined from site inspections (a site inspection is required in all cases);
 - (ii) Site investigations (site investigation will require site mapping, delineation of different site conditions and may involve sub surface investigation to determine soil/rock parameters

and groundwater conditions. Boreholes and/or test pit excavations or other methods necessary to adequately assess the geotechnical/geological model for the site also need to be detailed); and

- (iii) Any other information used in preparation of the geotechnical report.
- (d) Photographs and/or drawings of the site and related land adequately illustrating all geotechnical features referred to in the geotechnical report.
- (e) An assessment of the risk posed by all reasonably identifiable geotechnical hazards which have the potential to either individually or cumulatively impact upon people or property upon the site or related land or surrounding sites to the proposed development in accordance with the AGS 2007 guidelines.
- (f) Classification of the building site in accordance with the current edition of *AS 2870 - Residential Slabs and Footings*.
- (g) A conclusion as to whether the site is suitable for the development proposed to be carried out either conditionally or unconditionally. This must be in the form of a specific statement that the site is suitable for the development proposed to be carried out with an acceptable risk in accordance with the measures and methods to be applied to the site including but not limited to recommendations on:
 - (i) Selection and construction of footing systems;
 - (ii) Earthworks;
 - (iii) Surface and sub surface drainage;
 - (iv) Recommendations for the selection of structural systems consistent with the geotechnical assessment of the risk;
 - (v) Any conditions that may be required for the ongoing mitigation and maintenance of the site and the proposal, from a geotechnical viewpoint; and
 - (vi) Highlighting and detailing the geotechnical inspection regime to provide the PCA and builder with adequate notification for all necessary inspections.
- (h) The geotechnical impact assessment report must be accompanied by form M11 or M13 (for subdivisions only) as applicable in Appendix 1 of this policy bearing the original signature of the engineering geologist or geotechnical engineer, who has either prepared or technically verified the geotechnical report certifying that it has been prepared in accordance with this policy and AGS 2007 guidelines as amended.
- (i) Where a geotechnical impact assessment report prepared for a site identifies engineering techniques to enable development on a site previously restricted from development because the slope instability identified the risk to property and/or life posed by the slope instability as greater than the level of acceptable risk, the geotechnical report must also take into consideration any impacts as a result of remedial works on surrounding sites and related land.
- (j) Where a geotechnical impact assessment report contains a recommendation for a separate analysis of the site to be carried out by another consultant, (e.g. a flood study to be compiled by a hydrological consultant), this recommendation is to be highlighted to the applicant to enable the applicant to engage the required consultant and obtain the necessary report prior to the lodgement of the application.

5.3 Circumstances in which council would not approve a Development Application

1. Where a geotechnical impact assessment report does not comply with the minimum information requirements contained in this policy.
2. Where a geotechnical impact assessment report has been prepared or verified by a geotechnical engineer or engineering geologist with qualifications which do not meet the requirements of this policy.

3. In circumstances where Council or independent consultant engaged by Council review a geotechnical impact assessment report and assess that the risk to property and/or life posed by the slope instability of site is greater than the level of acceptable risk as defined by this policy and AGS 2007 as amended, after all reasonable and practicable measures to reduce foreseeable risk have been considered and/or where the geotechnical impact assessment report does not follow the methodology of this policy and AGS 2007 as amended.
4. Where there is a history of landslide upon the subject site or related land and where the site has not undergone satisfactory remediation measures (in the opinion of Council) to achieve an acceptable hazard risk.
5. Note: Any geotechnical remediation work must be approved by Council prior to commencement. Remediation must be validated by the installation of in-ground instrumentation that must be monitored until the slope instability is confirmed as remediated to an acceptable risk. As geotechnical hazards are often weather dependant, this process may extend over a period of many months or years.
6. A geotechnical impact assessment report for the remediation must be prepared and verified by a geotechnical engineer or engineering geologist and a remediation certificate in accordance with form M15 of this policy must be lodged with Council prior to any further development continuing on the site.
7. Any development upon a site where the hazard risk cannot be reduced to an acceptable level either through appropriate building design or practicable mitigation measures and / or maintenance of the site or related land.
8. Any other circumstance where the hazard risk is in the opinion of Council unacceptable.

5.4 Structural design

1. The structural design must be submitted to the PCA prior to works commencing and must be accompanied by form M12 as applicable in Appendix 1 of this policy bearing the original signature of the structural engineer, who prepared the structural design. This will serve as a mechanism to verify to the PCA that the structural design has been prepared in accordance with the recommendations given in the geotechnical report for the same development.
2. The form establishes that the recommendations given in the geotechnical impact assessment report have been interpreted and incorporated into the structural design as originally intended by the geotechnical engineer in preparing the geotechnical report.

5.5 Final certification

1. Where required by a development consent a final structural certificate must be issued to the PCA in accordance with form M16 of this policy prior to the issue of an occupation certificate and must bear the original signature of the structural engineer, who prepared the structural design. This will serve as a mechanism to verify to the PCA that the development works were carried out in accordance with the requirements of the structural design and any site inspections, and that any changes to the development occurring during construction were carried out in accordance with all the requirements and recommendations of the structural design and geotechnical report, conditions of development consent relating to geotechnical issues, and any site instructions issued.

If a completed form is not submitted with an application for occupation certificate, then the PCA must refuse to issue an occupation certificate until the completed form is submitted

2. Where required by a development consent a final geotechnical certificate must be issued to the PCA in accordance with form M11 of this policy prior to the issue of an occupation certificate and must bear the original signature of the geotechnical engineer or engineering geologist, who prepared or technically verified the geotechnical report. This will serve as a mechanism to verify to the PCA that the development works were carried out in accordance with the requirements of the geotechnical report during construction, and any site inspections, and that no unforeseen ground conditions have

been encountered which could impact on the integrity of structures on site or related land and any subsequent geotechnical requirements introduced during the construction process.

If a completed form is not submitted with an application for occupation or subdivision certificate where required by a development consent then the PCA must refuse to issue an occupation or subdivision certificate until the completed form is submitted.

Appendix: 1 FORMS

1. M11 Geotechnical Declaration and Verification Development Application (Clauses 5.1, 5.2(h))

This form also includes declaration of subdivision reports and reports greater than two years old. If the form is not submitted with the geotechnical report the report will be refused.

2. M12 Structural/Civil/Geotechnical Engineering Declaration - Construction Certificate Application. (Clauses 3.0 and 5.4, & Prior to Issue of Construction Certificate Condition)

If a completed form is not attached to the structural design submitted to the certifying authority with the application for a construction certificate, then the certifying authority must refuse to issue a construction certificate until the completed form is submitted.

3. M13 Geotechnical Declaration Subdivision Construction Certification Application. (Clauses 3.0 and 5.2(h), & Prior to Issue of Engineering Construction Certificate Condition)

If the form is not submitted with the geotechnical report the report will be refused.

4. M14 Geotechnical Declaration Minor Impact (Minor structures Clause 3.0 and 5.1(f))

This form is as a way of allowing a relatively small inconsequential development to proceed without the need for a geotechnical report to be produced in accordance with the DCP. Council will accept an application for this type of development if the form is completed by a geotechnical engineer or engineering geologist declaring that the impact from the development is so minimal that a geotechnical report is not required. Note: notwithstanding this the geotechnical consultant will determine whether a geotechnical report is required.

6. Form M15 has been superseded – Use Form M11

This form must be submitted where development must be staged for geotechnical reasons and remediation of the site to an acceptable risk is necessary prior to any further development continuing on the site.

If a completed form is not submitted with an application for construction certificate(s) for subsequent stages of the development, then the PCA must refuse to issue the construction certificate(s) until the completed form is submitted.

7. M16 Geotechnical Declaration Final Structural/Civil Certificate (Clauses 3.0 and 5.5(a) & PCA form)

That the structural design contains a highlighted reference to this requirement to enable the builder to give adequate notice of such inspections.

If a completed form is not submitted with an application for occupation certificate, then the PCA must refuse to issue an occupation certificate until the completed form is submitted.

8. Form M17 has been superseded – Use form M11

That the geotechnical report contains a highlighted reference to this requirement to enable the builder to give adequate notice of such inspections.

If a completed form is not submitted with an application for occupation or subdivision certificate, then the PCA must refuse to issue an occupation or subdivision certificate until the completed form is submitted.