

Geotechnical and Planning Advice for an Interim Erosion Management Overlay

Mornington Peninsula Shire Council, Victoria

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Review of Landslide Susceptibility Assessment
Mornington Peninsula Shire
Mornington Peninsula Shire Council

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Acronyms / Abbreviations

1H:2V	Slope Ratio of 1 Horizontal to 2 Vertical
AADT	Average Annual Daily Traffic
AHBP	Allowable Horizontal Bearing Pressure
AHD	Australian Height Datum
Base Course	Upper granular layer of the pavement
Capping Layer	Lower structural layer of pavement comprising Type A fill designed to minimise moisture movement between the upper pavement and underlying subgrade
BYDA	Before You Dig Australia
CBR	California Bearing Ratio (%)
Construction Layer	Lower structural layer of pavement comprising Type A fill used to facilitate trafficking of the subgrade during construction
CTCR	Cement Treated Crushed Rock
DCP	Dynamic Cone Penetrometer
DF	Direction Factor
DTP	Department of Transport and Planning (formerly VicRoads)
DTL	Daily Traffic Loading
EC	Electrical Conductivity
EMOs	Schedules to the Erosion Management Overlay
ESA	Equivalent Standard Axles
FCR	Fine Crushed Rock
FoS	Factor of Safety
GIS	Geographic Information Systems
GPS	Global Positioning System
HVAG	Heavy Vehicle Axle Group
HV	Heavy Vehicles (Usually a %)
IDW	Inverse Distance Weighting
LF	Loading Factor
LPP	Local Planning Policies
MGA	Map Grid of Australia
MPPS	Mornington Peninsula Planning Scheme
MPS	Mornington Peninsula Shire
NATA	National Association of Testing Authorities
NDCR	Non-Descript Crushed Rock
Nominal Diameter	The sieve size in mm in which nearly all of the crushed rock sample will pass through
OMC	Optimum Moisture Content
PSA	Planning Scheme Amendment
PMB	Polymer Modified Binder
Prime	Application of a primer to a prepared base
SAMI	Strain Alleviating Membrane Interlayer
Sub-Base Course	Lower granular layer of the pavement
Subgrade	Foundation material for the pavement
TDS	Total Dissolved Solids (salinity of water)
TLD	Traffic Load Distribution
Type A Fill	An engineered fill material defined in accordance with DTP (2015)
VPD	Vehicles Per Day
VPP	Victorian Planning Provisions



1 Introduction

Stantec was engaged by Mornington Peninsula Shire (MPS) Council to provide geotechnical and planning services in support of the development of an interim Erosion Management Overlay (EMO) relating to Landslide Susceptibility across the entire MPS.

These services were undertaken in accordance with our proposal, pro_1147626_interim_emo_b dated 15 August 2025 and formally accepted by MPS Council on 20 August 2025. During the course of the project, and following a meeting between MPS Council and Stantec, additional requirements were identified that extended beyond the original scope of work. To formally incorporate these additional needs, a Project Change Notice (PCN 304501945PCN01_Dec2_Rev01.1) was issued on 18 December 2025 and subsequently accepted by Claire Dougall on 19 December 2025. The PCN expanded the commission to include the additional stages.

This report has been prepared in part to review and summarise previous landslide susceptibility studies undertaken within the MPS, drawing primarily on Cardno Lane Piper (2012). Particular consideration has been given to earlier investigations and documented landslide occurrences within the Shire. The purpose of the report is to examine whether the existing methodology remains appropriate, to incorporate MPS' feedback and, where relevant, updating the landslide susceptibility assessment, improving the GIS-based susceptibility mapping and providing recommendations for planning controls.

This report represents the culmination of an iterative review and refinement process undertaken to develop the Refined EMO7 planning controls. An initial draft report, accompanying GIS mapping, draft EMO7 schedule and Incorporated Document were prepared and subsequently reviewed by Mornington Peninsula Shire and an independent peer reviewer. Feedback received through these reviews informed a series of revisions to both the spatial mapping and planning documentation, with updates made to improve accuracy, clarity and implementation of the proposed controls. This final report consolidates those changes and documents the refined GIS mapping, Schedule and Incorporated Document that are recommended for implementation.

The scope of works includes the following:

1. A review and written advice about the general robustness of the Cardno Lane Piper (2012) methodology, data, mapping and findings, and associated implications for the interim EMO.
2. Provision of recommendations for updates to the methodology adopted for both the interim and permanent EMOs.
3. Recommend an appropriate approach to implement an interim EMO to the Mornington Peninsula Planning Scheme (MPPS) which is currently not covered by an existing EMO and identified in Cardno Lane Piper (2012) as susceptible to landslide.
4. Prepare and provide an associated EMO schedule ordinance, mapping and written strategic justification to form the basis of a future Planning Scheme Amendment (PSA) request.



It is noted that this report does not cover other issues that might be covered by an EMO such as coastal regression, coastal inundation, river and creek erosion, tunnel erosion etc.

2 Terminology

For the purposes of this report, the following terms are defined to provide clarity to the context in this report. Where appropriate, the terms have been adopted from AGS (2007) otherwise, where not defined in AGS (2007), the terms have been developed to allow standardised terms that can be used in the report, by the Shire, in the scheme and incorporated documents to avoid confusion and misinterpretation. It is possible that future versions of the AGS framework will provide updated or more clearly defined terms that could be used in future revisions of these documents.

Geotechnical Practitioner – A qualified and experienced Geotechnical Engineer or Engineering Geologist who has experience in the management of slope stability problems and landslide risk management, is degree qualified, and who has current professional status as a:

- Chartered Professional Engineer (CPEng); or
- Registered Professional Engineer, Victoria (meaning a person who is registered under Part 2 of the Victorian Professional Engineers Registration Act 2019); or
- Chartered Professional Geologist (CPGeo); or
- Registered Professional Geologist (RPGeo).

Landslide - The movement of a mass of rock, debris, or earth (soil) down a slope.

Landslide Susceptibility –A quantitative or qualitative assessment of the classification, volume (or area) and spatial distribution of landslides which exist or potentially may occur in an area.

Landslide Risk – A measure of the probability and severity of an adverse effect to health, property or the environment due to the occurrence of a landslide

Landslide Hazard – A condition (due to a landslide) with the potential for causing an undesirable consequence.

Geotechnical Assessment – A Geotechnical Assessment identifies a site's geotechnical characteristics and landslide hazards. It determines whether the proposed buildings and works or subdivision layout are suitable (with or without mitigation measures) or, for buildings and works applications only, if further investigation and risk assessment are required. A Geotechnical Assessment must have regard to the methodology outlined in *Practice Note Guidelines for Landslide Risk Management* (AGS 2007c).

Geotechnical Investigation – A detailed investigation of a site with the purpose of assessing the geotechnical conditions on the site for design purposes. This may vary from a typical Site Classification, that would be required for a site in normal circumstances with relatively flat ground, to detailed laboratory testing, slope stability modelling and a detailed landslide risk assessment. The



Geotechnical Investigation would normally include an intrusive investigation such as boreholes and/or test pits but the level of investigation would depend on the needs of the project. A Geotechnical Investigation is typically not required for a planning permit, except under exceptional circumstances, but would be required for a building permit. A key part of the Geotechnical Assessment is to provide recommendations for the scope of the Geotechnical Investigation that would be required during the building permit phase.

Independent Peer Review – The assessment and design for landslide related issues is complex and there are many different opinions and ideas that could be adopted to ensure a development occurs with a 'Tolerable' level of risk. It is recommended that the Geotechnical Assessment be reviewed by an independent Geotechnical Practitioner (from a separate engineering firm to the writer) to provide an opinion on whether the Geotechnical Assessment appropriately addresses the requirements of the project. The Independent Peer Review should make a clear statement on whether the Geotechnical Assessment has appropriately assessed Landslide Risk and that a 'Tolerable' risk can be achieved. Where the Independent Peer Review considers that a 'Tolerable' risk is not achieved they should provide recommendations for further assessment that needs to be undertaken, either during the planning permit phase or building permit phase, as appropriate depending on the degree that the issues have not been addressed.

Landslide Risk Assessment - A Landslide Risk Assessment assesses and quantifies the risk to life and risk to property for a development exposed to significant landslide hazards, and determines whether the proposed development achieves tolerable risk requirements. It must be carried out in accordance with the methodology in *Practice Note Guidelines for Landslide Risk Management* (AGS, 2007c)

Tolerable Landslide Risk – Tolerable landslide risk is a range that society can live with so as to secure certain net benefits. It is a range of risk regarded as non-negligible and needing to be kept under review and reduced further if possible. The maximum Tolerable Risk is defined as:

- For loss of life, for the person(s) most at risk, it is taken as having a probability of no greater than 10^{-5} (1 in 100,000) per annum calculated in accordance with the Australian Geomechanics Society Practice Note Guidelines for Landslide Risk Management 2007. For societal risk, i.e. the cumulative risk to all people, it is taken as having a probability of no greater than 10^{-4} (1 in 10,000) per annum.
- For property loss it is assessed qualitatively using the Australian Geomechanics Society Practice Note Guidelines for Landslide Risk Management 2007, Appendix C. The tolerable risk level is selected depending on the new development type in accordance with Table 1.



Table 1: Maximum tolerable landslide risk to property

New Development Type	Maximum Qualitative Tolerable Landslide Risk
Essential facilities including hospitals, medical and surgery facilities, designated emergency shelters and facilities, buildings and facilities containing toxic or explosive materials in sufficient quantity capable of causing hazardous conditions that extend beyond property boundaries.	Low
All other construction of buildings or constructions and carrying out of works.	Moderate

3 Background

MPS has previously undertaken a two-stage GIS-based landslide susceptibility program.

Stage 1 was completed between 2000 and 2002 and included the compilation of the key datasets needed for a shire-wide assessment, including geology, cadastre, terrain, aerial-mapped landslides and groundwater. In that stage it was recommended that a consistent susceptibility framework to support planning decisions was introduced.

Stage 2 was completed in 2011 and 2012 and reported in Cardno Lane Piper (2012). Stage 2 built on the work completed in Stage 1 using improved topographic information, particularly multi-year LIDAR, together with digitised geological mapping, aerial photography and a geo-referenced library of consultant reports. This enabled the development of shire-wide susceptibility mapping that classified land into areas of Low, Medium and High landslide susceptibility and was verified against known historical landslides. The outputs have informed the application of EMOs and continue to assist MPS in assessing development proposals.

Since the completion of the 2012 study, the Shire has experienced a number of landslide incidents in a range of settings. Several recent events have occurred within residential areas, often associated with construction works or site disturbance. Landslides within the MPS have caused damage to property and the environment and, in some areas, present an ongoing risk to human life.

A State government enquiry recommended that MPS implement an interim EMO covering the whole shire for areas defined high landslide susceptibility in the Carno Lane Piper (2012) report. This was introduced EMO7 in the Planning Scheme Amendment C312morn. In this report that EMO will be referred to as 'C312morn EMO7'.

MPS Council has subsequently engaged Stantec to review and refine the landslide susceptibility mapping with a goal to provide clearer and more practical guidance for applicants undertaking works within MPS, including consistent triggers for planning approvals and related permits across the Shire. The EMO that would result from the study would replace 'C312morn EMO7' and is referred to in this report as the 'Refined EMO7'.



The current scope of works reviews the established 2012 methodology while addressing issues such as mapping granularity and other challenges identified through recent use.

4 Review of Cardno Lane Piper (2012)

The current scope of work includes a review of Cardno Lane Piper (2012) to assess the appropriateness of the methodologies and the different component parts of the assessment that were presented in the report. The findings of this review will inform the methodology adopted in the update of the landslide susceptibility mapping and therefore also the preparation of the draft interim EMO: Schedule 7 (EMO7) and associated Incorporated Document for this scope of works.

4.1 Data Resources

4.1.1 Topography

The topographic inputs used in Cardno Lane Piper (2012) draw from a combination of elevation datasets, aerial imagery and site observations that together provide a multi-resolution understanding of landform and slope conditions across MPS.

The key resources include the following:

- Photogrammetric DTM (CIP 2005–06) – early terrain model.
- LIDAR terrain data (2006–2007) – high-resolution elevation data (1 m → processed to 2 m grid).
- 0.5 m and 10 m contour mapping – derived from LIDAR DTM.
- Greater Melbourne 1998 aerial photography Runs 34 to 49 – stereographic interpretation.
- DSE CIP 2005–06 aerial imagery – updated photographic dataset.
- Digital cadastre survey – boundary reference for integrating topography with land parcels.

These datasets provided a comprehensive topographic foundation, combining modern elevation models with multiple generations of aerial photography to support reliable terrain interpretation and landslide susceptibility mapping.

Based on our review, the methodology presented in Cardno Lane Piper (2012) remains appropriate for use in establishing the Refined EMO7. While more recent data may be slightly more accurate and there may be localized changes due to anthropomorphic causes, such as earthworks and development, and natural causes, such as landslides and erosion, the accuracy of the data is considered to be sufficient for the interim EMO.

The recommendations relating to the permanent EMO are presented in Section 7.



4.1.2 Geology

The geological information used in the landslide susceptibility assessment was sourced from mapped geological surveys, published literature, previous consultant investigations and aerial photographic interpretation. Key datasets include the Geological Survey of Victoria 1:63,360 maps, digitised geology zones used in the GIS model, published geological studies and more than 150 geotechnical reports held by Council, together with field-verified landslide studies at locations such as Ballar Creek, Tanti Creek, Flinders and Hearn Creek.

Across MPS, the main geological units include older sedimentary rocks, granitic intrusions, Tertiary volcanic materials, marine clays, sandstone formations and Quaternary sands. These materials exhibit varying susceptibility to instability, with the Tertiary Older Volcanics and Balcombe Clay in particular, commonly associated with known landslide occurrences. Landslides in the other geologies are also known to occur, but less frequently.

These datasets collectively provide a clear overview of the Peninsula's geological framework and form the foundation for the landslide susceptibility assessment. For further geological details, reference should be made to Cardno Lane Piper (2012).

In general, the geology GIS is considered appropriate for the development of the interim EMO. The geological conditions will generally not have changed on a broader scale as such changes occur over much longer periods of time.

However, it is known there are minor variations and discrepancies in the geological maps. Furthermore, minor changes due to events such as floods and landslides can result in localized changes to the geology. It is recommended that these are recorded when identified in site assessments and then the maps are updated over time each time the system is revised.

While reviewing the full geology of the Shire would assist in more detailed mapping, revision of the State government (i.e. Geology Victoria) maps is beyond the remit of the Shire, and as such, should be coordinated with the State based updates of any mapping as they occur.

4.1.3 Existing Landslides

The existing landslide information used to support the susceptibility assessment was sourced from a combination of aerial photographic interpretation, historical geotechnical investigations and previously completed landslide studies across MPS. These datasets collectively document known and potential slope failures, their locations and characteristics.

Key resources include:

- Aerial photography – Greater Melbourne 1998 series. Used to identify “possible” to “certain” landslides across the Peninsula through stereographic interpretation.
- DSE CIP 2005–06 digital aerial imagery: Provided updated visual confirmation of earlier slope - failure mapping and identification of additional failures.



- Digitised landslide inventory: All identified slope failures from aerial photography were digitised and incorporated into the GIS model, including both “possible” and “certain” landslides.
- Previous detailed landslide susceptibility studies: Including Ballar Creek (Coffey 1999), Tanti Creek (Lane Piper 2010), Flinders (Lane Piper 2008) and Hearn Creek (Piper & Associates 1999). Boundaries from these studies were directly adopted.
- Historical geotechnical and consultant reports: A total of 158 geotechnical reports were reviewed and summarised to validate known landslides and creep zones.
- Field-verified landslide sites: Landslides identified and confirmed through previous investigations at locations such as Davey’s Bay, Mount Martha North, Sunnyside Beach, Shoreham, Somers and others.
- Slope related terrain indicators – LIDAR-derived slope data used to delineate headscarps, breaks of slope and creep zones that correlate with known landslide locations.

These resources form a comprehensive baseline dataset of existing landslides, enabling verification of the susceptibility model and ensuring that historical slope failures, both confirmed and potential, are consistently incorporated into the landslide assessment framework. This approach is still considered valid. However, as new landslides are identified over time they should be added to the landslide registry and then included in future assessments to ensure that identified landslides are included within the ‘high landslide susceptibility’ zone.

4.2 Landslide Susceptibility Methodology

The landslide susceptibility methodology used in Cardno Lane Piper (2012) was based on a GIS-driven analytical framework designed to evaluate landslide susceptibility across the Mornington Peninsula Shire at a regional scale. The approach integrated multiple geospatial and geological datasets, including digitised geological information, a LIDAR-derived digital terrain model, slope and aspect calculations, mapped landslides, aerial photographic interpretation and a substantial library of consultant geotechnical reports. These inputs were assembled into parameter maps that described the key terrain and geological factors influencing slope instability.

Within the GIS environment, susceptibility was assessed across an 8m grid, with each grid point evaluated according to its geological unit, the maximum local slope within a 6m radius and the predominant slope aspect. The original susceptibility boundaries were adopted as the initial basis of the interim study to keep consistent, as best as practical, with the C312morn EMO7 – the subject of recent PSA C312morn.

For each geological unit, the method derived slope thresholds that define the boundaries between high, medium and low susceptibility. These thresholds were established through analysis of LIDAR data surrounding verified landslide headscarps and creep zones, allowing the model to reflect the characteristic behaviour of different geological materials. Once applied across MPS, the results were converted from grid-based outputs into polygons suitable for planning, followed by a review process to ensure that susceptibility boundaries aligned with observed site conditions. The classification system followed the definitions set out in the Australian Geomechanics Society (2007) guidelines and applied



a standard three-level zonation (High, Medium and Low), each linked to progressively higher requirements for geotechnical investigation prior to development.

Slope thresholds for High/Medium and Medium/Low were derived per geological unit using LIDAR-based statistics around mapped headscarps and creep zones, then validated against documented landslide sites across multiple lithologies.

Groundwater and rainfall datasets were reviewed at a regional scale but were not applied directly to local-scale susceptibility calculations due to sparse and non-representative coverage.

The LIDAR terrain model, processed to a 2m grid after de-spiking and vegetation correction, as this was considered the most appropriate basis for assessing slope and aspect derivation.

The methodology provided a consistent and repeatable way to generate susceptibility mapping. Its application enabled the MPS Council to interpret development constraints more clearly and to support more defensible planning decisions across the Shire. Although the methodology has generally performed well, and mapped landslides typically fall within high-susceptibility areas, subsequent use of the mapping has highlighted the need to refine certain elements, predominantly related to the highly detailed and granular nature of the maps including the presence of a large number of small, fragmented polygons and inclusion of features such as dams and cuttings in areas that are relatively flat. As the previous report was never finalised beyond a draft the maps did not proceed to the formatting that would be adopted for an EMO and make such refinements.

As part of the development of the interim EMO the data has been reviewed and refined to remove the smaller polygons and modify the boundaries to make the maps more suitable and practical for use as a formal EMO boundary. A discussion on the methodologies that were adopted to refine the GIS maps for the Refined EMO7 is provided in Section 5 while recommendations for further enhancements that could be made for the permanent EMO are provided in Section 7.

4.3 High / Medium Landslide Susceptibility Boundary

Further to the above, the original system provided in Cardno Lane Piper (2012) allowed for a dual set of categories with one EMO covering areas of moderate landslide susceptibility and a separate EMO covering areas of high landslide susceptibility. The two suggested EMOs worked together with the moderate landslide susceptibility EMO providing a lower level of planning controls and the high landslide susceptibility EMO providing a higher level of planning controls. The preciseness of the boundary between the two was less of an issue for borderline sites because if a property fell slightly outside the high boundary it would still be picked up within the moderate EMO.

It has been suggested that the Refined EMO7 would work best with a single EMO only covering areas of high landslide susceptibility and that coverage of medium landslide susceptibility sites was not required as they should be sufficiently covered by a normal geotechnical investigation required for a standard development.

It is considered that the risk involved in this assumption is significant because a small change in a calculated susceptibility rating can result in a site changing from the full requirements to no requirements at all.



An option that was considered was to include part of the upper end of the medium landslide susceptibility zone within the Refined EMO7 as high landslide susceptibility. This issue was considered when reviewing the mapping methodologies and is discussed in later sections.

4.4 Existing EMOs

A total of seven EMOs are currently active within the planning scheme. During the process of conducting this study it was identified by DTP that the existing EMO were to remain in place as part of the integration of the updated Refined EMO7 (with the exception of C312morn EMO7). Future modification to areas covered by the existing EMO would need to be assessed as part of the process for the permanent EMO.

The following sections outline the summary of each EMO, an assessment of its suitability for an EMO going forward.

EMO1 - Erosion Prone Slopes & EMO2 – Unstable Slopes

EMO1 applies to areas of Erosion Prone Slopes identified in the early 1970s by the Westernport Regional Planning Authority. EMO2 applies to areas of Unstable Slopes also identified in the early 1970s by the Westernport Regional Planning Authority.

There is no record of the method used to establish EMO1 and EMO2. The EMOs do not provide specific guidelines for geotechnical assessment or investigation required in order to develop.

It is assumed that the basis for the original EMO1 and EMO2 was sound and based on evidence of erosion issues or slope stability issues, or slopes similar to those with those issues. Therefore, for this interim EMO it is accepted that EMO1 and EMO2 remain in place. However, there are areas where the predictive models from Cardno Lane Piper (2012) and EMO1 / EMO2 do not produce consistent boundaries. In other areas it is clear that there are gaps in EMO1 and EMO2 which were left out due to the presence of another overlay that was not allowed to overlap at the time of the adoption of EMO1 and EMO2. Therefore, as part of the manual refinement process discussed in Section 5.4., the Refined EMO7 boundaries have been adjusted to fill in obvious gaps in the EMO1 and EMO2 boundaries and also provide a more consistent boundary between EMO1, EMO2 and other EMO boundaries.

It is recommended that as part of the full review for the permanent EMO, the areas covered by EMO1 and EMO2 be reassessed with modern techniques consistent with the methodologies used for the rest of the shire and incorporated into a single overall EMO. This may result in the EMO1 and EMO2 boundaries being adjusted, or even totally removed in some areas. However, it is also recommended that an initial assumption be made that there is an issue present that needs to be addressed, and that the areas should only be removed if there is clear evidence that the area should not be included.

EMO3 - Ballar Creek

EMO3 was introduced in 1999 based on a detailed assessment prepared by Coffey Geosciences and relates only to the area in the vicinity of Ballar Creek in Mount Eliza. The report contained a detailed assessment of the landslide potential at Ballar Creek, providing a technically sound basis for EMO3.



The report also introduced the need for appropriate geotechnical assessments of any developments in the area covered by this EMO.

EMO3 is limited to the local area around Ballar Creek and whilst it requires consideration be made for geotechnical assessments, it does not provide specific guidelines for geotechnical investigation.

Cardno Lane Piper (2012) adopts the EMO3 boundary and treats it as confirmed evidence of local instability. In the landslide susceptibility mapping, EMO3 acts as a real case study validating the model by comparing predicted results with field assessments and is assumed to require permit triggers and geotechnical input through the overlay provisions.

The model treated all areas within EMO3 as areas of high landslide susceptibility and overruled any slope-based susceptibility modelling.

EMO3 is to be retained for the Refined EMO system. However, some localised adjustments have been made to the Refined EMO7 around the boundaries of EMO3 to ensure the two EMO better interface with each other.

Going forward towards a permanent EMO, it is recommended that EMO3 be fully integrated into a single overall EMO as an area of high landslide susceptibility.

EMO4 - Medium Landslide Susceptibility for Flinders and Tanti Creek

EMO4 was introduced in 2009 to areas in the vicinity of Tanti Creek in Mornington and in the township of Flinders. EMO4 is supported by earlier geotechnical work on the stability of the Tanti Creek banks and nearby slopes by Lane Piper (2010) and in the moderately sloping areas of Flinders by Lane Piper (2008). The areas covered by EMO4 were those identified as areas of Medium landslide susceptibility, as identified in the Lane Piper reports. Development constraints and recommended levels of geotechnical investigation were included in EMO4, based on recommendations from the Lane Piper reports.

Cardno Lane Piper (2012) references the specific areas where EMO4 has been applied and retains EMO4 coverage in the shire-wide mapping so that planning triggers and investigation requirements reflect the local conditions already identified.

Any areas that were identified as EMO4 were adopted as medium landslide susceptibility in the model with this rating overruling any value predicted based on slope.

As it is proposed by DTP that any existing EMO are to be retained, EMO4 will remain in place as part of the Refined EMO system.

However, for the Permanent EMO, if high landslide susceptibility is to be adopted as the definition for requiring an EMO, then it may be prudent to review EMO4. In that case some of the flatter areas of EMO4 could be removed but it may be appropriate that some of the steeper areas of EMO4 are included in the future Permanent EMO.

EMO5 - High Landslide Susceptibility for Flinders and Tanti Creek

EMO5 was introduced in 2009 to areas in the vicinity of Tanti Creek in Mornington and in the township of Flinders. EMO5 is supported by earlier geotechnical work on the stability of the Tanti Creek banks



and nearby slopes by Lane Piper (2010) and in the steeper and landslide prone areas by Lane Piper (2008). The areas covered by EMO5 were those identified as areas of High landslide susceptibility, as identified in the Lane Piper reports. Development constraints and recommended levels of geotechnical investigation were included in EMO5, based on recommendations from the Lane Piper reports.

Cardno Lane Piper (2012) references the specific areas where EMO5 has been applied and retains EMO5 coverage in the shire-wide mapping so that planning triggers and investigation requirements reflect the local conditions already identified.

Any areas that were identified as EMO5 were adopted as high landslide susceptibility in the model with this rating overruling any value predicted based on slope. EMO5 will remain in place as part of the Refined EMO system.

It is recommended that all areas of EMO5 are included as part of a future single Permanent EMO, including steeper areas of EMO4 that are also considered to need planning guidance.

EMO6 - Beach and Foreshore Areas

EMO6 was introduced in 2025 and relates to coastal erosion and foreshore processes along the Shire's Westernport foreshore. Whilst it refers to landslides in a coastal setting, it is predominantly focused on landslides resulting from sea level rise and coastal forces. Consequently, the requirements of EMO6 include a Coastal Hazard Vulnerability Assessment, but do not specify any geotechnical assessment or investigation requirements.

EMO6 was generally applied as a buffer along the coastline. However, it does not consider the differences in geology and provides a similar buffer whether the coastline is provided by sand dunes, clay cliffs, or rock cliffs.

In the Flinders area, where EMO4 & EMO5 had previously been implemented, EMO6 overrode and removed the previous EMO4 & EMO5 mapping. It is understood that this was in error. It is recommended that in areas where EMO4 or EMO5 were removed due to the implementation of EMO6 then they are either reinstated to have EMO4 or EMO5 in place as appropriate, or the areas are included in the Refined EMO7.

EMO7 - High Landslide Susceptibility Areas (C312morn EMO7)

EMO7 was introduced at the start of 2026 as part of C312morn and is a new temporary interim schedule that applies to land identified as highly susceptible to landslides but not already covered by an existing EMO. This EMO is a temporary interim measure to ensure that areas of high-landslide susceptibility trigger appropriate planning permits and geotechnical assessment while the Shire undertakes a comprehensive review and update of the existing landslide susceptibility data to inform permanent controls.

C312morn EMO7 was based on the initial draft mapping that formed part of Cardno Lane Piper (2012) and as such it still included many small polygons and anthropomorphic features such as dams, fill embankments and road cuttings.



It is recommended that the C312morn EMO7 be removed and replaced by the new Refined EMO7 that is recommended in this report.

This system should then be reviewed and updated as part of a Permanent single EMO that covers the Shire in a consistent manner.

Summary of the Existing EMO system and working to a consistent system

The current system of 7 different EMO for the Shire is a patchwork of different systems and different rules that vary across the Shire. At the moment it is possible to have one set of planning rules in place for one site which are minimalistic and unclear, such as defined for EMO1 and EMO2, and then a relatively short distance away have similar site conditions and geology but have very different planning requirements. This may cause inconsistencies in the determination of planning permit applications for works affected by EMOs across the shire.

We note the timing of the completion of the requirements such as intrusive geotechnical investigations in each EMO is currently within the planning stage of the permit application. This results in a burden on landowners to finance sometimes significant geotechnical investigations at a stage where the process may be halted or significantly modified due to other planning permit considerations. It is recommended that the sequencing of works is considered for change, such that clauses are included at the planning stage to ensure that the required intrusive investigations are completed during design phase instead of during the planning phase.

As the current assessment is considering the requirements for an update to C312morn EMO7, it is not proposed to review or modify any areas that are currently covered by EMO1 to EMO5.

However, into the future, it is recommended existing EMO Schedules 1-5 as well as the Refined EMO7 be incorporated into an all-encompassing EMO Schedule. It is further recommended that a single set of requirements be applied to an all-encompassing EMO to ensure consistency in application across the Shire.

EMO6 should be retained, but areas of the previous EMO4 and EMO5 that were removed due to the instigation of EMO6 should be reinstated as part of the new EMO.

4.5 Feedback from the Shire

Over the course of the current works, Stantec has attended multiple meetings with MPS to discuss some of the issues associated with the draft map produced in 2012 and obtained the following key feedback from the officers who use the susceptibility map:

- The current map is too granular with highly variable boundaries and small polygons;
- It is difficult to implement due to the large area of coverage including areas which are clearly in flatter ground; and
- Anomalies have been identified in localised areas due to the presence of anthropomorphic features such as dams, fill embankments, cuttings and retaining walls.

The current work on the Refined EMO7 aims to address this feedback.



4.6 WSP Peer Review of C312morn EMO7

WSP was engaged by MPS to conduct a peer review of the C312morn EMO7 – the subject of PSA C312morn - which is based on Cardno Lane Piper (2012). Their findings are presented in the letter referenced PS228982-WSP-MEL-GEO-LTR-002 Rev 0 dated 08 December 2025. The key findings are summarised below:

Methodology and Mapping

- More recent LiDAR data is available and could improve the landslide inventory, although it's unlikely to significantly change the susceptibility at the Interim EMO stage. WSP recommends using updated LiDAR to inform the permanent EMO.
- Small, isolated areas of high susceptibility result from the 8m x 8m grid methodology. WSP recommends filtering out small polygons, excluding locally steep slopes caused by earthworks and applying an appropriate mapping scale consistent with AGS 2007 Guidelines (1:25,000 to 1:5,000)
- Susceptibility mapping should be based on natural gradients rather than earthworks, which should be subject to separate engineering controls.
- Uncertainties in the geological mapping of boundaries between formations are acknowledged. A targeted review of geological boundaries is unlikely to be of benefit for the Interim EMO but may be of benefit for the development of the permanent EMO.
- The delineation between medium and high susceptibility zones should be reviewed based on planning implications for the Interim EMO and for the permanent EMO additional consideration should be made for the reassessment of the threshold for landslide susceptibility.
- Inclusion of break-back and run-out buffer zones is recommended based on manual assessment of topography, geology and landslide history.

EMO Schedule and Assessment Framework

- WSP recommends creating an Incorporated Document with a tiered landslide assessment framework, allowing Council discretion to waive geotechnical assessments on the recommendation of a geotechnical engineer.
- An internal Council-use map identifying three areas of EMO based on the level of assessment required, such as:
 - Waiving geotechnical assessment for areas within C312morn EMO7 that are not in the Refined EMO7
 - Requiring geotechnical assessment for all medium susceptibility areas unless otherwise advised by a geotechnical practitioner
 - Requiring geotechnical assessment for all remaining high susceptibility areas, and landslide risk assessment if recommended by a geotechnical assessment



- Independent peer review of geotechnical reports should be arranged by Council for higher risk applications. Planner training should be provided to support this process.
- The blanket exemption for slopes less than 17 degrees should be removed, and exemptions carefully refined (i.e. minor works or landslide reducing measures), while avoiding exemptions for activities such as significant vegetation removal.
- Consideration should be given to permits for works that may alter drainage or increase water infiltration.

Permit Conditions

- Suggested permit conditions include requiring implementation of endorsed geotechnical recommendations, ensuring durability and appropriate design life of mitigation measures, compliance with bushfire requirements, lawful stormwater discharge, and appropriate tree removal practices.

Public Communication

- Clear communication is recommended regarding partial EMO coverage of properties, the distinction between landslide susceptibility and risk and likely requirements for geotechnical assessments and investigations.
- WSP notes that although insurance companies ultimately decide what events are covered or not, no evidence of EMO-related increases in insurance premiums or property value loss have been observed in other council areas and suggests that improved landslide risk management may provide a net benefit to property values.
- It should be communicated that flat sites may be affected due to run-out or break-back risks or because local flatness results from earthworks rather than natural gradients.

Overall, the observations made in the WSP review are supportive of the methodology presented in Cardno Lane Piper (2012) and are consistent with Stantec's position.

4.7 Overview of Review Findings

The review of Cardno Lane Piper (2012) indicates that the geological framework and the core methodology adopted in the 2012 landslide susceptibility assessment remains a technically sound, consistent and repeatable way to generate susceptibility mapping, and it remains capable of being updated as new datasets become available.

The current range of seven (7) EMOs that are active across MPS has been implemented over multiple decades and the basis for each of the EMOs, and the differing requirements for geotechnical assessment within each of the EMOs, does not provide a consistent framework for the uniform consideration of landslide susceptibility across the Shire.

In summary based on the review of Cardno Lane Piper (2012), review of the existing EMO system, feedback from the Shire and the peer review by WSP, it is recommended that the following considerations are made when assessing updates for the EMOs:



- The base framework for susceptibility mapping presented in Cardno Lane Piper (2012) is sound and should be retained in the landslide susceptibility assessment for the Refined EMO7.
- The identification of updated data sets, such as new LiDAR and new aerial imagery is unlikely to have a significant impact on the Refined EMO7 except in localised areas and therefore rerunning of the susceptibility model at this stage is not warranted for an interim measure.
- Updated mapping to reduce the number of small polygons, merging and/or smoothing polygons to improve planning utility and interfacing with existing EMO is warranted for the Refined EMO7.
- A Shire-wide consistent overlay framework is recommended to replace the current mix of area-specific EMOs, and EMOs for which the basis is not well understood, to identify a unified set of planning triggers and guidance that is applicable across the Shire.
- The requirements for geotechnical assessment and investigation outlined in the EMOs should be considered in terms of timing. Currently EMO4 and EMO5 require significant intrusive investigation during the planning stage, when the planning application for the development could realistically be refused on grounds other than landslide susceptibility, resulting in unnecessary upfront costs to landowners.
- A single EMO covering high landslide susceptibility areas is considered appropriate provided that the mapping methodologies assist with considering areas between medium and high landslide susceptibility.

Finally, the peer review completed by WSP broadly agrees that the approach adopted in Cardno Lane Piper (2012) is generally appropriate for the assessment of landslide susceptibility across the Shire. The key recommendations made in addition to those identified above from the Stantec review of Cardno Lane Piper (2012) that will be incorporated into the Refined EMO7 include consideration of man-made structures such as retaining walls, cuttings, fill embankments and dams. WSP recommends that the anthropomorphic slopes created by these structures are removed from the susceptibility mapping, and that the mapping be based on the natural slope of the area. However, the presence of these features does not preclude an area being included in the EMO if their presence is due to the natural slope falling within the slope gradient limits for the particular geology.

Section 5 to Section 6 of this report detail the changes in methodology implemented for the Refined EMO7, with recommendations for the permanent EMO provided in Section 7.

5 Update of GIS Methodology

The review of the GIS methodology for the previous landslide susceptibility mapping was undertaken and combined with feedback from MPS to assess its suitability and ongoing suitability for use in informing Refined EMO7. Through this review it was identified that the earlier maps and polygons were overly granular, limiting their effectiveness and practical application for planning purposes. As a result, revised methodologies were developed to produce a more robust, scalable and fit for purpose



GIS-based susceptibility map. These revised methodologies are presented in this section of the report.

The review also assessed the adequacy of buffer distances between susceptibility zones and incorporated changes in standard geotechnical practice that have emerged since Cardno Lane Piper (2012) was published. The purpose of this assessment was to determine whether the engineering-based methods used previously remain appropriate for developing the Refined EMO7.

In parallel, a review of the earlier GIS workflow and rule set was conducted by the GIS team. This review examined opportunities to refine the existing approach and identified advancements in GIS and LiDAR technology that have the potential to enhance future updates to the landslide susceptibility mapping.

To update the 2012 landslide susceptibility dataset, Stantec undertook an iterative approach to review the most suitable interpolation methods to deliver the required output of the proposed Refined EMO7 layer that maintained the accuracy and integrity of the previous layer, while providing a clean, generalised dataset that is suitable to apply the susceptibility layer to the interim planning boundary.

Initially, Stantec completed a proof of concept for discussion with MPS based on a number of test areas chosen to provide representative insight into how the generalisation tools were applied in different situations with known hazards. The test areas included:

- **Sorrento:** steep coastal cliffs to be maintained by the generalisation process.
- **McCrae:** incorporating steep coastal areas, Arthurs Seat and less steep areas.
- **Mornington:** more densely populated residential area with riparian zone and existing EMOs.
- **Flinders:** allowing for review of interaction between recently adopted EMO boundaries.
- **Tyabb:** relatively uniform terrain with farm dams and embankments.



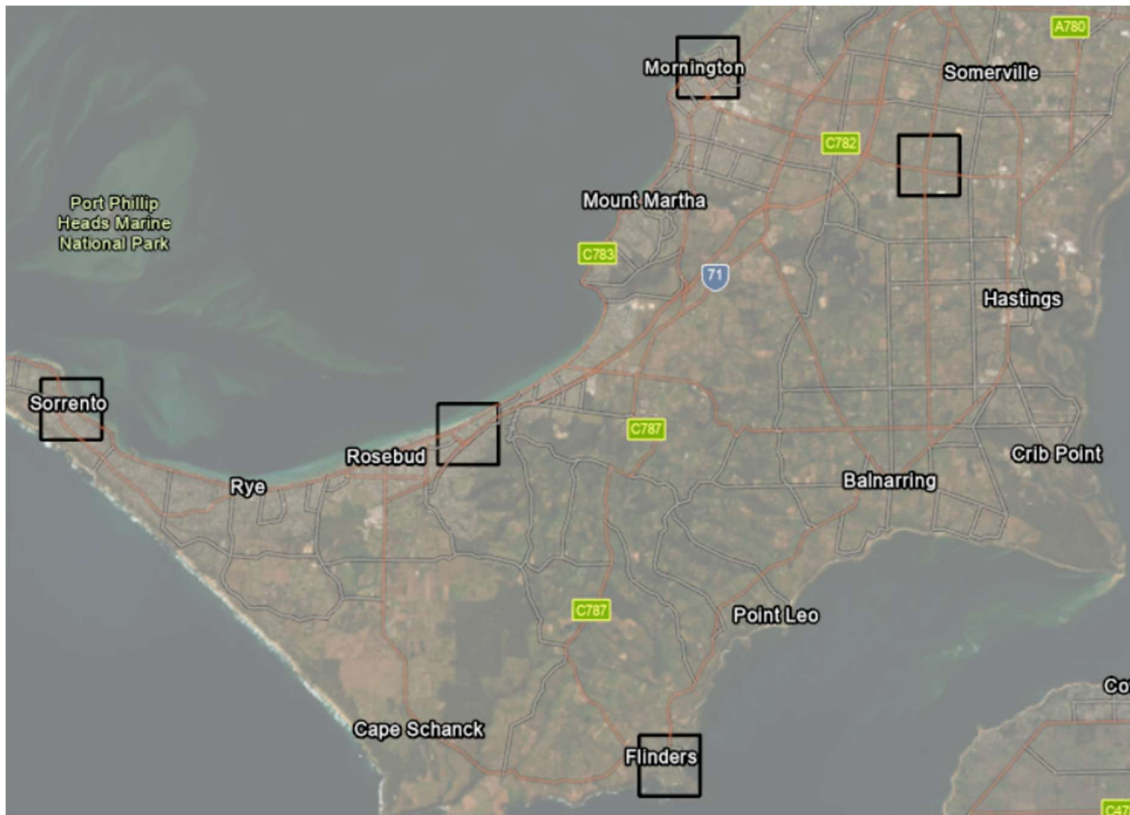


Figure 1: The locations of the selected test areas (identified above)

5.1 Remove Small Polygons

Feature Manipulation Engine (FME) is a powerful tool to build workflows to transform, clean and validate complex datasets. Stantec developed an FME workbench to join adjacent polygons and test the threshold for removing small polygons from the original susceptibility polygon dataset. This was run across the test areas to remove areas $<50\text{m}^2$, $<75\text{m}^2$ and $<100\text{m}^2$. In the example of Mornington *below*, this was successful in removing some of the granularity from the original susceptibility polygons, however the results were still too granular to generate a suitable planning boundary without significant manual intervention.



Figure 2: Original Susceptibility Layer (left) and Test area with polygon areas <100m2 removed (right)

In consultation with MPS, Stantec recommended that to further generalise the susceptibility dataset and maintain the integrity of the high-risk areas (*shown in red*), it was necessary to go back to the original automated susceptibility calculation points, containing the raw results of the multi-step approach as shown at 8m spacing in Figure 3

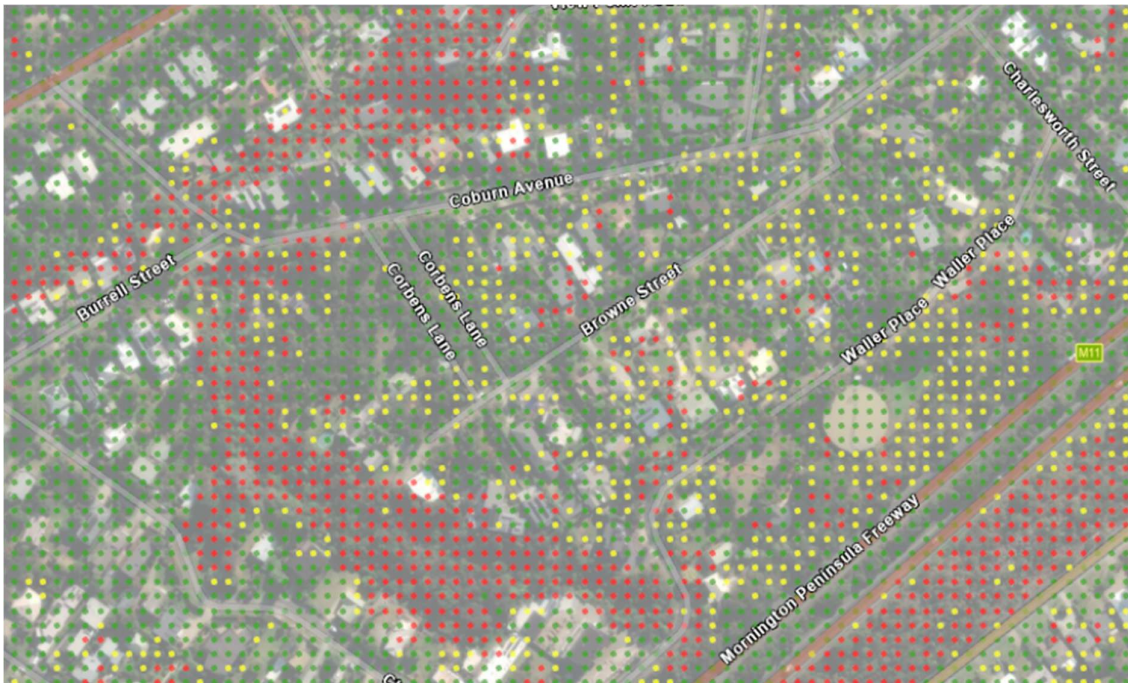


Figure 3: Original Susceptibility Results (8m point grid)

5.2 Inverse Distance Weighting

Stantec tested a range of Inverse Distance Weighting (IDW) interpolation techniques within ArcGIS Pro using the point susceptibility dataset, to identify the parameters that best maintained the integrity of the risk areas, while generalising the dataset in such a way that it could be used to generate the Refined EMO7 boundaries. Several parameters were tested against this interpolation method based on the settings in ArcGIS Pro. This included power, distance and cell size.

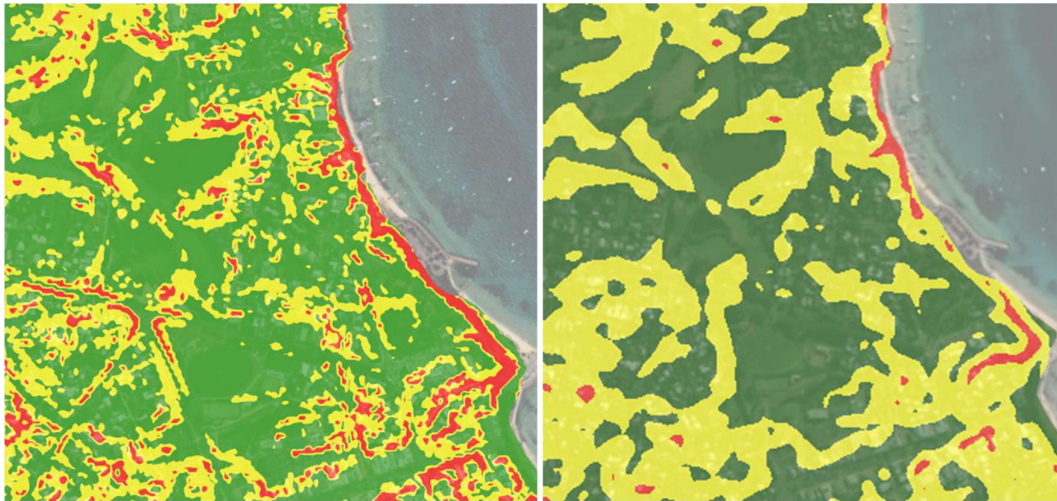


Figure 4: Effects of Inverse Distance Weighting interpolation on original 2012 results (left)

5.2.1 Power

This parameter (between 0.5 and 3) controls the significance of the points on interpolated value. A higher value results in less influence from distant points while a lower value results in greater influence from distant points. The results with a higher value remained granular while a lower value resulted in a more generalised dataset. A power of 0.5 was taken forward as the preferred solution.

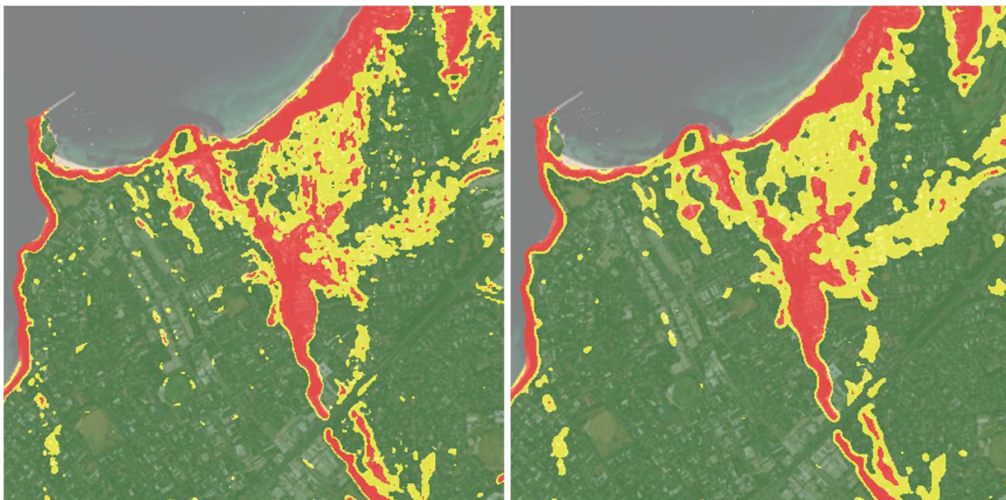


Figure 5: Impact of the "power" parameter on the results. Left: 1.5; and Right: 0.5 (Preferred).



5.2.2 Distance/Search Radius

This parameter considers how far the GIS software looks for related points (neighbours).

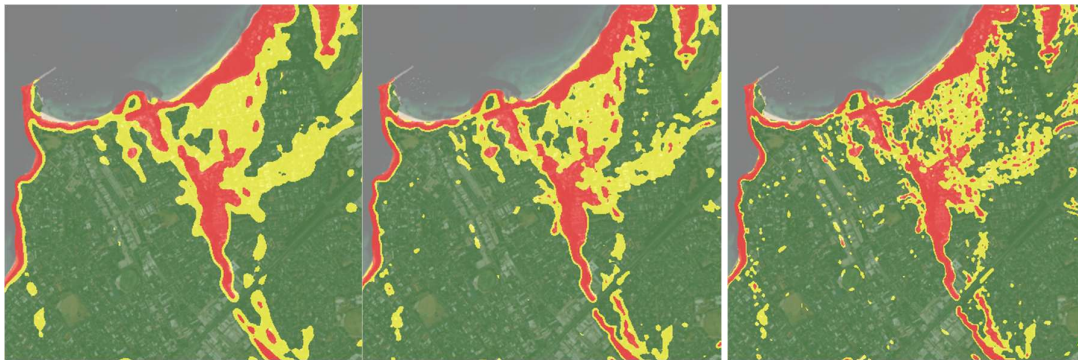


Figure 6 Impact of the "distance" parameter on the results. Left: 40m; Centre: 25m (Preferred) and Right: 15m

Initially the larger distance was preferred. However, upon closer inspection of our test areas, there were sections where there were smaller cliffs present in Sorrento and McCrae where the process resulted in the cliffs being smoothed out of the model when a greater distance was adopted. These cliffs were present in the model with a distance of 25m but disappeared when the distance was increased to 30m. Figure 7 below shows the difference with the orange zone being the area that falls within the high landslide susceptibility model with a 25m distance but falls outside the high landslide susceptibility model with a 30m distance.

Based on the above it was determined that a 25m distance was appropriate.

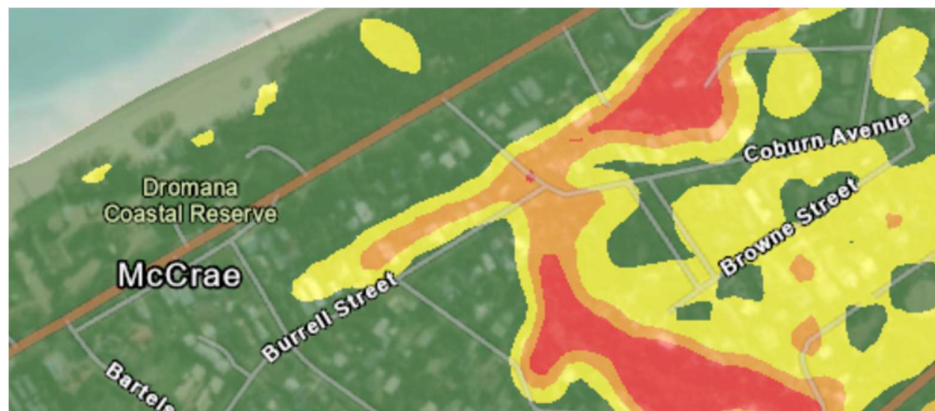


Figure 7: Steep section along Burrell Street (results showing 25m distance results)

5.2.3 Cell Size

Cell Size is the pixel size of the output raster dataset. Considering how resource intensive the original MapBasic analysis proved to be when it was run in 2012, the team was cognisant of being able to deliver results to MPS in a timely manner. Cell size was a consideration when re-sampling the point data to an 8m, 10m or 12m grid. The results were comparable and the 12m cell size was taken forward as preferred.



5.2.4 Summary of Findings

This interpolation process resulted in more generalised areas with cleaner boundaries. However, one of the issues was that in narrower areas with known landslide susceptibility, for example narrow cliffs in the Sorrento and McCrae area, high landslide susceptibility zones were generalised to the extent that these zones were assigned a lower rating.

Based on this data validation using areas of known susceptibility, it was identified that there was good correlation between areas that had a susceptibility rating of >20 before the data smoothing and those with a susceptibility rating of >15 after data smoothing. This was identified both in areas where there were cliffs present, and also in areas with a steep slope that had significant modifications with multiple retaining walls. In areas with more moderate slopes with modifications with retaining walls the model tended to accurately predict a lower susceptibility rating.

The figures below show an example of the original Cardno Lane Piper (2012) susceptibility map compared to the smoothed map with the susceptibility rating between 15 and 20 excluded and included.

The smoothing process and adoption of the susceptibility rating of >15 also helped to reduce the risk of sites which were previously borderline between medium and high landslide susceptibility falling outside the Refined EMO7 area. This is because the averaging out would tend to still include these borderline areas.

The areas with a susceptibility rating of >15, after smoothing, were then taken through to the next stage of analysis.

Table 2: Update to the data interpolation for susceptibility scores

Susceptibility Score	Original 2012 Data (Before Data Smoothing)	New Interpolation (After Data Smoothing)
0-10	Low	Low
10-15	Medium	Medium
15-20	Medium	High
20-30	High	High



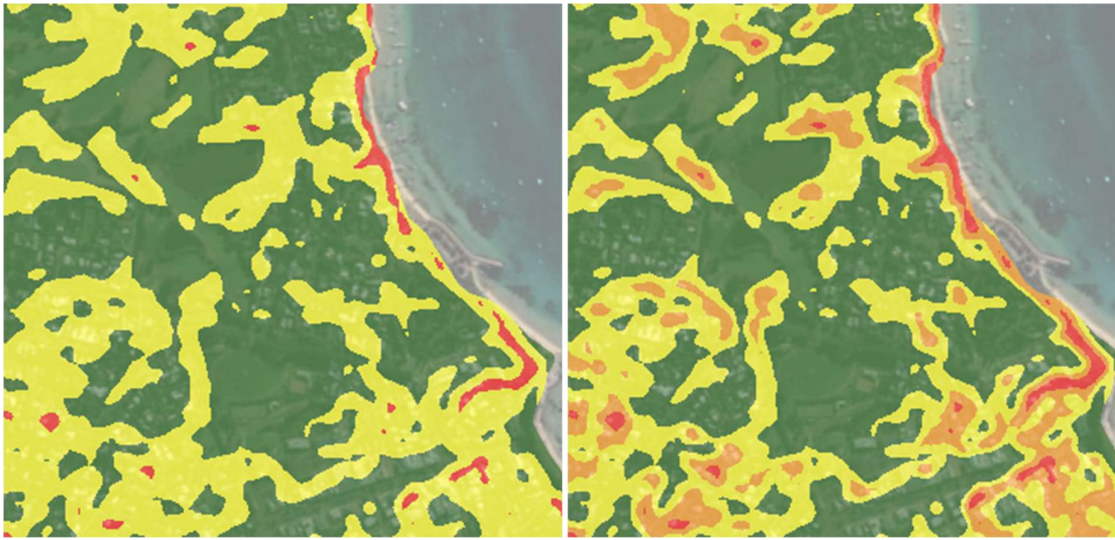


Figure 8: Addition of Medium-High category (shown in Orange)

5.3 FME Smoothing

Stantec used FME to assist with joining adjacent polygons, filling holes and removing small, isolated polygons. By being able to automate this process, the methodology is repeatable.

All polygons with a high rating after smoothing were taken to post-processing in FME for further cleaning to generate the final polygon that could be manually reviewed.



Figure 9: Raw interpolation results (left) and after post-processing with FME (right)

Figure 9 above shows the original susceptibility results from 2012 at Sorrento compared with the IDW interpolation results and the final cleaned dataset following FME post-processing.

- Polygons smaller than 500m² were removed.
- Narrow gaps were bridged.



- Edges were smoothed.

This resulted in a cleaner set of polygons more suitable for an EMO boundary.

5.4 Manual Review

Manual review was necessary to finalise the dataset. This included the following steps:

- Polygons smaller than 5000m² were assessed in greater detail
- Visually assessment was conducted for the presence of anthropomorphic features, such as dams, road cuttings, retaining walls etc, that may affect the ability of the model to predict the natural gradient
- Incorporated the EMO1 to 5 boundaries and adjusted the calculated boundaries to provide a consistent and smooth transition between the two where there may be differences
- In isolated areas, adjusted the boundaries where the contours identified potential landslides extended beyond the boundaries

5.5 Intermediate Review

Following application of the refinement methodologies described above, a further review was undertaken collaboratively by Stantec, Mornington Peninsula Shire and the independent peer reviewer. This review confirmed that the adopted methods were successful in significantly reducing noise within the landslide susceptibility mapping and improving the overall consistency of the outputs.

The review also identified that some areas remained less accurately represented than desired, particularly in locations close to susceptibility boundaries and where anthropogenic features influenced the underlying terrain. In these areas, the automated processing methods were found to have limitations in reliably distinguishing natural landform characteristics from modified ground conditions. As a result, additional assessment and refinement were undertaken to improve the representation of these features and ensure that the final mapping more accurately reflected observed site conditions and professional judgement.

5.6 Raster Based Method

After the Intermediate Review was conducted it was determined that a localised raster based approach was more appropriate to assess the changes in gradient across the study area. The raster maps were developed based on 3m x 3m pixels that identified the average slope across the local area surrounding the central pixel.

This methodology allowed a cleaner assessment on where the changes in slope were occurring as well as allowing the sudden changes caused by anthropogenic causes such as cut and fill batters or retaining walls to be more readily identified.



The rasters were then used in combination with the slope gradients identified in the original study to define the locations of the EMO boundaries.

A final visual audit and clean up was then conducted to further assess the potential influence of anthropogenic features. The visual audit was also used to remove minor slivers that had been introduced by the cutting of the existing EMO boundaries through the new EMO set.

An example of the raster set is provided in Figure 10.

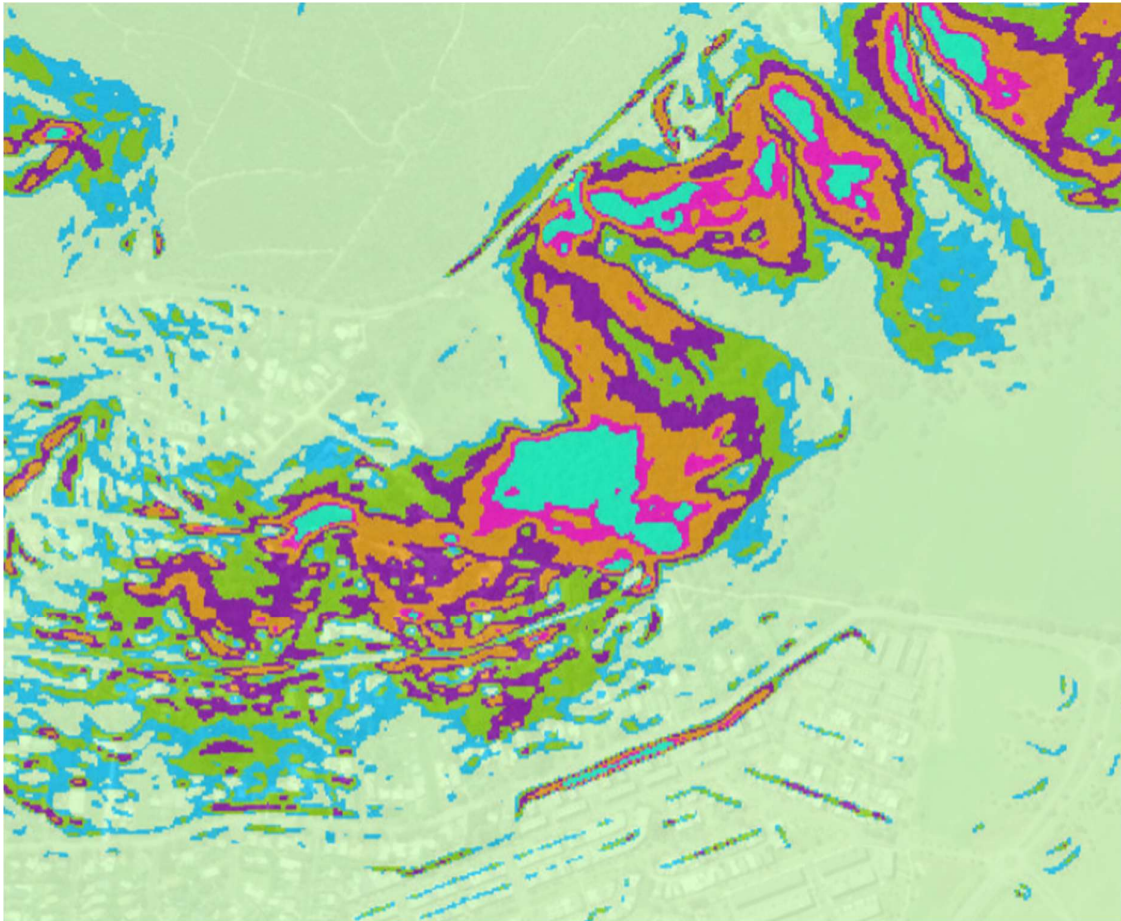


Figure 10: Slope Gradient Raster

Figure 11 shows a comparison of the July version of the GIS, after use of the raster method, against the April version based on the distance weighting method.

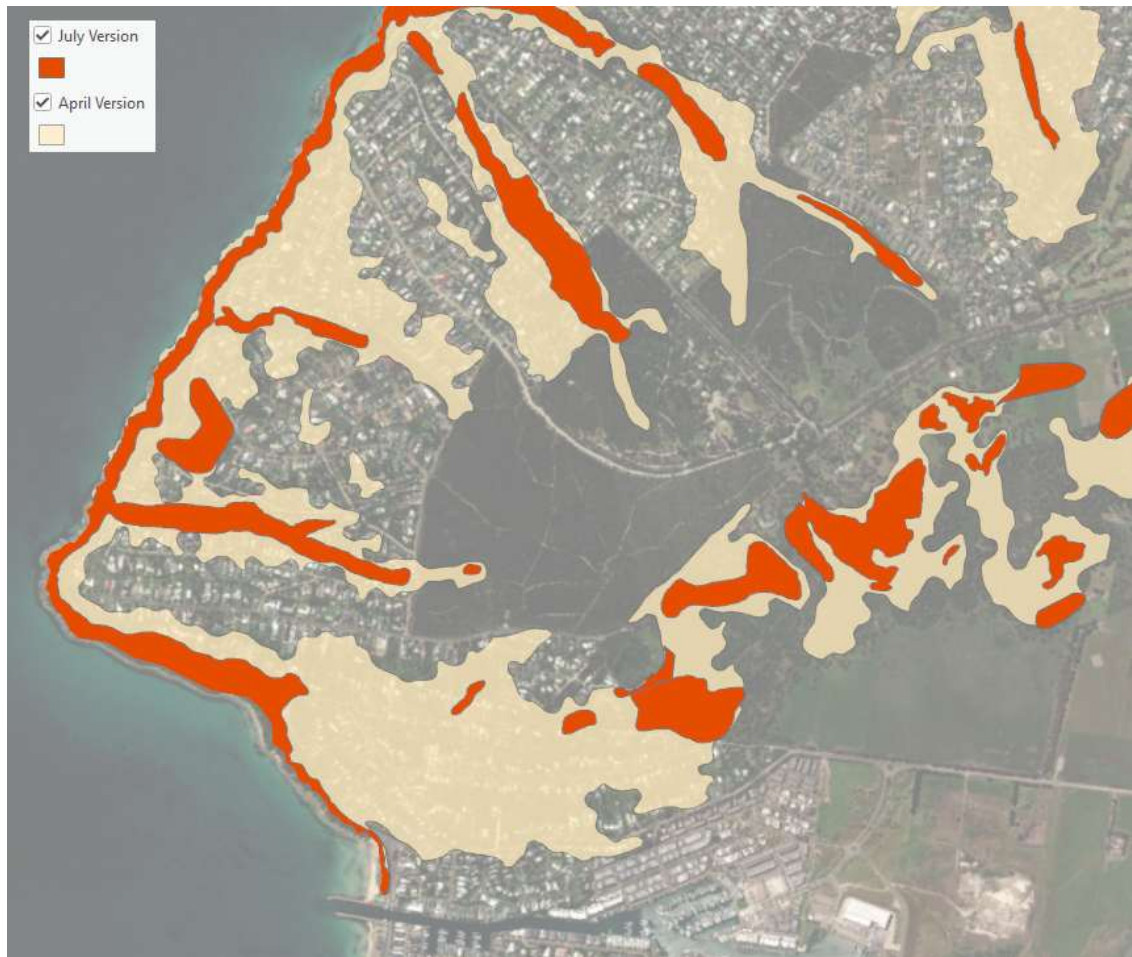


Figure 11: Previous interim EMO (light orange shading) with the final interim EMO (dark orange) near Mount Martha

6 Planning Implementation

6.1 Objectives

Stantec has undertaken the following:

- A comprehensive review of the Mornington Peninsula Planning Scheme (MPPS) as it relates to landslide susceptibility, and the history and application of EMOs.
- Consideration of appropriate planning controls and tools to implement the proposed Refined EMO7 over land which has a landslide susceptibility, and that falls outside the existing EMO1 to EMO5, as described by this review, and derived from:
 - A review of recently gazetted EMO controls in other local government areas.



- Alignment with Planning Requirements/Exemptions commentary outlined in the *East Gippsland C159egip Basis for Amendment to Erosion Management Overlay (WSP, 2025) report* ('WSP Report').
- The Explanatory Report and Ordinances gazetted as part of PSA C312morn introducing C312morn EMO7 into the MPPS.
- Preparation of draft proposed Refined EMO7 Ordinance (in conjunction with our Geotechnical team), ensuring that the recommended requirements achieve a net community benefit and is proportionate to risk. That is, that the proposed Refined EMO7 appropriately identifies areas of landslide susceptibility and manages landslide risk to life and property while minimising unnecessary regulatory or administrative burden for landowners and Council until permanent shire-wide EMOs are developed and applied in future.
- Preparation of a draft Incorporated Document to guide the degree of geotechnical reporting required to accompany planning permit applications triggered by the Refined EMO7.

6.2 Planning Overview

The recent landslides in McCrae in 2022 and 2025, and the subsequent Board of Inquiry findings into the McCrae landslide (9/9/2025) ('BOI') have underscored the significant impact that landslides can have on a community and have revealed opportunities for system-wide improvements in both emergency management and land planning.

Recommendation 27 of BOI *'recommends the Shire urgently implement an interim EMO schedule that applies, at a minimum, to the land that was highly susceptible to landslides in the 2012 mapping obtained by the Shire. The Shire should promptly obtain advice from geotechnical engineers about the appropriateness of including a wider area on an interim basis.'*

In direct response to this recommendation, MPS Council has now developed planning controls, and implemented as part of C312morn EMO7 to manage geotechnical hazards associated with all high priority, high landslide susceptibility areas across the Shire (the subject of Ministerial PSA C312morn – *interim EMO7: Highly susceptible landslide areas*).

The mapping associated with the C312morn EMO7 is a direct translation of highly susceptible landslide areas identified in Cardno Lane Piper (2012).

The purpose of this assessment is to guide the substitution of the C312morn EMO7, to facilitate a Refined EMO7 before permanent shire-wide EMO/s are implemented into the MPPS.

6.2.1 How is landslide risk managed in the planning system?

Planning tools are particularly important in the context of landslide risk. Like many hazards – such as bushfire and flood – poor planning can increase community vulnerability and exposure through development in high-risk areas. Uniquely, poor planning can also be a preparatory factor for landslides. While individual buildings may be able to manage landslide risk through engineering



solutions, poor planning for urban development may disrupt natural slopes and change water pathways, destabilising areas of land and creating or exacerbating landslide risk.

There are two primary mechanisms within Victoria's land use planning system that seek to manage landslide risk:

- Statewide policies contained in the Planning Policy Framework.
- The application of the Erosion Management Overlay (EMO).

These two mechanisms are supported by a range of broader tools which can also assist to mitigate landslide risk, such as the Vegetation Protection Overlay (VPO) and stormwater management planning.

6.2.2 Limitations on the efficacy of the planning tools

The 3 key limitation findings of the BOI with respect to how landslide risk is managed in the planning system are as follows:

- Widely inconsistent approaches by local planning authorities to the identification and management of landslide susceptibility and risk.
- Lack of distinction between coastal erosion and landslide within a single overlay, and
- Planning controls for different hazards in conflict with one another, such as vegetation management for bushfire risk and landslide mitigation measures.

In addition, there are limitations to what the planning scheme can regulate - that is it only regulates the prospective use and development of land. It cannot regulate use or development that lawfully existed or was carried out before the scheme (or parts of it) came into effect.

6.3 Existing MPPS Land Susceptibility Policies/Controls

The MPPS uses state and local planning policies and Schedules to the Erosion Management Overlay ('EMOs') to manage land erosion, slope stability and development on geotechnically sensitive areas.

The MPPS also uses Schedules to the Environmental Significance Overlay ('ESOs') and Design & Development Overlay ('DDOs') to protect the unique environmental and landscape values of the Peninsula susceptible to geotechnically sensitivity.

6.3.1 State and Local planning policies

6.3.1.1 Clause 02.02-3: Environmental Risks and Amenity (LPP)

The Peninsula faces a number of environmental issues, such as the loss and degradation of native vegetation, pest plant and animal infestation, lowered habitat capacity, pollution of streams and aquifers, erosion and mass wastage of slopes, and damage to scientific and historic sites.



While most areas of the Peninsula are physically stable, areas west of the Selwyn Fault (the Nepean Peninsula) and some localised areas are prone to erosion and instability. The beach, dune, cliff and intertidal areas are particularly sensitive to human interference.

Of particular concern is the bed and bank erosion of Ballar Creek; the land slopes along the creek are susceptible to instability if disturbed by earthworks, which needs to be carefully managed.

Council's strategic directions for 'Environmental risks and amenity' are to:

- *Protect the unique environmental and landscape values of the Peninsula.*
- *Preserve the stability of land by avoiding development in areas prone to erosion.*

6.3.1.2 Clause 13.04-2S: Erosion and Landslide (VPP)

Clause 13.04-2S of the MPPS provides for state planning objectives, strategies and policy guidelines to protect areas prone to erosion, landslide or other land degradation processes.

13.04-2S
31/07/2018
VC148

Erosion and landslip

Objective

To protect areas prone to erosion, landslip or other land degradation processes.

Strategies

Identify areas subject to erosion or instability in planning schemes and when considering the use and development of land.

Prevent inappropriate development in unstable areas or areas prone to erosion.

Promote vegetation retention, planting and rehabilitation in areas prone to erosion and land instability.

6.3.1.3 Clause 13.04-2L-01/02: Erosion & Landslide (LPP)

This Clause provides specific local planning policy applications, strategies, guidelines and documents applicable to land affected by:

- EMO: *Schedule 3: Ballar Creek, Mount Eliza* (EMO3), and
- EMOs: *Schedule 4: Land Susceptibility Area A* (EMO4) & *Schedule 5: Land Susceptibility Area B* (EMO5) - *Tanti Creek, Mornington & Flinders townships*

where EMO5: Area B indicates higher susceptibility than EMO4: Area A, and triggers stricter assessment and reporting requirements.

EMOs: Schedules 1, 2 & 6 are not specifically mentioned under this Clause.

6.3.1.4 Clause 62.02: Buildings & Works exemptions

Clauses 62.02-1 and 62.02-2 (*as at the time of writing*) set out exemptions from permit requirements in this scheme relating to the construction of a building or the construction or carrying out of works.

These exemptions do not apply to the removal, destruction or lopping of trees and the removal of vegetation.



62.02-1

14/12/2023
VC253

Buildings and works not requiring a permit

Any requirement in this scheme relating to the construction of a building or the construction or carrying out of works, other than a requirement in the Public Conservation and Resource Zone, does not apply to:

- Buildings or works which provide for fire protection under relevant legislation.
- Emergency works undertaken by, or on behalf of, a municipality, public authority or utility service provider in the exercise of any power conferred on them under any Act.
- Buildings or works with an estimated cost of \$1,000,000 or less carried out by or on behalf of a municipality.
- Maintenance works carried out by a municipality or public authority to prevent or alleviate flood damage.
- An anemometer located on a site for three years or less.
- Buildings and works associated with a use on adjoining land or street trading if authorised under a local law.
- Gardening.
- Buildings and works associated with a minor utility installation.
- Power lines and electrical sub-stations associated with an Energy generation facility or Geothermal energy extraction if a permit was issued for such use or development prior to the approval date of Amendment VC157.
- Buildings or works which are a modification necessary to comply with a direction under the *Dangerous Goods Act 1985* or the *Occupational Health and Safety Act 2004* or a Development Licence, Operating Licence or notice under the *Environment Protection Act 2017*.
- Buildings and works for a telecommunications facility exempt from a permit under clause 52.19-1.
- Buildings and works associated with a dam if a licence is required to construct the dam or to take and use water from the dam under the *Water Act 1989*.
- Buildings and works associated with a carnival or circus if the requirements of A 'Good Neighbour' Code of Practice for a Circus or Carnival, October 1997 are met.
- Buildings and works associated with apiculture if the requirements of the Apiary Code of Practice, May 2011 are met.
- A temporary portable classroom associated with an education centre located on a site for three years or less.
- A temporary shed or temporary structure for construction purposes, or a temporary portable land sales office located on the land for sale.
- A children's cubbyhouse.
- External lighting normal to a dwelling or small second dwelling.
- The construction, alteration, removal or demolition of an observational bore where a licence has been issued for those works under Part 5 of the *Water Act 1989*.
- Any works associated with the use of land for earth and energy resources industry if the conditions of Clause 52.08 are met.



- A crop support or protection structure associated with horticulture, including a trellis, cloche, net and shade cloth. It does not include a structure with a solid roof or solid wall such as a glass house or igloo.
- An annexe attached to a movable caravan located on land used for a camping and caravan park.
- Works associated with geotechnical testing or service proving.
- Buildings and works associated with the use of land in a road to trade from a stall, stand, motor vehicle, trailer, barrow or other similar device.
- The construction of or putting up for display a sign consistent with the requirements of Clause 52.05-10.
- Temporary buildings and works associated with environmental monitoring (including monitoring groundwater, noise or air quality) constructed or carried out by or on behalf of the Head, Transport for Victoria.

62.02-2
14/12/2023
VC253

Buildings and works not requiring a permit unless specifically required by the planning scheme

Any requirement in this scheme relating to the construction of a building or the construction or carrying out of works, other than a requirement in the Public Conservation and Resource Zone, does not apply to:

- A fence.
- The construction of or putting up for display a sign (except for a sign consistent with the requirements of Clause 52.05-10 which is provided for in Clause 62.02-1).
- Roadworks.
- Buildings and works associated with a railway, railway station or tramway constructed or carried out by or on behalf of the Head, Transport for Victoria. If the buildings or works are on land in an Urban Floodway Zone, Floodway Overlay, Land Subject to Inundation Overlay, Special Building Overlay and will redirect or obstruct the water flow path, they must be constructed and carried out to the satisfaction of the relevant floodplain management authority.
- Street furniture including post boxes, telephone booths, fire hydrants, bus shelters, shade sails, traffic control devices and public toilets.
- Park furniture including seating, tables, shelters, rubbish bins, playground equipment, barbecues, shade sails, drinking fountains and public toilets.
- Furniture and works normally associated with an education centre including, but not limited to, outdoor furniture, playground equipment, art works, drinking fountains, rubbish bins and landscaping.
- Disability access and disability facilities associated with an education centre (not including a lift external to a building).
- Art work that is carried out by or on behalf of a public land manager.
- Oil pipelines.



- Buildings and works associated with a moveable unit as defined in the *Housing Act 1983*, carried out by or on behalf of the Chief Executive Officer, Homes Victoria.
- The internal rearrangement of a building or works provided the gross floor area of the building, or the size of the works, is not increased and the number of dwellings is not increased.
- Repairs and routine maintenance to an existing building or works.
- Domestic services normal to a dwelling or small second dwelling.
- A rainwater tank with a capacity of not more than 10,000 litres.
- Bicycle pathways and trails.
- A television antenna.
- A flagpole.
- A domestic swimming pool or spa and associated mechanical and safety equipment if associated with one dwelling on a lot.
- An open-sided pergola or verandah to a dwelling or small second dwelling with a finished floor level not more than 800 mm above ground level and a maximum building height of three metres above ground level.
- A deck to a dwelling or small second dwelling with a finished floor level not more than 800 mm above ground level.
- A disabled access ramp.
- Any works necessary to prevent soil erosion, or to ensure soil conservation or reclamation.
- A solar energy system attached to a building that primarily services the land on which it is situated.
- Buildings and works associated with cat cages and runs, bird cages, dog houses, and other domestic animal enclosures associated with the use of the land as a dwelling.
- Services normal to a building other than a dwelling or small second dwelling, including chimneys, flues, skylights, heating and cooling systems, hot water systems, security systems and cameras, downpipes, window shading devices, or similar.
- An electric vehicle charging station.

This does not apply if a permit is specifically required for any of these matters.



6.3.2 Clause 44.01: Erosion Management Overlay (EMO)

The key purpose of the EMO is to

'protect areas prone to erosion, landslide and other land degradation or coastal processes by minimising land disturbance and inappropriate development.'

A planning permit is required for matters under the following respective MPSS clauses.

6.3.2.1 Buildings and works

Clause 44.01-2 overrides the following Cl. 62.02-2 exemptions:

44.01-2
14/12/2023
VC253

Buildings and works

A permit is required to construct a building or construct or carry out works, including:

- Roadworks (other than roadworks constructed or carried out by or on behalf of the Head, Transport for Victoria).
- A domestic swimming pool or spa and associated mechanical and safety equipment if associated with one dwelling on a lot.
- Any other matter specified in Clause 62.02-2 if specified in a schedule to this overlay.

This does not apply if a schedule to this overlay specifically states that a permit is not required.

NB. A planning permit is not required *'if a schedule to the overlay specifically states that a permit is not required'*.

6.3.2.2 Vegetation removal

44.01-3
31/07/2018
VC148

Vegetation removal

A permit is required to remove, destroy or lop any vegetation. This does not apply:

- If a schedule to this overlay specifically states that a permit is not required.
- If the table to Clause 44.01-4 specifically states that a permit is not required.
- To the removal, destruction or lopping of native vegetation in accordance with a native vegetation precinct plan specified in the schedule to Clause 52.16.

6.3.2.3 Subdivision

44.01-5
31/07/2018
VC148

Subdivision

A permit is required to subdivide land.



6.3.3 Existing Schedules to the EMO ('EMOs')

EMOs have been progressively introduced into the MPPS (or its predecessors) since the 1970s and are generally based on area-specific geotechnical studies undertaken within the municipality.

There are currently 7 (seven) EMOs within the MPPS. The areas they cover, or overlays, are described in Table 4 (*below*).

Table 3: History of existing EMOs in the MPSS

EMO Schedule	History
EMO1 & EMO2 (1970s)	EMO1: 'Erosion Prone Slopes' affects much of the hinterland (Arthurs Seat, Rosebud, Red Hill, Main Ridge to Flinders) & EMO2: 'Unstable Slopes' affects other areas of Arthurs Seat, Rosebud and Flinders. These areas were identified in the 1970s by a Conservation Plan which was the strategic work that informed the <i>Western Port Region Interim Development Order Amendment No. 1A</i> (predecessor to Planning Schemes) carried out by the Western 'Port Regional Planning Authority.
EMO3 (2000)	EMO3 was introduced via Amendment C017 to land in the vicinity of Ballar Creek based on the ' <i>Mornington Peninsula Shire Council Landslide Zoning, Ballar Creek, Mount Eliza, Victoria, (Coffey, 2000)</i> '
EMO4 & EMO5 (2011)	EMO4 & EMO5: 'Land Susceptibility Areas A and B (respectively)' were introduced via Amendment C105morn in 2011 to land in the vicinity of Tanti Creek and Flinders township based on the following studies: '<i>Geotechnical Assessment of Slope Stability, Tanti Creek (Lane Piper, 2010)</i>' <i>Geotechnical Assessment for Landslide Susceptibility & Investigation zoning, Flinders Foreshore (Lane Piper, 2008)</i>
EMO6 (2025)	EMO6: 'Erosion Hazard – Beach and Foreshore Areas' was introduced via Amendment C271morn in 2025 based on the ' <i>Western Port Coastal Villages and Surrounding Settlements Strategy</i> ' (<i>Urban Ethos, 2019</i>) and the ' <i>Western Port Local Coastal Hazard Assessment</i> ' (<i>Water Technology, 2014</i>) [NB. The mapping associated with EMO6 has mistakenly 'superseded' mapping associated with EMO4 & EMO5 proximate to Flinders township].
(C312morn) EMO7 (2026)	EMO7: 'High Landslide Susceptibility Areas' was introduced via Ministerial PSA C312morn in January 2026 – areas of high landslide susceptibility identified in <i>Cardno Lane Piper (2012)</i> .

The existing EMOs do not contemplate VicSmart application eligibility.

6.3.4 Other Planning Overlays affecting land prone to erosion

EMOs do not cover all land that is known to have landslide susceptibility or erosion issues.

Other areas known to have susceptibility to erosion (or landslide) may be contained in other overlays: more specifically in *Schedules 1-17, 20-23 & 25* to the Environmental Significance Overlay (ESOs) and/or in *Schedules 2-7, 18* to the Design and Development Overlay (DDOs).



6.4 Recommendations for Refined EMO7 Schedule

The BOI recommended that interim planning controls be implemented within the Mornington Peninsula Planning Scheme to manage development in areas of high landslide and erosion susceptibility. In response, the recently gazetted C312morn EMO7 was introduced in January 2026 as a direct translation of the high landslide susceptibility mapping prepared by Cardno Lane Piper (2012), applying controls to areas not previously covered by an Erosion Management Overlay.

The purpose of updating the C312morn EMO7 is to refine and replace both the Planning Scheme mapping and associated Ordinance provisions prior to the completion of a future shire-wide EMO review.

The development of the refined mapping and planning controls has been an iterative process undertaken in consultation with Mornington Peninsula Shire Council and the independent peer reviewer. An initial draft report, including accompanying GIS mapping, draft EMO7 Schedule and Incorporated Document, was prepared and circulated for review. Feedback received through this consultation process informed successive refinements to the mapping methodology, overlay boundaries and planning provisions. This final report incorporates those revisions and presents the refined EMO7 framework recommended for implementation.

6.4.1 Objectives of Amended Provisions

Based on Cardno Lane Piper (2012), and following suggested feedback from stakeholders, refined provisions to Refined EMO7 seek to meet the following overarching objectives:

- Ensure risk to life from geotechnical hazards is tolerable.
- Include exemptions that are simple to interpret.
- Provide discretion for Council to waive the requirements of a geotechnical assessment where the impacts of landslide susceptibility are insignificant.
- Ensure consistency with precedent from recently gazetted EMO controls in other local government areas.
- Provide clear guidelines on when geotechnical assessment is required and what information it needs to contain.
- Reduce the administrative burden on applicants and statutory planners.

6.4.2 Review of recently gazetted EMO controls in other local government areas

Stantec has reviewed the following PSA documentation applying (or seeking to apply) EMOs into respective Planning Schemes:



Table 4: Review of PSA relating to the application of EMOs

PSA	Planning Scheme	Application
C119cola	Colac Otway	EMO1 (Landslide)
Proposed C225yan	Yarra Ranges	EMO1 (Landslide Susceptibility)
Proposed C159egip	East Gippsland	EMO1 (Landslide / Slope degradation hazards including shallow landslides on moderately steep to steep slopes)

6.4.3 Findings of document review

6.4.3.1 C119cola (Colac Otway)

The amendment implements the findings of the *Colac Otway Shire Erosion Management Overlay Review dated September 2021 (Golder Associates Pty Ltd)* by amending the Erosion Management Overlay (EMO) mapping and the Schedule to the EMO to reduce the extent of land affected, increase permit exemptions and reduce application requirements.

The amendment changes the Colac Otway Planning Scheme in the following ways:

- Amends the EMO mapping.
- Amends Schedule 1 to Clause 44.01 Erosion Management Overlay.
- Amends the Schedule to Clause 72.04 Documents Incorporated in the Planning Scheme to insert the *Requirements for a Geotechnical Assessment, Landslide Risk Assessment or Landslide Hazard Assessment prepared in support of a planning permit application under the Erosion Management Overlay (EMO) October 2021* as an Incorporated Document in the Colac Otway Planning Scheme.
- Amends the Schedule to Clause 72.08 Background Documents to insert the *Colac Otway Shire Erosion Management Overlay Review 2021* as a Background Document in the Colac Otway Planning Scheme.

6.4.3.2 Notable inclusions from C119cola

- At Section 2.0 of EMO1, the **Statement of Risk** states that '*Risk from landslide needs to achieve Tolerable Risk*'.

Tolerable Risk is a risk within a range that society can live with so as to secure certain net benefits. It is a range of risk regarded as non-negligible and needing to be kept under review and reduced further if possible. The maximum tolerable risk is defined as:

- For loss of life for the person(s) most at risk, it is taken as having a probability of no greater than 10^{-5} (1:100,000) per annum calculated in accordance with the *Australian Geomechanics Society Practice Note Guidelines for Landslide Risk Management 2007*.



- For property loss, it is assessed qualitatively using the *Australian Geomechanics Society Practice Note Guidelines for Landslide Risk Management 2007* and specifically Appendix C to that document and is selected depending on the new development type in accordance with Table 6: Maximum tolerable risk to property (C119cola) (*below*):

Table 5: Maximum tolerable risk to property (C119cola)

New Development Type	Maximum Qualitative Acceptable Risk
Essential facilities including hospitals, medical and surgery facilities, designated emergency shelters and facilities, buildings and facilities containing toxic or explosive materials in sufficient quantity capable of causing hazardous conditions that extend beyond property boundaries.	Low
All other construction of buildings or constructions and carrying out of works.	Moderate

[NB. A *National Landslide Risk Management Framework for Australia* (Australian Geomechanics Society Vol.42 No.1 March 2007(AGS 2007a-e) ('AGS 2007 Guidelines') is already (in part) a Background Document at Cl. 72.08 of MPPS (referred to as '*Practice Note Guidelines for Landslide Risk Management*', *Australian Geomechanics Journal*, Vol. 42, No. 1 (B. Walker, W. Davies & F. Wilson, 2007) and/or '*Guidelines for Landslide Susceptibility, Hazard and Risk Zoning for Land Use Management*', *Australian Geomechanics Journal*, Vol. 42, No. 1 (Australian Geomechanics Society Landslide Zoning Working Group, 2007).]

- At Section 3 of EMO1, the **Permit Requirements** do not override any additional Cl. 62.02-2 Buildings and Works exemptions.

There are, however, a number of minor buildings, works, earthworks and vegetation loss provisions that are not required under this overlay – where consideration includes the volume of water-bearing structures and ground disturbance.

- **Application Requirements** introduces the Incorporated document titled '*Requirements for a Geotechnical Assessment, Landslide Risk Assessment or Landslide Hazard Assessment prepared in support of a planning permit application under the Erosion Management Overlay (EMO) – October 2021*'.

This Incorporated document sets out the requirements for geotechnical assessment and reporting in support of planning applications required under the provisions of the Colac Otway Erosion Management Overlay – Schedule 1. There are different assessment and reporting requirements for subdivision and Buildings & works. Such requirements can be waived by the Responsible Authority.

(Refer to Appendix A: EMO1: C119cola)



6.4.3.3 Proposed C225yran (Yarra Ranges) & Proposed C159egip (East Gippsland)

Both of these proposed PSAs seek to introduce EMOs by:

- clearly articulating what the proposed schedule relates to (i.e. Landslide Susceptibility, Areas Susceptible to Landslide on Moderately steep slopes);
- outlining **Erosion Management objectives** to be achieved;
- providing a **Statement of Risk**, stating 'Risk from landslide (and erosion) hazards needs to achieve a Tolerable Risk level to be considered suitable for new development (akin to C119 cola);
- describing **Permit Requirements** and **Application Requirements**, to include the introduction of an Incorporated document that sets out the requirements for geotechnical assessment and reporting in support of planning applications required under the provisions of the EMOs. C225yran seeks to implement different assessment and reporting requirements for Subdivision and Buildings & works. Such requirements can be waived by the Responsible Authority.
- applying **Decision Guidelines**.

In particular, reference is made to the *East Gippsland C159egip Basis for Amendment to Erosion Management Overlay (WSP, 2025) report* ('WSP Report').

(Refer to Appendix B: EMO1 c159egip & Appendix C EMO1 c225yran)

6.4.4 Proposed Refined EMO7 Schedule considerations

6.4.4.1 Statement of Risk

A **Statement of Risk** should be provided in the Refined EMO7 Schedule, describing the geotechnical hazards to which Mornington Peninsula is exposed and the key areas exposed to these hazards. Importantly, it should describe the level of risk to life and property that Mornington Peninsula Shire will tolerate for new development exposed to geotechnical hazards and how those risks should be estimated. Risk estimation is undertaken in accordance with the methods described in the AGS 2007 Guidelines, which is widely adopted nationally, and is already a Background Document referred to at Cl. 72.08 of the MPPS.

Our position on Moderate risk to property aligns with WSP's position, as referenced from WSP Report below:

'Whilst AGS 2007 (Guidelines) clearly recommends Moderate risk as an appropriate threshold for the evaluation of risk to property, there is some ambiguity with respect to the example implications of Moderate risk set out in the Risk Evaluation Table in Figure 4.1 of AGS 2007 (Guidelines). Whilst this table indicates Moderate risk to property can be tolerated, it recommends measures are implemented to reduce the risk to Low. This raises the question



as to whether a situation in which there are no practical measures available to reduce the risk from Moderate to Low can be tolerated and in the context of the EMO, whether a development can be approved.

All of the other Planning Schemes reviewed have interpreted Moderate risk as tolerable, including in cases where the risk cannot practically be reduced from Moderate to Low. We agree with this interpretation. Notwithstanding this, when Moderate risk has been assessed, a principle of 'As Low as Reasonably Practical' ('ALARP') should apply. That is, if there are practical measures that can be implemented to reduce risk, they should be. In line with ALARP principles, a geotechnical assessment or landslide risk assessment undertaken by a geotechnical practitioner should include recommendations to reduce risk to as low as reasonably practical. This approach is in line with the tolerable risk threshold to which their risk assessment is compared and the guidance in AGS 2007 (Guidelines) that where tolerable risk has been assessed, measures to reduce the risk should be implemented. Implementation of the recommended measures would then become a condition of the planning permit. It is recommended that consideration be given to adopting 'Tolerable' levels to assess risk to property in line with building importance as set out in Table 4.1. Under these levels, the risk to property for residential development would have a tolerable threshold of Moderate.

The AGS 2007 Guidelines recommend that risk to property be assessed qualitatively and risk to life quantitatively. The AGS 2007 Guidelines provide a 'Tolerable' threshold for the quantitative assessment of risk to life of 10^{-5} (1 in 100,000) per annum for loss of life of the individual most at risk and assuming new development. This approach is consistent with criteria provided in other EMO schedules within Victoria, including Colac Otway, Frankston, Yarra Ranges, Alpine Resorts.'

(Refer to Appendix D: Section 2.0 – Statement of Risk of the draft proposed Refined EMO7 Schedule)

6.4.4.2 Permit Requirements and Exemptions

The appropriateness of overriding any Cl. 62.02-2 buildings and works exemptions, and potential buildings and works not requiring a planning permit, are discussed below, using, where applicable, relevant buildings and works considerations referred to in WSP Report (*in italics*).

Permit Requirement considerations follow:

a) Minor Alterations (and extensions) to an existing building

'....It is too onerous to require a planning permit for minor extensions if they do not significantly alter the landslide risk....a nominal maximum floor area of 20sqm. for minor buildings and works and extensions is proposed (in conjunction with other criteria), below which an exemption applies. This area has been selected for consistency with other planning schemes.'



Stantec commentary:

It is recommended that these WSP considerations be adopted.

Stantec considers that a new building of less than 20sqm in area should be exempt from requiring planning consent in the draft Refined EMO7 Schedule.

b) Earthworks

'Earthworks can cause or exacerbate geotechnical hazards because they can be potentially unstable causing soil or rock to collapse on to buildings or people.....

Furthermore, earthworks can trigger landslides on natural slopes by changing the distribution of stresses in the ground. However, it is not practical to require a planning permit for any form of ground disturbance no matter how minor if the consequences of instability are not significant.

It is recommended that minor earthworks, which could change the natural ground surface by a vertical height of less than 1m, be exempt. It is important to note that the 1m is measured relative to the natural ground surface. If for example existing earthworks which exceed a depth of 1m are deepened by 0.5m, the earthworks would not be exempt because the overall depth of excavation relative to the natural ground surface would be 1.5m.

Similarly, existing earthworks near a proposed development, for example a cut, could present a risk to a new development even if the new development does not require new earthworks. To account for this, a clause that triggers a geotechnical assessment if there are existing earthworks greater than 1m high within 5m of a proposed development is recommended.'

Stantec commentary:

It is recommended that these WSP considerations be adopted.

Identified earthworks of less than 1m should be exempt from requiring planning consent in the draft Refined EMO7 Schedule - with the added clarification that the combined depth of earthworks, whether above or below the natural ground surface, be limited to 1m at any point within a horizontal distance of 5m.

c) Stormwater Discharge

Uncontrolled stormwater discharge is an identified risk.

Stantec commentary:

It is recommended that planning consent is required for any identified building or works exemptions at Cl. 62.02-2, if they propose or require discharge of stormwater via an on-site absorption, detention, or ground infiltration system.



d) Fences

'Fences generally do not change or introduce landslide or erosion risks unless:

- They are impermeable at ground surface level and could cause disruption or redirection and concentration of surface water flow leading to erosion or landslide.*
- They are heavy, for example masonry that could present a risk to life if it were to be constructed on unstable ground and were to topple.*

There is a basis to exempt most fences including permeable, lightweight fences such as agricultural fences. Freestanding masonry walls higher than 1m and fences impermeable at ground level should not be exempt.'

Stantec commentary:

It is recommended that these WSP considerations be adopted.

Such fencing exemptions are reflected in the proposed Refined EMO7 Schedule.

e) Water holding structures

'Water holding structures such as tanks, pools and spas present a landslide risk because they could leak, leading to a concentration of water in the subsurface which could lead to instability. Tanks can also impose a significant surcharge load to the slope. Notwithstanding this, small, engineered, impervious water holding structures such as engineered water tanks, spas and pools can be expected to have a low likelihood of leakage. If these water holding structures are fitted with underdrainage, typically an underlying granular aggregate layer provided to allow water leakage from the tank to drain out on to the slope surface rather than infiltrate into the slope, there is a low likelihood of the water holding structure reducing the stability of a slope and there may be a basis to exempt.....

Larger impermeable water holding structures or pervious water holding structures such as dams or ponds are generally more prone to developing a leak than smaller ones. Larger engineered water holding structures and unlined water holding structures are not exempt.'

Stantec commentary:

It is recommended that these WSP considerations be adopted.

It is recommended that engineer designed impervious water holding structures not exceeding 5,000 litres, including spas and associated mechanical and safety equipment (constructed above ground level), should be exempt. (Earthworks associated with water holding structures considerations may not be exempt).

A landscaping water feature or other non-engineer designed or manufactured water retaining structure of less than a nominal 500 litres should also be exempt.

Roadworks carried out or on behalf of the municipal council should also be exempt.



f) Vegetation Removal

‘Good landslide and slope stability management would usually involve the retention of vegetation as far as is practical. Where removal or modification of vegetation does not substantially change the capacity of the vegetation to remove moisture from the soil, there is a basis for an exemption. This exemption criteria has been selected for consistency with other planning schemes.’

Stantec commentary:

It has been recommended that a permit is not required for the following impacts to vegetation:

- Within 2m of an existing fence or 5m of an existing building.
- Planted and less than 10 years old.
- Dead, if the ground surface is reinstated.
- A weed listed in the Schedule to Clause 52.17.
- Required to be removed, destroyed, or lopped to the minimum extent necessary to enable the carrying out of conservation works undertaken by or on behalf of the public land manager, or where there is no relevant public land manager, by or on behalf of a minister, government department, public authority, or municipal council.
- To lop vegetation, for maintenance only, if no more than 1/3 of the foliage of each individual plant is lopped or pruned.

g) Transitional arrangements for building permits

Proposed buildings and works that have already been issued a building permit, and any associated vegetation impacts (to the minimum extent necessary to enable the construction of a building or the construction or carrying out of works in accordance with a building permit already issued), should be exempted.

Stantec commentary:

Transitional arrangements for building and works that have already been issued a building permit (and considered associated vegetation impacts) are reflected in the proposed Refined EMO7 Schedule.

(Refer to Appendix D: Section 3.0 – Permit Requirements of the draft proposed Refined EMO7 Schedule)



6.4.4.3 Application Requirements

a) Plans: Buildings & Works and Subdivision

The following **Application Requirements** should apply to an application for a permit under the proposed Refined EMO7 Schedule, in addition to those specified in Clause 44.01 and elsewhere in the scheme, as appropriate, to the satisfaction of the responsible authority:

- Plans drawn to scale and dimensioned, including site layout and elevation plans, showing the existing conditions of the subject land, the relevant existing conditions of adjacent land, and the proposed development, including:
- The topography of the land, including land contours, watercourses and drainage lines, and identified geotechnical hazards.
- Buildings and structures.
- Earthworks and earth retaining structures.
- Driveways and access tracks.
- Water holding structures and water infrastructure, including water supply, drainage and effluent disposal systems.
- Vegetation, including the location, species, manner and extent of proposed removal, destruction or lopping, and the species, density, and location of proposed planting.
- For subdivision applications, the proposed subdivision layout.

b) Geotechnical studies (and the introduction of an Incorporated Document)

The extent of geotechnical studies prepared to inform landslide or erosion risk (as part of a planning permit application process) can vary considerably.

Costs to prepare such advice can be significant unless there is a better understanding of the level of geotechnical reporting required commensurate with the landslide risk.

We consider there to be a requirement to better define the geotechnical reporting requirements needed to support a planning application in an area subject to landslide or erosion hazards.

The use of an 'Incorporated Document' has been adopted and successfully in use by other Councils to better define the geotechnical reporting requirements.

An Incorporated Document can (amongst other matters) guide and convey the relevant information required at the planning permit application stage to all stakeholders, particularly a Geotechnical Practitioner and Council Officers, and achieve consistency between different Geotechnical Practitioners.

We consider the use of an Incorporated Document associated with the Refined EMO7 Schedule.



An Incorporated Document, outlining Geotechnical Information Requirements for the proposed Refined EMO7 Schedule, should:

- Set out the required qualifications for the project Geotechnical Practitioner - with these being persons who have been assessed as competent by a recognised accrediting authority. This approach is in line with requirements introduced more broadly for all engineers through the Victorian Professional Engineers Registration Bill in 2019, which describes the required competence of engineers practicing within Victoria and the maintenance of a register of persons assessed as competent. A list of minimum qualifications that geotechnical practitioners and engineering geologists should hold is recommended for inclusion in the Incorporated Document;
- Provide a description of the land affected by the Incorporated Document;
- State its purpose, and any expiry of its specific control/s;
- Outline Geotechnical Information Requirements for the Refined EMO7 Schedule, including consideration of the preparation of a Geotechnical Assessment or Landslide Risk Assessment;

The Geotechnical Assessment analyses the geotechnical characteristics of land to determine whether landslide hazards are, or are likely to be, compatible with the safety of the proposed buildings and works or subdivision layout. The assessment may recommend that a permit be granted, subject to conditions ensuring that risk to life and risk to property are maintained within tolerable risk requirements;

If the Geotechnical Assessment concludes that an application for buildings and works is subject to significant landslide hazards, a Landslide Risk Assessment should be undertaken;

- Allow the responsible authority to waive the need to prepare a Geotechnical Assessment;
- Clarify what a Geotechnical Assessment or Landslide Risk Assessment should contain, having regard to the methodology outlined in *Practice Note Guidelines for Landslide Risk Management* (AGS 2007c), including a recommended planning permit conditions statement (as appropriate); and
- Provide Independent Peer Review opportunities.

The geotechnical documentation required by and prepared in accordance with the Incorporated Document should be referenced under **Application Requirements**. The responsible authority may waive or vary the requirement.

(Refer to Appendix D: Section 4.0 – Application Requirements of the draft proposed Refined EMO7 Schedule)

(Refer to Appendix E: draft Incorporated Document Geotechnical Information Requirements for the Erosion Management Overlay, Schedule 7)



6.4.4.4 Decision Guidelines

Decision guidelines should consider:

- The statement of risk.
- Whether development is designed and located in accordance with established principles of good hillside construction practice and is responsive to the landform and site conditions.
- For buildings and works, whether the application achieves a tolerable risk to human life and property.
- The recommendations of the geotechnical documentation required by the incorporated document '*Geotechnical Information Requirements for the Erosion Management Overlay, Schedule 7 (Stantec and Mornington Peninsula Shire, July 2026)*', and the recommendations of any peer review.
- Whether ongoing monitoring and maintenance of risk mitigation measures are required to achieve tolerable risk to human life and property for the life of the development.

(Refer to Appendix D: Section 5.0 – Decision Guidelines of the draft proposed Refined EMO7 Schedule)

6.4.5 Applying the proposed Refined EMO7 Schedule

It is considered inappropriate to replace long-term EMOs (EMO1-EMO5) with the proposed Refined EMO7 through a Ministerial PSA. This should be the subject of the forthcoming shire-wide EMO review.

On this basis, the Refined EMO7 should solely supersede the recently gazetted C312morn EMO7 by way of a Ministerial Amendment (and subject to approval by the Department of Planning & Transport).

The tracked changes between C312morn EMO7 and proposed Refined EMO7 Schedule are provided at **Appendix F**, rationalising these changes from both a planning and geotechnical perspective.

The requirements of this overlay should have an **expiry** date.



7 Recommendations for Permanent EMO mapping.

The mapping methods outlined in this report are considered appropriate for the implementation of the Refined EMO7.

However, for the development of the permanent EMOs it is recommended that the landslide susceptibility assessment is updated using the most recent available datasets and that it incorporates any revisions in methodology as identified in this section. It is recommended that the following items are considered in the development of the permanent EMO:

- Adopt the most recent datasets available for aerial imagery and LiDAR
- Update the landslide inventory for the Shire using the most recent information available to include landslides that have occurred since 2012 (aerial imagery, LiDAR, geotechnical reports, known landslide information, etc)
- Review of the EMO1 and EMO2 areas and consider whether or not they should be included in the Permanent EMO. This should be done on an individual basis for each defined polygon (area) within the EMO as it is likely that the review will show some areas are consistent with the updated computational assessment methodologies while others are considered to be inappropriate.
- Review and update of geological boundaries where they have been identified as varying from those shown on the Geological Maps of Victoria during site inspections. It is recommended that these are recorded and then the maps are updated over time each time the system is revised.

A review of the full geology of the Shire is beyond the remit of the Shire, and as such, should be coordinated with the State based updates of any mapping as they occur.

- Reassessment of the updated data to create a fresh baseline and apply the updated GIS methods as outlined in Section 5 of this report
- Inclusion of break back and run out zones within the areas of high risk of landslide susceptibility.
- Consider further updates to GIS technologies.
- Further update the ordinances and Incorporated Documents based on feedback received from the Refined EMO.

It is important to note that while the above should generally result in similar set of areas covered by the existing EMOs on a regional scale, variation around the boundaries can be expected due to the new LiDAR data and analysis methodologies that would be adopted at that time.



8 References

Australian Geomechanics Society (2007), A National Landslide Risk Management Framework for Australia, *Australian Geomechanics*, Volume 42, No 1, March 2007.

- AGS2007a: Guideline for landslide susceptibility, hazard and risk zoning for land use planning *Australian Geomechanics*, Vol 42 No1, March 2007 (abbreviated title: Landslide Zoning Guideline)
- AGS2007b: Commentary on guideline for landslide susceptibility, hazard and risk zoning for land use planning, *Australian Geomechanics*, Vol 42 No1, March 2007 (abbreviated title: Commentary on Landslide Zoning Guideline)
- AGS2007c: Practice Note guidelines for landslide risk management, *Australian Geomechanics*, Vol 42 No1, March 2007 (abbreviated title: Practice Note 2007)
- AGS2007d: Commentary on Practice guidelines for landslide risk management, *Australian Geomechanics*, Vol42 No1, March 2007 (abbreviated title: Practice Note Commentary)
- AGS2007e: Australian GeoGuides for slope management and maintenance, *Australian Geomechanics*, Vol 42 No1, March 2007 (abbreviated title: Australian GeoGuides)

Cardno Lane Piper (2012), *Draft Landslide Susceptibility Assessment Stage 2, Mornington Peninsula Shire*. Ref. 207166Report02.1, 1 February 2012, Stantec Australia Pty Ltd

Lane Piper (2010), *23019Report01.7 Geotechnical Assessment of Slope Stability, Tanti Creek, Mornington*, 30 March 2010, Stantec Australia Pty Ltd

Lane Piper (2008), *27005Report01.2 Geotechnical Assessment of Landslip Susceptibility and Investigation Zoning, Flinders Foreshore, Mornington Peninsula*, 24 January 2008, Stantec Australia Pty Ltd

Piper & Associates (1999), *99071, Slope Stability Analyses of Hearn Creek Banks, Mount Martha*, Stantec Australia Pty Ltd



Appendices



Appendix A EMO1 C119cola



SCHEDULE 1 TO CLAUSE 44.01 EROSION MANAGEMENT OVERLAY

Shown on the planning scheme map as **EMO1** .

EROSION MANAGEMENT OVERLAY - SCHEDULE 1**1.0**21/09/2022
C119cola**Erosion management objectives to be achieved**

To ensure that development can be undertaken at a tolerable risk to human life and property from landslip.

2.021/09/2022
C119cola**Statement of risk**

Areas subject to landslip are within the Otway Ranges, coastal areas along the Great Ocean Road and farming areas in the Forrest and Gellibrand localities.

The occurrence of landslips within Colac Otway Shire has historically caused damage to property and the environment and presents an ongoing risk to human life. Geotechnical studies have documented historical landslip occurrences and seek to identify areas susceptible to future landslide occurrence.

The control of environmental factors and development relating to vegetation cover, drainage, rock and soil disturbance and effluent and stormwater disposal are all important in managing the risk of landslip.

Risk from landslip needs to achieve Tolerable Risk.

Tolerable Risk is a risk within a range that society can live with so as to secure certain net benefits. It is a range of risk regarded as non-negligible and needing to be kept under review and reduced further if possible. The maximum tolerable risk is defined as:

- For loss of life for the person(s) most at risk, is taken as having a probability of no greater than 10^{-5} (1:100,000) per annum calculated in accordance with the *Australian Geomechanics Society Practice Note Guidelines for Landslide Risk Management 2007*.
- For property loss is assessed qualitatively using the *Australian Geomechanics Society Practice Note Guidelines for Landslide Risk Management 2007* and specifically Appendix C to that document and is selected depending on the new development type in accordance with Table 1.

Table 1 - Maximum tolerable risk to property

New Development Type	Maximum Qualitative Tolerable Risk
Essential facilities, including hospitals, medical and surgery facilities, emergency services facilities, designated emergency shelters and facilities, buildings and facilities containing toxic or explosive materials in sufficient quantity capable of causing hazardous conditions that extend beyond property boundaries.	Low
All other new development, including residential dwellings.	Moderate

Permit requirement

A permit is not required to:

- Construct or carry out works associated with:
 - A pond or open, impervious water holding structure with a capacity of less than 10,000 litres.
 - A masonry wall if the height of the wall does not exceed one metre.
 - A spa and associated mechanical and safety equipment if the spa has a capacity not exceeding 5,000 litres and is constructed at or above ground level.
- Construct or carry out earthworks that result in a modified ground surface that is less than one metre above or below the natural ground level.
- Extend a building or carry out works, provided:
 - The gross ground floor area is not increased by more than 20 square metres.
 - Stormwater from the building is drained to a legal point of discharge.
 - The slope of the land within 20 metres of the building is 9 degrees (15%) or less.
- Construct a non-habitable structure ancillary to a dwelling, including carports and garden sheds, provided:
 - The structure is constructed of lightweight, flexible materials (not bricks, concrete blocks or similar).
 - The ground surface area occupied by all such structures on the property does not exceed 40 square metres.
 - The slope of the land within 20 metres of the structure is 9 degrees (15%) or less.
 - Stormwater from the roof is drained to the legal point of discharge.
- Construct or extend a building used for agricultural purposes in the Farming Zone.
- Construct or carry out works undertaken by or on behalf of a public authority relating to watercourse management, environmental improvements or infrastructure services.
- Remove, destroy or lop vegetation if any of the following apply:
 - The trunk circumference measured at 1 metre above ground level does not exceed 2 metres and the natural ground surface is reinstated.
 - The vegetation is dead and the natural ground surface is reinstated.
 - The roots below the ground level are retained, and the vegetation removal is associated with the maintenance of an existing minor utility installation.
 - The vegetation is to be removed, destroyed or lopped in conjunction with timber production, and:
 - Complies with the *Timber harvesting Prescriptions for Environmental Protection – Otway Region Private Land Native Forests and Plantations* ; and
 - Details of landslip risk is provided to and approved by the responsible authority.
 - The lopping is for pruning to improve a tree's health or structural stability.

Application requirements

The following application requirements apply to an application for a permit under Clause 44.01, in addition to those specified in Clause 44.01 and elsewhere in the scheme, and must accompany an application, as appropriate, to the satisfaction of the responsible authority:

- For an application to construct a building or construct or carry out works, plans drawn to scale and dimensioned, showing as appropriate:
 - The proposed new development, including as appropriate a site plan, building elevations, access, cut and fill, retaining walls and effluent disposal system.
 - Any existing development, including buildings, water tanks and dams on both the subject lot(s) and adjacent land.
 - Any existing development on the subject lot(s), including cut and fill, stormwater drainage, subsurface drainage, water supply pipelines, sewerage pipelines or effluent disposal installations and pipelines and any otherwise identified geotechnical hazard.
 - Details and location of existing vegetation, including any vegetation to be removed.
- For an application to subdivide land, plans drawn to scale and dimensioned, showing as appropriate:
 - The proposed subdivision layout and land contours.
 - Any existing development, including buildings, water tanks and dams on both the subject lot(s) and adjacent land.
 - Any existing development on the subject lot(s), including cut and fill, stormwater drainage, subsurface drainage, water supply pipelines, sewerage pipelines or effluent disposal installations and pipelines and any otherwise identified geotechnical hazard.
 - Details and location of existing vegetation, including any vegetation to be removed.
- A geotechnical assessment, landslide hazard assessment or landslide risk assessment as required by and prepared in accordance with the Incorporated document titled ‘ *Requirements for a Geotechnical Assessment, Landslide Risk Assessment or Landslide Hazard Assessment prepared in support of a planning permit application under the Erosion Management Overlay (EMO) October 2021* ’ and to the satisfaction of the responsible authority.
- Where, in the opinion of the responsible authority, the application for a subdivision or development will not adversely increase the landslip risk to life or property affecting the subject lot(s) or adjoining or nearby land, a written geotechnical assessment, landslide hazard assessment or landslip risk assessment (as appropriate) is not required.

5.0
21/09/2022
C119cola

Decision guidelines

The following decision guidelines apply to an application for a permit under Clause 44.01, in addition to those specified in Clause 44.01 and elsewhere in the scheme which must be considered, as appropriate, by the responsible authority:

- The risk to human life and property is tolerable.
- The need for any ongoing monitoring and maintenance for mitigation measures.

Appendix B EMO1 c159egip



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Proposed C159egip

SCHEDULE 1 TO CLAUSE 44.01 EROSION MANAGEMENT OVERLAY

Shown on the planning scheme map as **EMO1**.

AREAS SUSCEPTIBLE TO LANDSLIP ON MODERATELY STEEP SLOPES

1.0

--/--/---
Proposed C159egip

Erosion management objectives to be achieved

To ensure that development can be undertaken at a tolerable risk to human life and property from landslip and slope degradation hazards including shallow landslides on moderately steep to steep slopes.

2.0

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Proposed C159egip

Statement of risk

Parts of East Gippsland are prone to hazards caused by landslip and other slope degradation processes including shallow landslides on moderately steep to steep slopes. These hazards involve the unplanned movement of soil or rock through collapse or its movement downslope under the action of gravity. There are areas of the highlands within East Gippsland Shire, that are prone to landslip including slopes on alpine valleys, escarpments and water courses.

Hazards caused by landslip and erosion within East Gippsland have historically caused damage to property and the environment and present an ongoing risk to human life. Geological studies have identified historical landslip and erosion occurrences and sought to identify areas susceptible to future occurrence.

All land included in the Erosion Management Overlay has been identified as having a sufficiently high risk of impact from landslip or erosion hazards to warrant specific review of these risks prior to the issue of a planning permit for buildings and works or subdivision. The control of environmental factors and development relating to vegetation cover, drainage, rock, earthworks, soil disturbance and effluent and stormwater disposal are all important for managing the risk from these hazards.

Risk from landslip and erosion hazards needs to achieve a Tolerable Risk level to be considered suitable for new development.

Tolerable Risk is risk within a range that society can live with to secure certain net benefits. It is a range of risk that is regarded as non-negligible and requires ongoing review and reduction if possible. The maximum tolerable risk is defined as:

- For loss of life for the person(s) most at risk, it is taken as having a probability of no greater than 10^{-5} (1 in 100,000) per annum calculated in accordance with the *Australian Geomechanics Society Practice Note Guidelines for Landslide Risk Management 2007*.
- For property loss it is assessed qualitatively using the *Australian Geomechanics Society Practice Note Guidelines for Landslide Risk Management 2007*, Appendix C. The tolerable risk level is selected depending on the new development type in accordance with Table 1.

Table 1 - Maximum tolerable risk to property

New Development Type	Maximum Qualitative Tolerable Risk
Essential facilities including hospitals, medical and surgery facilities, emergency services facilities, designated emergency shelters and facilities, buildings and facilities containing toxic or explosive materials in sufficient quantity capable of causing hazardous conditions that extend beyond property boundaries.	Low

All other construction of buildings or construction and carrying out of works. Moderate

3.0

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Proposed C159egip

Permit requirement

A permit is not required to:

- Construct or carry out works associated with:
 - A dam, pond or open impervious water holding structure with a capacity of less than 500 litres.
 - Landscaping water feature(s) provided it does not entail ponding of more than 500 litres.
 - A domestic rainwater tank with capacity of not more than 4500 litres, constructed at ground level or above.
 - A spa and associated mechanical and safety equipment, provided that the spa has a capacity not exceeding 5000 litres and is constructed at or above ground level.
 - A masonry wall with a wall height does not exceed 1000 millimetres and the wall does not alter surface water drainage.
 - A fence of lightweight construction provided it is either permeable or the base of the fence is at least 50 millimetres above the ground surface level and does not obstruct surface water flow.
- Construct or carry out earthworks that result in a modified ground surface less than 1000 millimetres above or below the natural ground level and does not allow water ponding.
- Extend or alter a building, provided all of the following are met:
 - The gross ground floor area is not increased by more than 40 square metres.
 - Stormwater from the building is drained to a legal point of discharge.
 - There are no existing earthworks (cut or fill) higher than 1 metre, within 5 metres of the proposed extension.
- Construct a building associated with agricultural activities, provided all of the following are met:
 - The building is constructed of lightweight, flexible materials (not bricks, concrete blocks or similar).
 - There are no existing earthworks (cut or fill) higher than 1 metre, within 5 metres of the proposed building.
 - Stormwater from the building is drained to a legal point of discharge.
- Construct a retaining wall, providing all of the following are met:
 - The retaining wall is less than 1 metre high.
 - The retaining wall is not attached to or part of a building structure.
 - The retaining wall is not within 1 metre of a boundary.
- Construct any structure necessary to prevent or control soil erosion, or to ensure soil conservation and/or reclamation.
- Construct a non-habitable structure ancillary to a dwelling (including carports and sheds), provided all of the following are met:
 - The structure is constructed of lightweight, flexible materials (not bricks, concrete blocks or similar).

- The ground surface area occupied by all such structures on the property does not exceed 40 square metres.
- There are no existing earthworks (cut or fill) higher than 1 metre, within 5 metres of the proposed structure.
- Stormwater from the building is drained to the legal point of discharge.
- Construct or carry out repair or maintenance works undertaken by or on behalf of a public authority relating to watercourse management, environmental improvements or infrastructure services.
- Remove, lop or destroy vegetation if any of the following apply:
 - The trunk circumference is 0.5 metres or less when measured at 1.3 metres above ground level.
 - The vegetation is within 2 metres of a building.
 - Dead vegetation where the natural ground surface is reinstated.
 - Lopping necessary to improve the health or structural stability of a tree.
 - The vegetation removal is part of agricultural activities such as ploughing, grazing or slashing of substantially cleared areas maintained for pasture or crop raising.
 - Removal of the minimum extent of vegetation necessary for the establishment and/or maintenance of fences in a rural zone.
- Construct a bore, advertising structure, jetty, wind turbine or solar energy facility associated with accommodation or agricultural uses.

4.0

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Proposed C159egip

Application requirements

The following application requirements apply to an application for a permit under Clause 44.01, in addition to those specified in Clause 44.01 and elsewhere in the scheme and must accompany an application, as appropriate, to the satisfaction of the responsible authority:

- For an application to construct a building or construct or carry out works, plans drawn to scale and dimensioned, showing as appropriate:
 - The proposed new development, including a site plan, land contours, building elevations, access, cut and fill, retaining walls and effluent disposal system.
 - Any existing development, including buildings, water tanks and pools or dams on both the subject lot(s) and adjacent land.
 - Any existing earthworks and water infrastructure on the subject lot(s), including cut and fill, stormwater drainage, subsurface drainage, water supply pipelines, sewerage pipelines or effluent disposal installations and pipelines and any otherwise identified geotechnical hazard.
 - Details and locations of existing vegetation, including any vegetation to be removed.
- For an application to subdivide land, plans drawn to scale and dimensioned, showing as appropriate:
 - The proposed subdivision layout and land contours.
 - Any existing development, including buildings, water tanks and pools or dams on both the subject lot(s) and adjacent land.
 - Any existing earthworks or water infrastructure on the subject lot(s), including cut and fill, stormwater drainage, subsurface drainage, water supply pipelines, sewerage pipelines or effluent disposal installations and pipelines and any otherwise identified geotechnical hazard.

- Details and location of existing vegetation, including any vegetation to be removed.
- A geotechnical assessment, landslide risk assessment or landslide hazard assessment as required by and prepared in accordance with the Incorporated Document titled '*Requirements for a Geotechnical Assessment, Landslide Risk Assessment or Landslide Hazard Assessment prepared in support of a planning permit application under the Erosion Management Overlay (WSP, 2025)*' and to the satisfaction of the responsible authority.

A geotechnical assessment, landslide risk assessment or landslide hazard assessment (as appropriate) is not required where in the opinion of the responsible authority, the application for a subdivision or development will not adversely increase the risk to life or property affecting the subject lot(s) or adjoining or nearby land caused by a geotechnical hazard.

The responsible authority may require a geotechnical assessment, landslide risk assessment or landslide hazard assessment that has been submitted with an application, to be reviewed by an independent geotechnical practitioner.

5.0

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Proposed C159egip

Decision guidelines

The following decision guidelines apply to an application for a permit under Clause 44.01, in addition to those specified in Clause 44.01 and elsewhere in the scheme which must be considered, as appropriate, by the responsible authority:

- Whether the risk to life and property is tolerable.
- The recommendations of the geotechnical assessment, landslide risk assessment or landslide hazard assessment and any independent review.
- The risks associated with the need for any ongoing monitoring and maintenance for mitigation measures.

Appendix C EMO1 c225yran



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Proposed C225yran

SCHEDULE 1 TO CLAUSE 44.01 EROSION MANAGEMENT OVERLAY

Shown on the planning scheme map as **EMO1**

LANDSLIP SUSCEPTIBILITY

1.0

01/03/2024
C217yran

Erosion management objectives to be achieved

To ensure that development can be undertaken at a tolerable risk to human life and property from landslip.

2.0

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Proposed C225yran

Statement of risk

Areas subject to landslip across the Yarra Ranges include the hillsides along the Yarra River valley, the mountains of the Dandenong Ranges and agricultural areas of Silvan, Monbulk and Seville.

The occurrence of landslips within the Yarra Ranges has historically caused damage to property and the environment and presents an ongoing risk to human life. Geotechnical studies have documented historical landslip occurrences and sought to identify areas susceptible to future landslide occurrence.

The control of environmental factors and development relating to vegetation cover, drainage, rock, earthworks, soil disturbance and effluent and stormwater disposal are all important in managing the risk from landslip.

Risk from landslip needs to achieve a Tolerable Risk level to be considered suitable for new development.

Tolerable Risk is a risk within a range that society can live with so as to secure certain net benefits. It is a range of risk that is regarded as non-negligible and requires ongoing review and reduction if possible. The maximum tolerable risk is defined as:

- For loss of life of the individual most at risk, it is taken as having a probability of no greater than 10^{-5} (1 in 100,000) per annum calculated in accordance with the *Australian Geomechanics Society Practice Note Guidelines for Landslide Risk Management 2007*.
- For property loss is assessed qualitatively using the *Australian Geomechanics Society Practice Note Guidelines for Landslide Risk Management 2007*, specifically Appendix C to that document with the maximum tolerable risk level selected based on the type of new development in accordance with Table 1.

Table 1 - Maximum tolerable risk to property

New Development Type	Maximum Qualitative Tolerable Risk
Essential facilities including Hospitals, Medical centres and Emergency services facilities. Land uses capable of causing hazardous conditions including Earth and energy resources industry, Freezing and cool storage and Fuel depots.	Low
All other land uses	Moderate

3.0

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Proposed C225yran

Permit requirement

A permit is required for all subdivision and new buildings and works except for:

- Impervious water holding structures engineer designed or manufactured to an Australian Standard such as domestic rainwater tanks and spas, ponds and rainwater gardens with a capacity not exceeding 5000 litres.

YARRA RANGES PLANNING SCHEME

- Landscaping water features or other non-engineer designed or manufactured water retaining structures that do not entail ponding of more than 500 litres.
- A masonry fence, if the height of the fence does not exceed one metre and the fence does not alter surface water drainage.
- A fence of lightweight construction including timber, wire or aluminium and where the fence is permeable, or where the base of the fence is at least 50 millimetres above the ground surface and does not obstruct surface water flow.
- Earthworks that result in a modified ground surface that is less than 1 metre above or below the natural ground level and does not allow water ponding.
- Repair or maintenance works to existing assets undertaken by, or on behalf of a municipality, public authority or utility service provider relating to watercourse management, environmental improvements or infrastructure services.
- Alteration or extension to an existing building provided all of the following are met:
 - the floor area of the alteration or extension is not more than 20 square metres;
 - the alteration is connected to a legal point of discharge;
 - there are no existing earthworks higher than 1 metre within 5 metres of the alteration or addition.
- An outbuilding ancillary to a dwelling, provided all the following are met:
 - the building is not used for accommodation;
 - the building is constructed with aluminium, steel or timber;
 - the total area of outbuildings on the lot is 40 square metres or less;
 - the building is connected to a legal point of discharge;
 - there are no existing earthworks higher than 1 metre within 5 metres of the building.
- A building used for agriculture, provided all of the following are met:
 - the building is constructed with aluminium, steel or timber;
 - there are no more than two agricultural buildings on the lot;
 - the building is connected to a legal point of discharge;
 - there are no existing earthworks higher than 1 metre within 5 metres of the building.
- A temporary shed or temporary structure for construction purposes with a floor area of 20 square metres or less.
- A retaining wall associated with new excavation or fill provided all of the following are met:
 - the retaining wall and associated earthworks result in a modified ground surface that is less than 1 metre above or below the natural ground level;
 - the retaining wall is less than 1 metre high;
 - the retaining wall is not attached to or part of a building or structure;
 - the retaining wall does not provide landslip protection for any adjoining land.
- A retaining wall or slope retention to support existing earthworks provided the earthworks were undertaken prior to 2001.
- Remove, destroy or lop vegetation, either separately or as part of building works if any of the following apply:

- A tree with a trunk circumference of 0.5 metres or less measured 1.3 metres above ground level.
- Vegetation within 2 metres of a building.
- Dead vegetation where the ground surface is reinstated.
- Lopping necessary to improve the health or structural stability of a tree.

4.0

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Proposed C225yran

Application requirements

The following application requirements apply to an application for a permit under Clause 44.01, in addition to those specified elsewhere in Clause 44.01 and elsewhere in the scheme, and must accompany an application, as appropriate, to the satisfaction of the responsible authority.

For an application to construct a building or construct or carry out works:

- Plans drawn to scale and dimensioned, showing as appropriate;
 - The proposed new development, including as appropriate a site plan, land contours, building elevations, access, cut and fill, retaining walls and effluent disposal system.
 - Any existing development, including buildings, water tanks and pools or dams on both the subject lot(s) and adjacent land.
 - Any existing earthworks and water infrastructure on the subject lot(s), including cut and fill, stormwater drainage, subsurface drainage, water supply pipelines, sewerage pipelines or effluent disposal installations and pipelines and any otherwise identified geotechnical hazard.
 - Details and locations of existing vegetation, including any vegetation to be removed.
- A Geotechnical Assessment or Landslide Risk Assessment prepared in accordance with the Incorporated Document 'Requirements for a Geotechnical Assessment, Landslide Risk Assessment or Landslide Hazard Assessment prepared in support of a planning permit application under the Erosion Management Overlay (Yarra Ranges Shire Council, June 2025).'

For an application to subdivide land:

- Plans drawn to scale and dimensioned, showing as appropriate;
 - The proposed subdivision layout and land contours.
 - Any existing development, including buildings, water tanks and pools or dams on both the subject lot(s) and adjacent land.
 - Any existing earthworks or water infrastructure on the subject lot(s), including cut and fill, stormwater drainage, subsurface drainage, water supply pipelines, sewerage pipelines or effluent disposal installations and pipelines and any otherwise identified geotechnical hazard.
 - Details and location of existing vegetation, including any vegetation to be removed.
- Landslide Hazard Assessment in accordance with the Incorporated Document 'Requirements for a Geotechnical Assessment, Landslide Risk Assessment or Landslide Hazard Assessment prepared in support of a planning permit application under the Erosion Management Overlay (Yarra Ranges Shire Council, June 2025).'

If in the opinion of the responsible authority an application requirement is not relevant to the evaluation of an application, the responsible authority may waive or reduce the application requirements.

5.0

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Proposed C225yran

Decision guidelines

The following decision guidelines apply to an application for a permit under Clause 44.01, in addition to those specified elsewhere in Clause 44.01 and elsewhere in the scheme must be considered, as appropriate, by the responsible authority:

- The statement of risk and whether the risk to human life and property is tolerable.
- The recommendations of the Geotechnical Assessment, Geotechnical Hazard Assessment or any Landslide Risk Assessment.
- The need for any ongoing monitoring and maintenance for mitigation measures.

Appendix D Refined EMO7 Schedule



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SCHEDULE 7 TO CLAUSE 44.01 EROSION MANAGEMENT OVERLAY

Shown on the planning scheme map as **EMO7**.

LANDSLIDE SUSCEPTIBILITY

1.0

Erosion management objectives to be achieved

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C314morn

To ensure that development achieves tolerable landslide risk to human life and property.

To ensure that development is designed and located in accordance with established principles of good hillside construction practice and is responsive to the landform and site conditions.

2.0

Statement of risk

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C314morn

This schedule applies to land within Mornington Peninsula that has been identified as being susceptible to landslide. These areas have been identified through an assessment of underlying geologies, slope gradient, slope aspect, and the characteristics of historical landslide events.

The occurrence of landslides on the Mornington Peninsula has caused damage to property and the environment and landslides present an ongoing risk to human life. Geotechnical studies have documented historical landslide occurrences and seek to identify areas susceptible to future landslide occurrence.

The control of environmental factors and development, including vegetation cover, drainage, earthworks, soil disturbance, and effluent and stormwater disposal, are all important in managing the risk from landslide.

Landslide risk is assessed and quantified in accordance with *Practice Note Guidelines for Landslide Risk Management* (Australian Geomechanics Society, 2007). Maximum tolerable risk for new development is defined as:

- For loss of life, having a probability not exceeding 10^{-5} (1 in 100,000) per year.
- For risk to property, tolerable risk is measured qualitatively as not exceeding:
 - Low-risk, for development associated with essential service facilities including hospitals, medical centres, and emergency service facilities, and for land capable of causing hazardous conditions including earth and energy resources, freezing and cool storage and fuel depots.
 - Moderate-risk, for development associated with all other land uses including residential land uses.

3.0

Permit requirement

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C314morn

A permit is required to:

- Construct a building or construct or carry out works specified in Clause 62.02-2, other than an internal rearrangement of a building or works or repairs and routine maintenance to an existing building or works, if the building or works do any of the following:
 - Exceed a floor area or works area of 20 square metres.
 - Include earthworks where the depth of excavation, height of fill, or combination of both exceeds 1 metre at any point within a horizontal distance of 5 metres.
 - Propose or require discharge of stormwater via an on-site absorption, detention, or ground infiltration system.
- Construct a fence if the fence does any of the following:

- Exceeds 1 metre in height and is constructed of masonry or concrete.
- Obstructs or redirects the flow of surface water, including by being constructed with a continuous impermeable base.

- Construct a rainwater tank.

A permit is not required for the following:

- To construct a building or construct or carry out works for:
 - A new building not used for accommodation, if all of the following are met:
 - The floor area of the building does not exceed 20 square metres.
 - The depth of excavation, height of fill, or combination of both does not exceed 1 metre at any point within a horizontal distance of 5 metres.
 - The building is located more than 5 metres from existing earthworks where the depth of excavation, height of fill, or combination of both exceeds 1 metre at any point within a horizontal distance of 5 metres.
 - The building is connected to a legal point of discharge and stormwater is not discharged via an on-site absorption, detention, or ground infiltration system.
 - The building is constructed with frames, walls and roof of aluminium, steel or timber.
 - An alteration or extension to an existing building, if all of the following are met:
 - The floor area of the alteration or extension does not exceed 20 square metres.
 - The depth of excavation, height of fill, or combination of both does not exceed 1 metre at any point within a horizontal distance of 5 metres.
 - The alteration or extension is located more than 5 metres from existing earthworks where the depth of excavation, height of fill, or combination of both exceeds 1 metre at any point within a horizontal distance of 5 metres.
 - The alteration or extension is connected to a legal point of discharge and stormwater is not discharged via an on-site absorption, detention, or ground infiltration system.
 - Earthworks (including associated earth retaining structures), if all of the following are met:
 - The works do not exceed an area of 20 square metres.
 - The depth of excavation, height of fill, or combination of both does not exceed 1 metre at any point within a horizontal distance of 5 metres.
 - An above-ground water holding structure (including a swimming pool, spa or rainwater tank) engineered and designed to an Australian Standard with a capacity not exceeding 5,000 litres, and associated mechanical and safety equipment.
 - A landscaping water feature or other non-engineer designed or manufactured water retaining structure of less than 500 litres.
 - Roadworks carried out by or on behalf of the municipal council.
- To remove, destroy or lop vegetation that is:
 - Within 2 metres of an existing fence or 5 metres of an existing building.
 - Planted and is less than 10 years old.

- Dead, if the ground surface is reinstated.
- A weed listed in the Schedule to Clause 52.17.
- Required to be removed, destroyed, or lopped to the minimum extent necessary to enable the carrying out of conservation works undertaken by or on behalf of the public land manager, or where there is no relevant public land manager, by or on behalf of a minister, government department, public authority, or municipal council.
- To lop vegetation, for maintenance only, if no more than 1/3 of the foliage of each individual plant is lopped or pruned.
- To construct a building or construct or carry out works in accordance with a building permit issued on or before *[insert C314morn gazettal date]*.
- To remove, destroy or lop vegetation to the minimum extent necessary to enable the construction of a building or the construction or carrying out of works in accordance with a building permit issued on or before *[insert C314morn gazettal date]*.

4.0 Application requirements

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C314morn

The following application requirements apply to an application for a permit under Clause 44.01, in addition to those specified in Clause 44.01 and elsewhere in the scheme and must accompany an application, as appropriate, to the satisfaction of the responsible authority:

- Plans drawn to scale and dimensioned, including site layout and elevation plans, showing the existing conditions of the subject land, the relevant existing conditions of adjacent land, and the proposed development, including:
 - The topography of the land, including land contours, watercourses and drainage lines, and identified geotechnical hazards.
 - Buildings and structures.
 - Earthworks and earth retaining structures.
 - Driveways and access tracks.
 - Water holding structures and water infrastructure, including water supply, drainage and effluent disposal systems.
 - Vegetation, including the location, species, manner and extent of proposed removal, destruction or lopping, and the species, density, and location of proposed planting.
 - For subdivision applications, the proposed subdivision layout.
- The geotechnical documentation required by and prepared in accordance with the Incorporated Document '*Geotechnical Information Requirements for the Erosion Management Overlay, Schedule 7*' (Stantec and Mornington Peninsula Shire, July 2026)'.

If in the opinion of the responsible authority an application requirement is not relevant to the consideration or determination of an application, the responsible authority may waive or vary the requirement.

5.0 Decision guidelines

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C314morn

The following decision guidelines apply to an application for a permit under Clause 44.01, in addition to those specified in Clause 44.01 and elsewhere in the scheme which must be considered, as appropriate, by the responsible authority:

- The statement of risk.
- Whether development is designed and located in accordance with established principles of good hillside construction practice and is responsive to the landform and site conditions.

- For buildings and works, whether the application achieves a tolerable risk to human life and property.
- The recommendations of the geotechnical documentation required by the incorporated document '*Geotechnical Information Requirements for the Erosion Management Overlay, Schedule 7*' (Stantec and Mornington Peninsula Shire, July 2026)', and the recommendations of any peer review.
- Whether ongoing monitoring and maintenance of risk mitigation measures are required to achieve tolerable risk to human life and property for the life of the development.

6.0

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C314morn

Expiry

The requirements of this overlay cease to have effect after 3 November 2028.

Appendix E Incorporated Document



Mornington Peninsula Planning Scheme

Amendment C314morn

Incorporated Document

**Geotechnical Information Requirements for the Erosion Management Overlay,
Schedule 7**



July 2026

This document is an Incorporated document pursuant to section 6(2)(j) of the *Planning and Environment Act 1987*.

1. INTRODUCTION

This document is an incorporated document pursuant to section 6(2)(j) of the *Planning and Environment Act 1987* (the Act).

This document sets out the geotechnical information requirements for a planning permit application pursuant to Section 4.0 of Schedule 7 (Landslide susceptibility) to Clause 44.01 (Erosion Management Overlay) (EMO7) of the Mornington Peninsula Planning Scheme (the Scheme).

The geotechnical information required pursuant to Clause 5 of this incorporated document must be prepared by a Geotechnical Practitioner, being a qualified Geotechnical Engineer or Engineering Geologist who has experience in the management of slope stability problems and landslide risk management, is degree qualified, and who has current professional status as at least one of the following:

- Chartered Professional Engineer (CPEng).
- Registered Professional Engineer, Victoria (meaning a person who is registered under Part 2 of the *Victorian Professional Engineers Registration Act 2019*).
- Chartered Professional Geologist (CPGeo).
- Registered Professional Geologist (RPGeo)

In this document:

- A reference to works includes the removal, destruction, or lopping of vegetation.
- A reference to tolerable risk adopts the meaning set out in Section 2.0 of EMO7.

2. LAND DESCRIPTION

This document applies to all land affected by EMO7 in the Scheme.

3. PURPOSE

The purpose of this document is to set out the geotechnical information required to accompany an application in accordance with Section 6.0 of EMO7.

4. EXPIRY OF THIS SPECIFIC CONTROL

This document will cease to have effect after 3 November 2028.

5. GEOTECHNICAL INFORMATION REQUIREMENTS

Unless the requirements in Clause 5.1 are met, an application for the construction and carrying out of buildings and works, or for the subdivision of land, must be accompanied by a Geotechnical Assessment in accordance with Clause 5.2.

The Geotechnical Assessment analyses the geotechnical characteristics of land to determine whether landslide hazards are, or are likely to be, compatible with the safety of the proposed buildings and works or subdivision layout. The assessment may recommend that a permit be granted, subject to conditions ensuring that risk to life and risk to property are maintained within tolerable risk requirements.

If the Geotechnical Assessment concludes that an application for buildings and works is subject to significant landslide hazards, a Landslide Risk Assessment undertaken in accordance with Clause 5.3 is also required.

5.1 Waiving of Geotechnical Assessment

The responsible authority may waive the need for a Geotechnical Assessment if any of the following requirements are met:

- The applicant demonstrates, to the satisfaction of the responsible authority, that within 50 metres of the proposed buildings and works, the natural slope of the land does not exceed the maximum angle specified in the below table for the applicable geology:

Geology	Maximum slope
Balcombe Clay, Baxter Sandstone, Older Volcanics, Siltstone Soils	8°
Devonian Granite, Quaternary Sands	14°

- The applicant submits a statement from a Geotechnical Practitioner demonstrating the following, together with a Geotechnical Declaration – Minor Impact (Form D):
 - There are no credible landslide hazards that could affect the proposed development.
 - The site has not previously been affected by landslide.

5.2 Geotechnical Assessment

A Geotechnical Assessment identifies a site's geotechnical characteristics and landslide hazards. It determines whether the proposed buildings and works or subdivision layout are suitable (with or without mitigation measures) or, for buildings and works applications only, if further investigation and risk assessment are required. A Geotechnical Assessment must have regard to the methodology outlined in *Practice Note Guidelines for Landslide Risk Management* (AGS 2007c) and include the following information:

- **Scope and purpose:** an outline of the scope and purpose of the Geotechnical Assessment, including whether the purpose of the assessment is for buildings and works, subdivision, or both.
- **Geotechnical Practitioner details:** including name, qualifications, professional experience, including relevant experience in the management of slope stability and landslide risk management.

- **Site and proposed development description:** a comprehensive description of the physical characteristics of the site together with a description of the location and details of the proposed development.
- **Desktop assessment:** a review and summary of relevant available geotechnical data, including a record of data sources and a review of any available landslide inventory map with details of relevant landslide events including classification, location, volume, and the limitations of the landslide inventory.
- **Site inspection and fieldwork:** including photography, field mapping of geomorphic features, assessment of subsurface conditions and underlying geology, and discussion of the geotechnical model and geomorphic processes. Where relevant, land adjacent to the site should also be inspected and mapped. A statement must be included verifying that all field survey measurements were undertaken no more than 12 months prior to the lodgement of the planning permit application.
- **Plans and cross-sections:** a review of development plans including site layout plans, subdivision layout plans (as appropriate), and elevations and cross-sections of the subject land and surrounding land (as relevant) for the areas potentially subject to landslide hazards. Site plans and elevations must be based on field measurements, with measured ground slopes drawn to scale and dimensioned.
- **Hazard and risk commentary:** an analysis indicating whether there are natural slopes on or immediately adjacent to the subject land which exhibit evidence of landslide potential or a past landslide event, together with general commentary regarding the likely frequency and consequences of the identified landslide hazards, and the implications for likely levels of risk to life and risk to property. The analysis must consider potential adverse impacts to land adjacent to the subject land as relevant.
- **For applications for buildings and works:**
 - A completed **Geotechnical Declaration and Verification – Development Application (Form A)**.
 - **Significant hazard statement:** indicating whether in the opinion of the Geotechnical Practitioner the proposed buildings and works:
 - Will be subject to significant landslide hazard such that a Landslide Risk Assessment is required (as set out in Clause 5.3) to ensure tolerable landslide risk requirements are met; or
 - Will not be subject to significant landslide hazard for the design life of the development such that a Landslide Risk Assessment is not required, and tolerable landslide risk requirements are deemed to be met or are deemed met subject to recommended development conditions.
 - **Recommended conditions statement** (deferred to a Landslide Risk Assessment if required): listing any conditions necessary to ensure that the development achieves tolerable risk requirements, including reducing landslide risk exposure where practicable, including, as relevant, conditions related to:

- The location of buildings and works to avoid landslide hazards.
 - The details of recommended building footing types, base levels, and foundation materials for structural works.
 - The location, maximum depth, and structural retention methods for all soil and rock cuts and fills.
 - The location, design, and discharge points of water infrastructure including surface and subsurface drainage, stormwater and effluent disposal systems.
 - The removal, retention, and planting of vegetation.
 - The ongoing monitoring and maintenance of risk mitigation measures, including periodic inspections and review of structural performance measures (if necessary).
 - The integration of geotechnical inspections or investigations (including subsurface or intrusive geotechnical investigations, if necessary) and practitioner verifications into the Construction Management Plan prior to the commencement of any construction or carrying out of works.
 - Any other measures deemed necessary by the Geotechnical Practitioner.
- **For applications for subdivision:**
 - A completed **Geotechnical Declaration and Verification – Subdivision (Form C)**.
 - **Suitability statement and map:** indicating which areas of the subdivision and proposed lots are, in the opinion of the Geotechnical Practitioner:
 - Suitable for future development and not exposed to landslide hazards requiring mitigation measures.
 - Suitable for future development subject to conditions to mitigate landslide hazards.
 - Generally not suitable for future development without significant mitigation measures due to exposure to substantial landslide hazards.
 - **Recommended conditions statement:** listing any conditions necessary to ensure that the subdivision layout, access, infrastructure, and location of future buildings and works minimize landslide hazard exposure to as low as reasonably practicable.

5.3 Landslide Risk Assessment

A Landslide Risk Assessment assesses and quantifies the risk to life and risk to property for a development exposed to significant landslide hazards, and determines whether the proposed development achieves tolerable risk requirements. It must be carried out in accordance with the methodology in *Practice Note Guidelines for Landslide Risk Management* (AGS, 2007c) and include the following information:

- A completed **Geotechnical Declaration and Verification – Development Application (Form A)**.
- **Geotechnical Assessment review:** if the Landslide Risk Assessment is prepared by a different Geotechnical Practitioner, it must review the Geotechnical Assessment and:
 - If the findings and conclusions of the Geotechnical Assessment are supported, submit a statement agreeing with the findings of the Geotechnical Assessment; or
 - If the findings and conclusions are not supported, prepare an additional Geotechnical Assessment in accordance with Clause 5.2.
- **Incorporation of Geotechnical Assessment:** if the Landslide Risk Assessment is prepared by the same Geotechnical Practitioner, the Landslide Risk Assessment must incorporate the Geotechnical Assessment including all relevant items at Clause 5.2.
- **Further site inspection and fieldwork:** discussion of any supplementary site inspections and fieldwork used to confirm or update the geotechnical model following the Geotechnical Assessment for the purposes of the Landslide Risk Assessment. A statement must be included verifying that all field survey measurements were undertaken no more than 12 months prior to the lodgement of the planning permit application.
- **Risk assessment and quantification:** a full assessment of the risk posed by all identified landslide, debris flow and slope degradation hazards which could impact or be caused by the new development (including vegetation removal and potential vegetation able to be removed without a planning permit pursuant to Clause 52.12 of the Mornington Peninsula Planning Scheme) and which have the potential to either individually or cumulatively impact risk to life and risk to property.
- **Tolerable risk statement:** indicating whether in the opinion of the Geotechnical Practitioner, the proposed development can be undertaken and maintained throughout its design life such that the risk to life and property remains within tolerable levels, including reducing landslide risk exposure where reasonably practicable.
- **Recommended conditions statement:** listing any conditions necessary to ensure that the development's exposure to landslide risk is reduced to achieve tolerable risk requirements and reduce landslide risk exposure where reasonably practicable, including, as relevant, conditions related to:
 - The items listed under the requirement for a Recommended conditions statement at Clause 5.2, including specific consideration of the need for conditions related to:
 - The ongoing monitoring and maintenance of risk mitigation measures, including periodic inspections and review of structural performance measures.
 - The integration of geotechnical inspections or investigations (including subsurface or intrusive geotechnical investigations, if necessary) to inform the detailed engineering and design of the buildings and works, together with practitioner verifications into a Construction Management Plan prior to the commencement of any construction or carrying out of works.

- **Subsurface and intrusive geotechnical investigations:** where the risk assessment and quantification returns a result that indicates that the development is:
 - subject to landslide risk that is not tolerable, and
 - the Geotechnical Practitioner is unable to recommend conditions that enable the development to achieve tolerable risk requirements,

subsurface and intrusive geotechnical investigations must be carried out to inform the engineering and construction methodologies and any other mitigation measure necessary to achieve tolerable risk and minimise landslide risk where reasonably practicable. Subsurface and intrusive investigations may include boreholes, test pits, groundwater monitoring, laboratory testing or other forms of geotechnical modelling.

The findings of subsurface or intrusive geotechnical investigations must be integrated into an updated risk assessment and quantification, tolerable risk statement, and recommended conditions statement.

Subsurface and intrusive investigations are only required prior to the determination of an application where tolerable risk requirements cannot be demonstrated through non-intrusive methods, or may be undertaken at the discretion of the Geotechnical Practitioner at any time to support the application.

6. INDEPENDENT PEER REVIEW

The responsible authority may require the applicant to submit an independent peer review of any geotechnical information required by this incorporated document, which must be prepared by a third-party Geotechnical Practitioner.

The responsible authority may specify the scope of the peer review or may require that all geotechnical information is peer-reviewed.

7. REFERENCES

- *Landslide Risk Management Framework for Australia* (2007, as contained within the Journal and News of the Australian Geomechanics Society, volume 24, issue 1), incorporating the following:

Guideline Title	Abbreviated Title	Reference	Intended Users
"Guideline for landslide susceptibility, hazard and risk zoning for land use planning", <i>Australian Geomechanics</i> , Vol 42 No 1, March 2007.	Landslide Zoning Guideline	AGS (2007a)	Regulators, Geotechnical Practitioners
"Commentary on guideline for landslide susceptibility, hazard and risk zoning for land use planning", <i>Australian Geomechanics</i> , Vol 42 No 1, March 2007.	Commentary on Landslide Zoning Guideline	AGS (2007b)	As above
"Practice Note guidelines for landslide risk management", <i>Australian Geomechanics</i> , Vol 42 No 1, March 2007.	Practice Note 2007	AGS (2007c)	Geotechnical Practitioners, Regulators
"Commentary on Practice Note guidelines for landslide risk management", <i>Australian Geomechanics</i> , Vol 42 No 1, March 2007.	Practice Note Commentary	AGS (2007d)	As above
"Australian GeoGuides for slope management and maintenance", <i>Australian Geomechanics</i> , Vol 42 No 1, March 2007.	Australian GeoGuides	AGS (2007e).	General Public, Regulators, Geotechnical Practitioners

- *Landslide Susceptibility Assessment: Stage 2: Mornington Peninsula Shire* (Cardno Lane Piper, 2012)

Appendix F C312morn to Refined EMO Schedule tracked changes with explanatory comments



~~Interim control, Expires: 03/11/2028~~
C314morn

SCHEDULE 7 TO CLAUSE 44.01 EROSION MANAGEMENT OVERLAY

Shown on the planning scheme map as **EMO7**.

~~HIGH LANDSLIDE SUSCEPTIBILITY AREAS~~

1.0

Erosion management objectives to be achieved

~~Interim control, Expires: 03/11/2028~~
C314morn

To ensure that development achieves tolerable landslide risk to human life and property.

To ensure that development is designed ~~and located~~ in accordance with established principles of good hillside construction practice and is responsive to the landform and site conditions.

~~To avoid development in areas that cannot achieve tolerable landslide risk.~~

2.0

Statement of risk

~~Interim control, Expires: 03/11/2028~~
C314morn

~~This schedule applies to land within~~ Mornington Peninsula's areas of highest susceptibility Peninsula that has been identified as being susceptible to landslide. ~~These areas~~ have been identified through an assessment of underlying geologies, slope gradient, slope aspect, and the characteristics of historical landslide events.

The occurrence of landslides on the Mornington Peninsula has caused damage to property and the environment and landslides present an ongoing risk to human life. Geotechnical studies have documented historical landslide occurrences and seek to identify areas susceptible to future landslide occurrence.

The control of environmental factors and development, including vegetation cover, drainage, earthworks, soil disturbance, and effluent and stormwater disposal, are all important in managing the risk from landslide.

~~Tolerable Landslide risk is a range that society can live with so as to secure certain net benefits. It is a range of risk regarded as non-negligible assessed and needing to be kept under review and reduced further if possible, quantified~~ in accordance with *Practice Note Guidelines for Landslide Risk Management* (Australian Geomechanics Society, 2007e2007). Maximum tolerable risk for new development is defined as:

- ~~For loss of life, having a probability no greater than not exceeding~~ 10⁻⁵ (1 in 100,000) per annum year.
- For risk to property, tolerable risk is measured qualitatively as not exceeding:
 - Low-risk, for ~~development associated with~~ essential service facilities including hospitals, medical centres, and emergency service facilities, and for land capable of causing hazardous conditions including earth and energy resources, freezing and cool storage and fuel depots.
 - Moderate-risk, for ~~development associated with~~ all other land uses including residential land uses.

~~Principles of good hillside construction practice that are used to achieve tolerable risk are established in Landslide Risk Management (Australian Geomechanics Society, 2007).~~

3.0

Permit requirement

~~Interim control, Expires: 03/11/2028~~
C314morn

A permit is required to:

~~Construct a building or construct or carry out works for:~~

- ~~specified in Clause 62.02-2 (Buildings and works associated with a moveable unit as defined in the Housing Act 1983, carried out by or on behalf of the Chief Executive Officer, Homes Victoria.~~
- ~~A deck to a dwelling or small second dwelling with a finished floor level not more than 800 mm above ground level.~~

Commented [A1]: "High" deleted because the EMO7 is now a binary yes/no, in/out planning control. The Cardno report operated in the basis that "high" captured land within the upper third of landslide susceptibility scoring, and "medium" the middle third.

The revised EMO7 splits the difference and captures land in the upper half of landslide susceptibility scoring (in accordance with the Cardno 2012 methodology – that is, having a susceptibility score of 15/30).

Therefore, for planning purposes, land can either be considered as susceptibility to landslide, or not, and the use of the word "high" becomes unnecessary or redundant.

"Areas" is deleted because it is also redundant. The EMO7 is a spatial planning control that inherently applies to the areas it encumbers.

Commented [A2]: The addition of "and located" allows for consideration of the location of buildings and works, or layout of subdivision, to avoid development in unreasonably risky areas.

Commented [A3]: This is the inverse of the first objective and therefore redundant.

Commented [A4]: Grammatical tidying and removal of reference to "high".

Commented [A5]: Deletes the importation of the broadest definition of "tolerable risk" from AGS2007, which proved to be confusing and unnecessary, as our actual, adopted definition of maximum tolerable risk is provided below.

Commented [A6]: Consistent use of words (exceed(s)) and plain English.

Commented [A7]: Clarification that we are assessing against development not land use.

Commented [A8]: Definition of tolerable risk is kept in the schedule, as opposed to the proposed Incorporated Document, to be consistent with the recommended approach of AGS Guidelines.

Commented [A9]: AGS 2007 is now referenced within the incorporated document.

Commented [A10]: Addition of capture all reference to Clause 62.02, where such buildings and works do the things listed below that can result in landslide risk (build over certain size, carry out earthworks, or result in groundwater infiltration).

Commented [A11]: These are now captured with the new reference to 62.02 as above.

- A rainwater tank with a capacity of not more than 10,000 litres.

A permit is not required for the following:

- To construct or carry out works if the works:
 - are entirely contained on a slope not exceeding 17°; and
 - do not exceed 0.6 metres of excavation or fill below or above natural ground level.
- To construct other than an internal rearrangement of a building or construct or carry out works for a repairs and routine maintenance to an existing building or structure not used for accommodation and ancillary to a dwelling, if:
 - the works, if the building or structure does not exceed 10 works do any of the following:
 - Exceed a floor area or works area of 20 square metres.
 - Include earthworks where the depth of excavation, height of floor area, and fill, or combination of both, exceeds 1 metre within a horizontal distance of 5 metres.
 - no excavation is required (Propose or require discharge of stormwater via an on-site absorption, detention, or ground infiltration system).
 - Construct a fence if the fence does any of the following:
 - Exceeds 1 metre in height and is constructed of masonry or concrete.
 - Obstructs or redirects the flow of surface water, including by being constructed with a continuous impermeable base.
 - Construct a rainwater tank.

A permit is not required for the following:

- To construct thea building or structure's foundations); construct or carry out works for:
 - A new building not used for accommodation, if all of the following are met:
 - The floor area of the building does not exceed 20 square metres.
 - The depth of excavation, height of fill, or combination of both, does not exceed 1 metre within a horizontal distance of 5 metres.
 - The building is located more than 5 metres from existing earthworks where the depth of excavation, height of fill, or combination of both exceeds 1 metre at any point within a horizontal distance of 5 metres.
 - The building is connected to a legal point of discharge and stormwater is not discharged via an on-site absorption, detention, or ground infiltration system.
 - The building is constructed with frames, walls and roof of aluminium, steel or timber.
 - An alteration or extension to an existing building, if all of the development would result in following are met:
 - The floor area of the alteration or extension does not more than two such buildings or exceed 20 square metres.
 - The depth of excavation, height of fill, or combination of both, does not exceed 1 metre within a horizontal distance of 5 metres.
 - The alteration or extension is located more than 5 metres from existing earthworks where the depth of excavation, height of

Commented [A12]: Internal re-arrangement and routine repairs and maintenance are the only necessary items to carve out from the 62.02 lead-in reference.

Commented [A13]: Per the geotechnical advice, these three types of things will capture development that may increase landslide risk. This wording of this logic follows through consistently for the permit exemptions as below.

Commented [A14]: A fence is a special case that wouldn't likely be captured by the above 62.02 reference, hence it requires its own permit trigger.

Commented [A15]: Consistent with Yarra Ranges permit trigger – any tall, heavy fence is a potential risk to life in a landslide susceptible area.

Commented [A16]: Can lead to increased groundwater infiltration, loosening slopes, or otherwise lead to erosion or soil instability.

Commented [A17]: Similar to above, rainwater tank is listed in 62.02-2 but might not trigger under the listed requirements, and requires its own specific trigger. Exemptions follow under the following section.

Commented [A18]: The building must do all these things (avoiding increasing landslide risk via size, depth of development, or changes to groundwater infiltration).

Commented [A19]: The building must be lightweight – heavy structures increase risk to life.

Commented [A20]: Same logic as above.

fill, or combination of both exceeds 1 metre at any point within a horizontal distance of 5 metres.

- The alteration or extension is connected to a legal point of discharge and stormwater is not discharged via an on-site absorption, detention, or ground infiltration system.
- Earthworks (including any associated earth retaining structures ~~on~~), if all of the ~~lot~~ following are met:
 - The works do not exceed an area of 20 square metres.
 - The depth of excavation, height of fill, or combination of both, do not exceed 1 metre within a horizontal distance of 5 metres.
- An above ground water holding structure (including a swimming pool, spa or rainwater tank) engineered and designed to an Australian Standard with a capacity not exceeding 5,000 litres, and associated mechanical safety equipment.
- A landscaping water feature or other non-engineer designed or manufactured water retaining structure of less than 500 litres.
- Roadworks carried out by or on behalf of the municipal council.
- The removal, destruction, or lopping of To remove, destroy or lop vegetation that is:
 - Within 2 metres of an existing fence or 5 metres of an existing building.
 - Planted and is less than 10 years old.
 - Dead, if the ground surface is reinstated.
 - A weed listed in the schedule to Clause 52.17 (Native vegetation).
 - Required to be removed, destroyed, or lopped to the minimum extent necessary to enable the carrying out of conservation works undertaken by or on behalf of the public land manager, or where there is no relevant public land manager, by or on behalf of a minister, government department, public authority, or municipal council.
- To lop vegetation, for maintenance only, if no more than 1/3 of the foliage of each individual plant is lopped or pruned.
- To construct a building or construct or carry out works in accordance with a building permit issued on or before [insert C314morn gazettal date].
- To remove, destroy or lop vegetation to the minimum extent necessary to enable the construction of a building or the construction or carrying out of works in accordance with a building permit issued on or before [insert C314morn gazettal date].

Commented [A21]: Same logic as above.

Commented [A22]: Reasonable to be able to remove vegetation around existing buildings and fences to allow for their use and maintenance.

Commented [A23]: This can be conceived as an extension of garden maintenance.

Commented [A24]:

Commented [A25]: Incorporation of Transitional Provisions request

4.0

Application requirements

The following application requirements apply to an application for a permit under Clause 44.01, in addition to those specified in Clause 44.01 and elsewhere in the scheme and must accompany an application, as appropriate, to the satisfaction of the responsible authority:

- Plans drawn to scale and dimensioned, including ~~a site plan, elevations, and land contours as appropriate, and showing~~ site layout and elevation plans, showing the existing conditions of the subject land, the relevant existing conditions of adjacent land, and the proposed development for the following:
 - ~~Any proposed new and existing development on~~ The topography of the subject lot(s), ~~land, including buildings and structures, accessways, water tanks and pools or dams, land contours, watercourses and drainage systems, effluent disposal systems, earthworks, retaining walls, cut and fill, and any other lines, and identified geotechnical hazards,~~
 - ~~Any existing development on adjacent lots~~ Buildings and structures.

Commented [A26]: I recommend reviewing this without track changes and reviewing against existing EMO7 for clarity.

The previous drafting was inconsistent and poorly grouped.

The revised drafting is better structured with improved readability, less redundancy, and it also captures a little more information that may be relevant to the consideration of an application.

- Earthworks and earth retaining structures.
 - Driveways and access tracks.
 - Water holding structures and water infrastructure, including buildings, water tanks and pools or dams, supply, drainage and any other identified geotechnical hazard, effluent disposal systems.
 - Details Vegetation, including the location, species, manner and locations extent of existing vegetation removal, destruction or lopping, and any the species, density, and location of proposed vegetation removal, planting.
 - Any For subdivision applications, the proposed subdivision layout.
- A Landslide Risk Assessment report. The report must:
 - Be The geotechnical documentation required by and prepared in accordance with Part C Guidelines the Incorporated Document 'Geotechnical Information Requirements for the Erosion Management Overlay, Schedule 7 (Stantec and Mornington Peninsula Shire, July 2026) for Practitioners of Practice Note Guidelines for Landslide Risk Management (AGS 2007c).
 - Be prepared by a suitably qualified geotechnical practitioner, meaning a specialist Geotechnical Engineer or Engineering Geologist who is degree qualified, is a member of a professional institute, and who has achieved chartered professional status as a:
 - Chartered Professional Engineer (CPEng); or
 - Registered Professional Engineer, Victoria (meaning a person who is registered under Part 2 of the Victorian Professional Engineers Registration Act 2019); or
 - Chartered Professional Geologist (CPGeo); or
 - Registered Professional Geologist (RPGeo);with experience in the management of slope stability, to the satisfaction of the responsible authority.
 - Be accompanied by a completed Form A Geotechnical Declaration and Verification (Appendix D of Practice Note Guidelines for Landslide Risk Management).
 - Incorporate and respond to the recommendations of the peer review.
 - An independent peer review of the Landslide Risk Assessment report, prepared by a suitably qualified geotechnical practitioner.
 - If, in the opinion of the geotechnical practitioner and the responsible authority, the proposed buildings and works are minor and create minimal or no geotechnical risk:
 - a completed Form D Geotechnical Declaration Minor Impact (Appendix D of Practice Note Guidelines for Landslide Risk Management) may be submitted instead of a Landslide Risk Assessment report.

If, in the opinion of the responsible authority, an application requirement is not relevant to the assessment consideration or determination of an application, the responsible authority may waive or vary the application requirements requirement.

Commented [A27]: This content, requiring specific geotechnical information, is entirely moved to the incorporated document.

Commented [A28]: Use of language from the Act and VPPs.

5.0

Decision guidelines

~~Interim control~~
C314morn

Interim control
Expires:
03/11/2028

The following decision guidelines apply to an application for a permit under Clause 44.01, in addition to those specified in Clause 44.01 and elsewhere in the scheme which must be considered, as appropriate, by the responsible authority:

- The statement of risk.
- Whether development is designed and located in accordance with established principles of good hillside construction practice and is responsive to the landform and site conditions.
- For buildings and works, whether the application achieves a tolerable risk to human life and property ~~is tolerable~~.
- The recommendations of the ~~Landslide Risk~~ geotechnical documentation required by the incorporated document 'Geotechnical Information Requirements for the Erosion Management Overlay, Schedule 7 (Stantec and Mornington Peninsula Shire, July 2026) ~~Assessment report and~~, and the recommendations of any peer review.
- ~~The need for~~ Whether any ongoing monitoring and maintenance ~~for~~ of risk mitigation measures are required to achieve tolerable risk to human life and property for the life of the development.
- ~~Landslide Risk Management (Australian Geomechanics Society, 2007).~~

Commented [A29]: Without this decision guideline, the decision maker can only require a development to meet tolerable risk requirements.

However, the addition of this decision guideline allows the decision maker to pursue the "As Low As Reasonably Practical" (ALARP) principle – that is, if there is an "easy" and practical "win" to be had to further reduce landslide risks/hazards, the decision maker can more easily compel the permit applicant to not be "lazy" and only meet the minimum requirement.

ALARP is discussed and encouraged in AGS2007.

Commented [A30]: Subdivision applications do not (necessarily) involve buildings and works. Because there is no buildings and works, it isn't always possible to measure "risk" which requires assessment of the hazard exposure to buildings.

That is, the "tolerable risk" framework is actually not applicable to subdivision applications. This is another reason why the above decision guideline is necessary.

Commented [A31]: The previous wording was somewhat unclear. The revised wording is worded properly as a test ("whether") and indicates why monitoring and maintenance may be required. It gives weight to permit conditions or section 173 agreements for the ongoing maintenance and reduction of landslide risk.

Commented [A32]: Cannot include references as decision guidelines per the Practitioner's Guide.

6.0

Expiry

~~Interim control~~
C314morn

Interim control
Expires:
03/11/2028

The requirements of this overlay cease to have effect after ~~12/2027~~ 3 November 2028.

Appendix G Limitations of Report



LIMITATIONS OF GEOTECHNICAL REPORTS

The purpose of this report is to provide a geotechnical assessment of the sites examined. The information provided herein will reduce the exposure to risks, but no geotechnical assessment can eliminate them. Nonetheless, even a rigorous assessment may fail to detect all of the geotechnical conditions on a site. Site variations may have occurred in areas not investigated or sampled.

This geotechnical report should not be used when the nature of the proposed site usage changes, when the size, layout, or location of the development is modified, when the site ownership changes nor should it be applied to a nearby area. No environmental assessment has been undertaken nor is implied.

This site geotechnical assessment identifies actual subsurface conditions where the samples were taken and at the time they were taken. The laboratory tests are carried out by external NATA accredited laboratories and any liability with regards to the testing is solely this laboratory's responsibility. Geotechnical engineers then interpreted the laboratory results and field data and rendered an opinion about the overall subsurface conditions, including the soil type, extent of the soil layers, and their likely impact on the proposed development, with a discussion of the implications considered likely. The actual conditions may differ from the inferred conditions, as no person (no matter how qualified) or even the most detailed subsurface investigation can predict with confidence what may be hidden by soil or water or may have altered with time. Often the interface between different geotechnical areas may be more abrupt or gradual than anticipated. The actual conditions in an area may differ from those predicted.

Site assessments are limited by time, and natural processes such as erosion, or mankind altering the ground conditions, including the site levels or filled areas, may affect a site assessment. This geotechnical assessment is prepared in response to a client's specific requirements. No person other than the client should apply the report without first conferring with Stantec.

Costly problems can occur if the report is misinterpreted. To avoid these problems, Stantec should be retained to work with the appropriate design professionals and to review the adequacy of their plans and specifications relative to the geotechnical matters.

This report should only be reproduced in its entirety. Reproduction of borehole or testpit logs alone without the entire report should not be permitted. Redrafting of the borehole or testpit logs for inclusion in drawings or other reports should not be allowed as errors in the drafting can occur. It is recommended that the report be made available in entirety to persons and organisations involved in the project such as contractors. Simply disclaiming responsibility for the accuracy of the subsurface or geotechnical information does not insulate the organisation from liability. The more information a contractor has available to him, the better able he is to avoid costly construction problems and costly adversarial situations.

Finally, geotechnical reports are based extensively on opinion and judgment and are less exact than other sciences. The report may contain a number of explanatory clauses or limitations on the results to inform the client about the restrictions of the report. These clauses are not meant to be exculpatory clauses to foist liability onto another person, but to identify where Stantec's and the client's responsibilities start and finish. Their use is to clarify where individual responsibilities lie and to allow the individual to take appropriate actions.



Stantec is a global leader in sustainable engineering, architecture, and environmental consulting. The diverse perspectives of our partners and interested parties drive us to think beyond what's previously been done on critical issues like climate change, digital transformation, and future-proofing our cities and infrastructure. We innovate at the intersection of community, creativity, and client relationships to advance communities everywhere, so that together we can redefine what's possible.

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