NOTICE OF AN APPLICATION FOR PLANNING PERMIT

Form 2

The land affected by the application is located at:	**7 Keys Court WY YUNG VIC 3875 Lot: 4 PS: 840690**
The application is for a permit to:	**Six Lot Subdivision, Removal of Native Vegetation and Roadworks**
A permit is required under the following clauses of the planning scheme:	
Planning Scheme Clause	**Matter for which a permit is required**
32.03-3 (LDRZ)	Subdivide land
44.01-2 (EMO)	Carry out works (roadfworks)
44.01-3 (EMO)	Remove, destroy or lop any vegetation
44.01-5 (EMO)	Subdivide land
52.17-1	Remove, destroy or lop native vegetation, including dead native vegetation
The applicant for the permit is:	**Beveridge Williams & Co Pty Ltd**
The application reference number is:	**5.2025.170.1**

You may look at the application and any documents that support the application free of charge at: https://www.eastgippsland.vic.gov.au/building-and-development/advertised-planning-permit-applications

You may also call 5153 9500 to arrange a time to look at the application and any documents that support the application at the office of the responsible authority, East Gippsland Shire. This can be done during office hours and is free of charge.

Any person who may be affected by the granting of the permit may object or make other submissions to the responsible authority.

An objection must

- **be made to the Responsible Authority in writing,**
- **include the reasons for the objection, and**
- **state how the objector would be affected.**

The responsible authority must make a copy of every objection available at its office for any person to inspect during office hours free of charge until the end of the period during which an application may be made for review of a decision on the application.

The Responsible Authority will not decide on the application before:	**Subject to the applicant giving notice**

If you object, the Responsible Authority will tell you its decision.

strata
geoscience and environmental

Erosion, Slope and General Geotechnical Risk Assessment and Management Strategies- 6 Lot Residential Subdivision

7 Keys Court Wy Yung

Important Notes:

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Strata Geoscience and Environmental reserves the right to submit this report the relevant regulatory agencies where it has a responsibility to do so.

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Abstract

. contracted Strata Geoscience and Environmental Pty Ltd to perform an erosion, slope stability and general geotechnical risk assessment and management strategies report of proposed development areas underlying 7 Keys Court Wy Yung. The proponent is proposing a 6 lot residential subdivision (see Appendix 1) in an area identified as a having a planning overlay for erosion.

Geotechnical reconnaissance of the proposed development area comprised field observation of geomorphic, soil and water factors associated with dispersive or aeolian derived soils as well as limited field and laboratory testing of soils recovered from geotechnical bores.

The investigation found little evidence of soil erosion or tunnelling save for that created by wombat burrows. Variable soil and geomorphic conditions exist over the site, namely a variable veneer of SANDS (SW/SP/SM) overlying deeper Clayey SANDS (SC) which sometimes transitioned to Sandy CLAYS (CL), with bores generally not terminating in refusal to a maximum depth of 1.5m.

Given this reconnaissance, there are two main regionally extensive soil types identified at the Site being Munro (deep sand - Podosol) and Stockdale (sand over clay – Sodosol/Chromosol).

A risk assessment for slope instability and erosion of soils over the proposed development areas has found:

- Sodic soil phases are likely to exist over the site associated with some subsoils of the Stockdale unit. The presence and severity of these sodic phases are likely to vary significantly. Such soils have the potential to cause tunnel and gully erosion and require management with increasing site development.
- Loose sandy topsoils of both soil units are susceptible to sheet and rill erosion from wind and water.

- **The risk associated with site development creating soil erosion is high and treatment measures MUST be adopted to limit this risk to life and property.**
- **The risk of creating slope instability over the site given the current development plans is low and should be accepted provided all treatment recommendations are adopted.**
- **Burrows are evident and should be infilled with burrowing animals removed.**
- **All areas affected by burrowing must be quarantined from development.**
- **Further geotechnical assessment of these areas required when areas have been remediated.**

Further qualitative geotechnical risk assessment has found potential risks associated with:

- Soil Reactivity
- Drainage
- Subsidence/Differential Settlement
- Uncontrolled fill
- Existing dam/wetlands/swamps
- Impacting Vegetation
- Burrows/Sinkholes
- Excavation and Fill
- Aggressive Soil
- Acid Sulphate Soils
- Collapsible Soils
- Disturbed Areas

It is noteworthy that qualitative testing of soils at the subdivisional/lot development stage will allow for accurate assessment and targeting of treatments as appropriate. Generic treatment measures to limit risk are detailed in Sections 4 and 5.

1. Introduction

1.1 Site Location and Context

The proposed development area is located at 7 Keys Court Wy Yung.

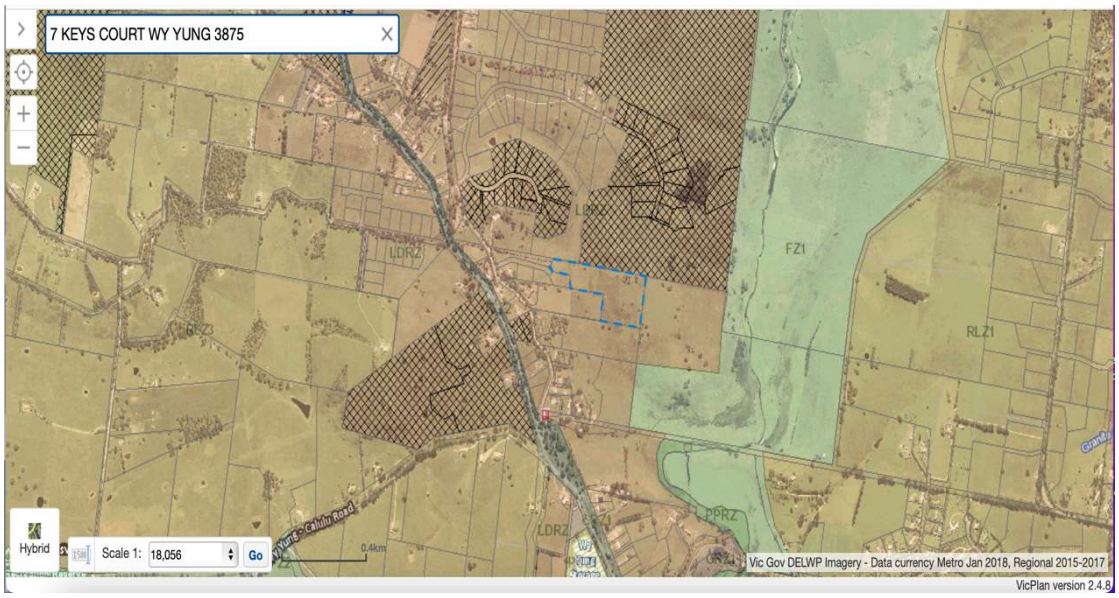


Figure 1 Site Location

1.2 Scope of Work

It is the scope of this investigation to perform a risk assessment for the potential to create soil erosion or slope instability given the current development proposal (see Appendix 1). The scope has been determined in consultation with the proponent and is subject to temporal and budgetary considerations. This investigation will inform further sampling and analysis as well as the preparation of site-specific management plans if warranted.

1.3 Guidelines and Standards Referenced

This investigation is made with reference to, or in general accordance with, the following standards and guidelines:

- Standards Australia (1993) AS1726-1993 Geotechnical Site Investigations
- Standards Australia (2004) AS/NZS4360 - Risk Management
- Standards Australia (1997) AS3798 “Guidelines for Earthworks on commercial and residential subdivision”
- Australian Geomechanics Society (2007) Landslide Risk Management. Australian Geomechanics 42(1) March 2007.

2. Desktop Review and Site Investigation

2.1 Mapped Surface Geology and Geomorphology

Referring to the Geoscience Australia 1:250000 Bairnsdale Sheet, the site is situated on undulating slopes underlain by Tertiary fluvial gravels, sands and clays which have been incised by localised drainage lines to create newer Quaternary aged alluvial/fluvial deposits. The site occupies a mid-slope position in the localised landscape between the ocean and main ranges with slight to steep slopes surrounding the proposed development areas.

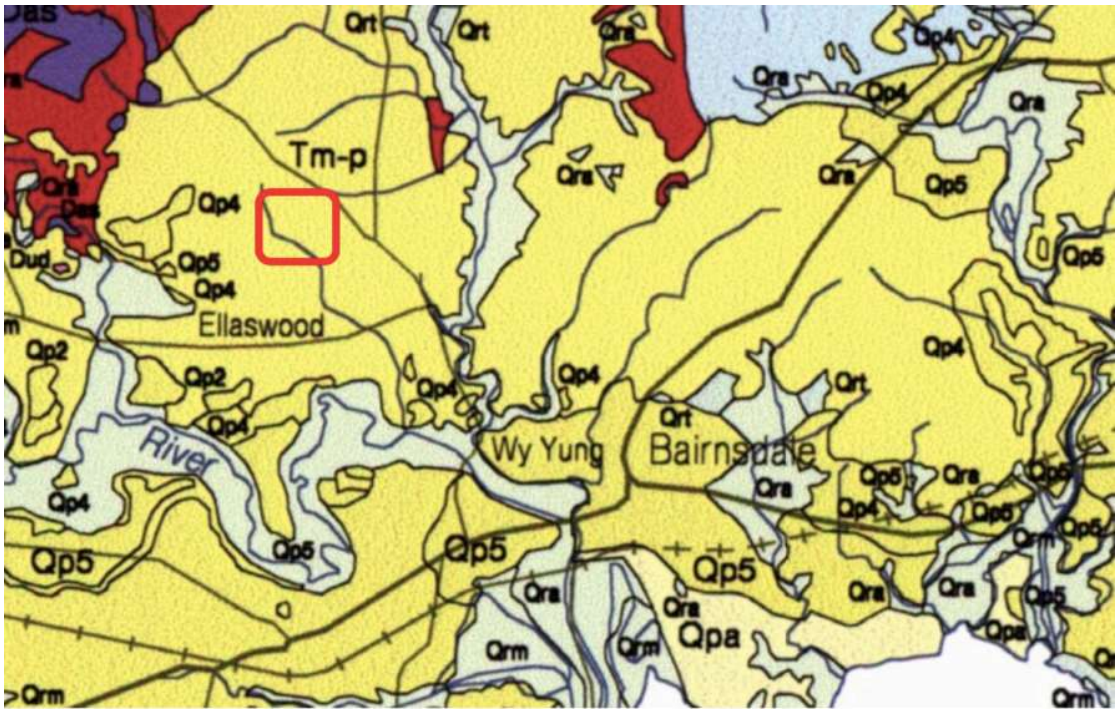


Figure 2 Geoscience Australia 1:250000 Bairnsdale Geological Map

2.2 Soils and Soil Mapping

The following is Taken from Doyle, 2019:

"There are two main regionally extensive soil types at the Site being Munro (deep sand - Podosol) and Stockdale (sand over clay – Sodosol/Chromosol).

The dominant soil types in the southern part of the Site are deep sandy soils (Podosols) of the Munro soil type. This soil is a moderately deep sandy to clayey sand soil derived from windblown and slope deposited sands and fine gravels with either or both accumulations of iron oxides and organic matter in the sandy subsoils (known as Podosols).

In the mid and northern parts of the Site, a texture-contrast soil (sandy above clayey sediments) formed from windblown sands over yellowish brown to reddish brown blocky structured clays to sandy clays are found. These have been described and mapped by the state government in the region as Stockdale soil type.

The Stockdale soil is typically a Subnatric Brown Sodosol or a Magnesic Brown Chromosol/Kurosol. These texture-contrast soils have sandy upper profiles over a sharp change to structured clayey subsoil profiles (clays at <50 cm from surface). The Stockdale Soil occurs on the elevated flat-topped ridgeline (old/elevated river terrace surface) and a lower terrace and the rolling slopes both above and below these flatter terrace remnants. Some stone-lines (concentrations of gravels and/or stones) occur in the texture-contrast soils at the sand – clay boundary."

The basic soil type distribution of Stockdale and Munro soils is shown in a Soil Map overlay in Figure 3 below and risk assessments for each soil type are presented in Section 3.4

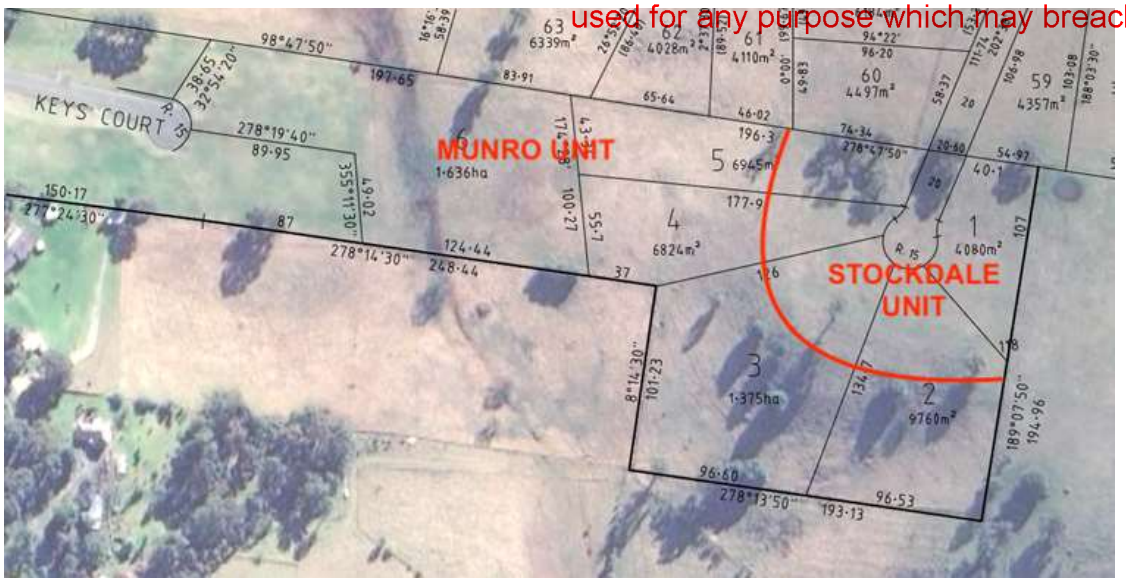


Figure 3 Soil Mapping Units Munro unit, clear represents Stockdale unit. Follows nomenclature and mapping of Doyle 2019.

2.3 Conceptual Site Hydrogeology

Whilst site specific hydro-geological modelling has not been conducted and no site specific data is available, it is likely that a shallow unconfined groundwater aquifer exists under the site in unconsolidated fluvial/alluvial sediments. Base flows for localised drainage lines are likely supplied by this shallow ephemeral unconfined aquifer moving through or over subsoils. Localised groundwater is therefore likely moving in a easterly direction. At the time of this investigation this aquifer was not intercepted to a drilled depth of 1.5 meters below ground surface (mbgs). Shallow groundwater can impact upon dispersive soils by causing tunnel erosion and it is therefore critical to manage groundwater flows where it is impacting upon soils.

Figure 4 Surface water catchments and site topography

2.4 Potential for Soil Erosion

Referring to the VICPLAN planning overlays the site is identified as having erosion management overlay (EMO) (Figure 3-6).

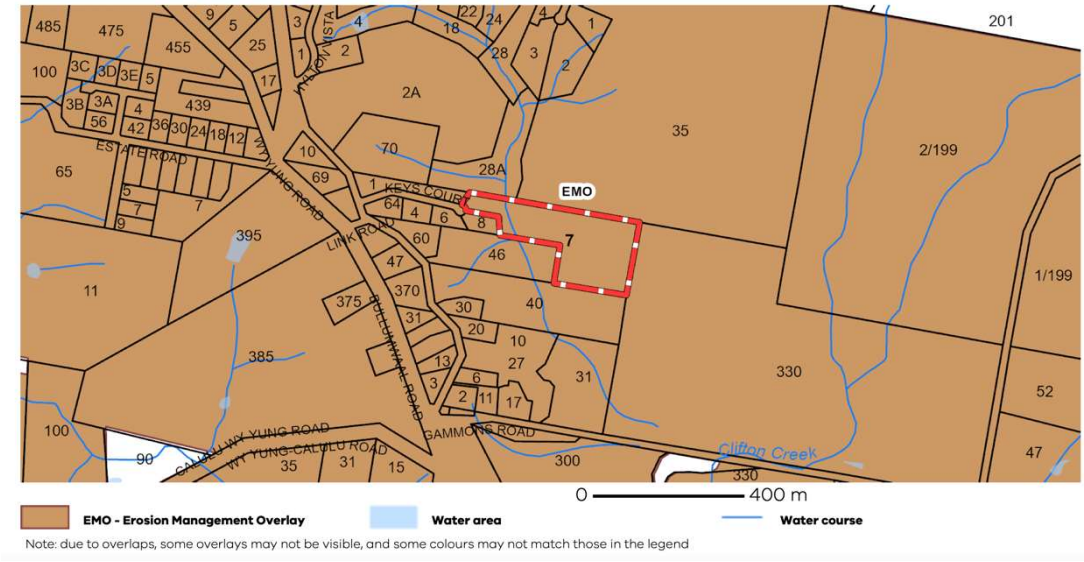
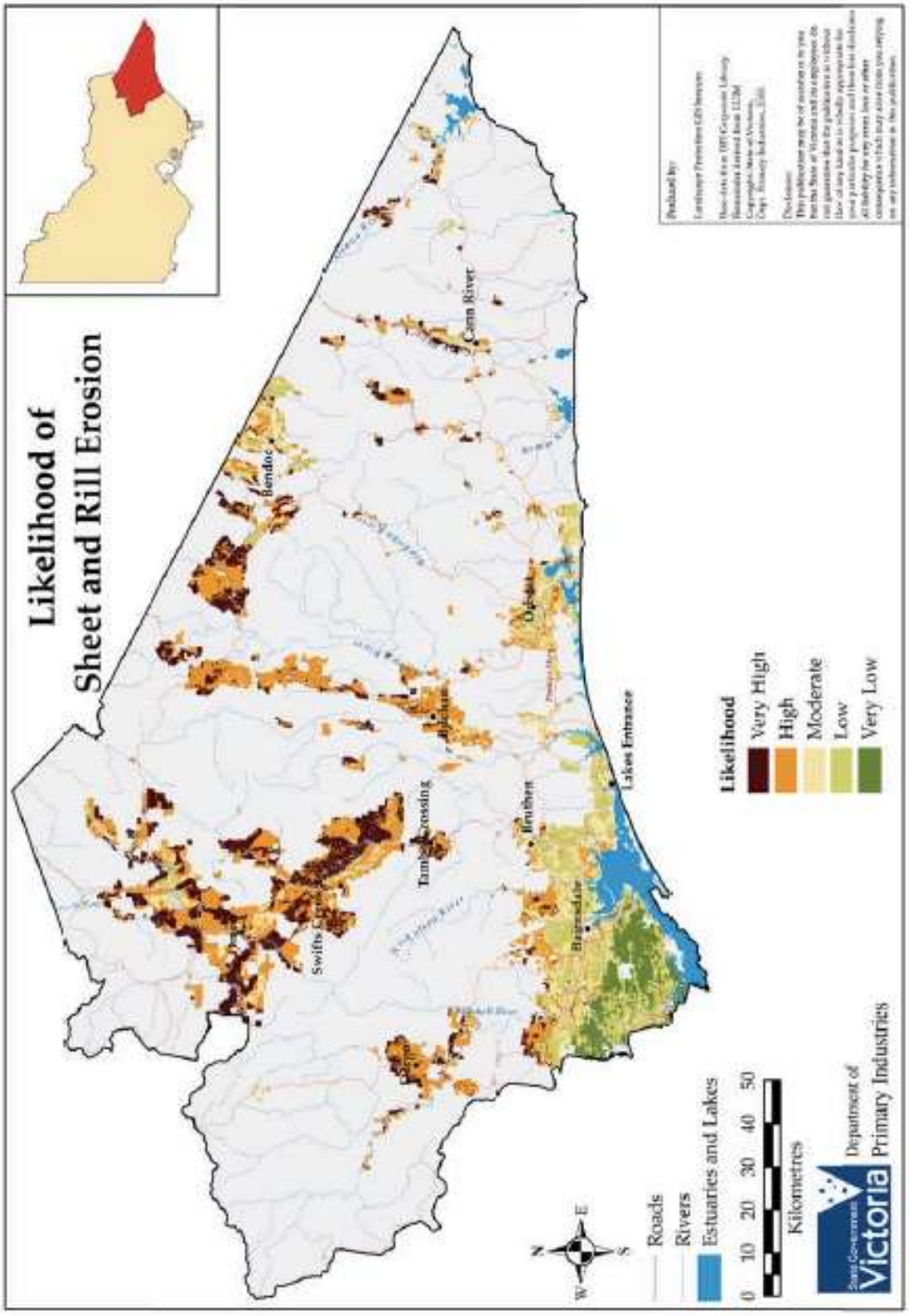
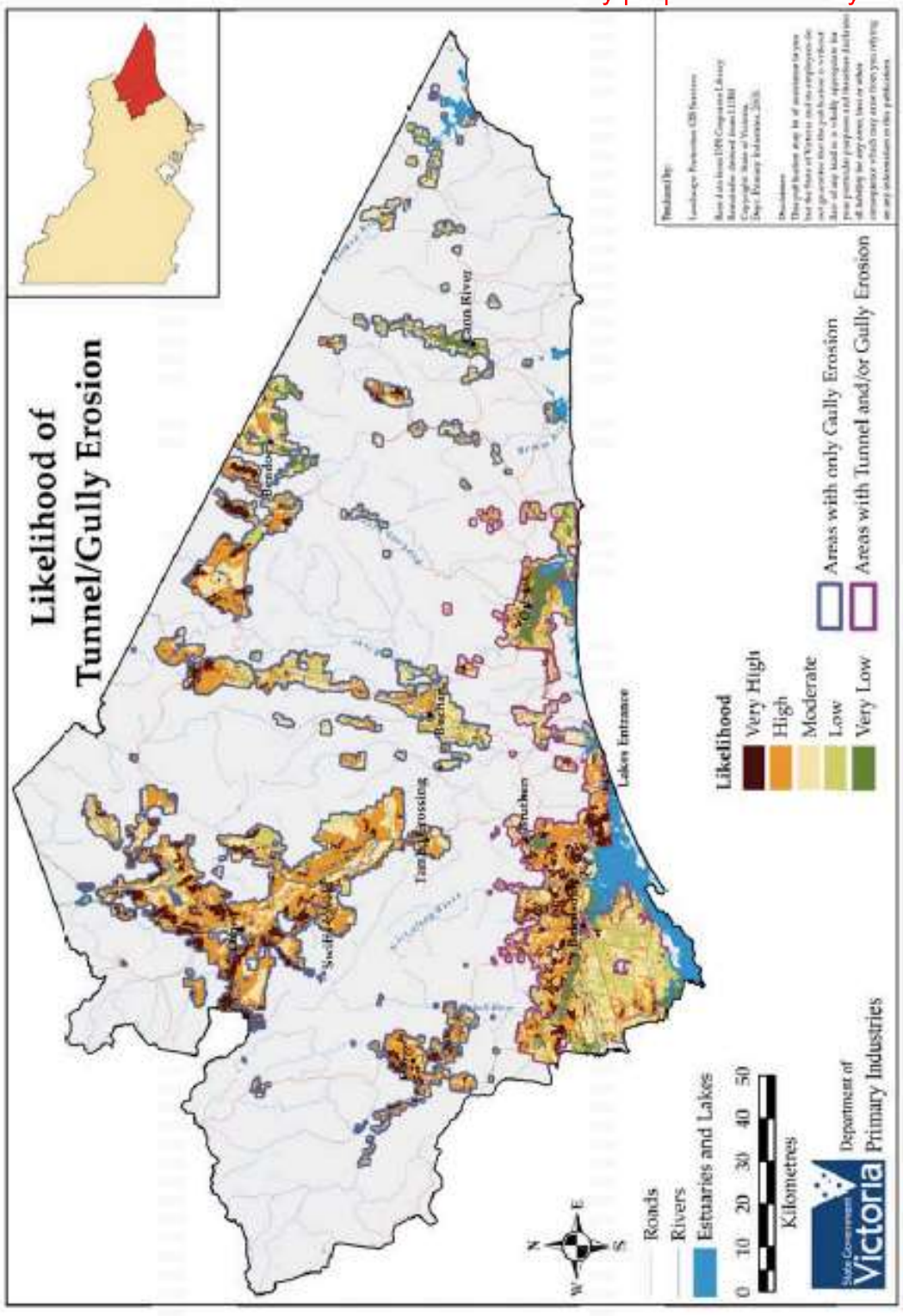
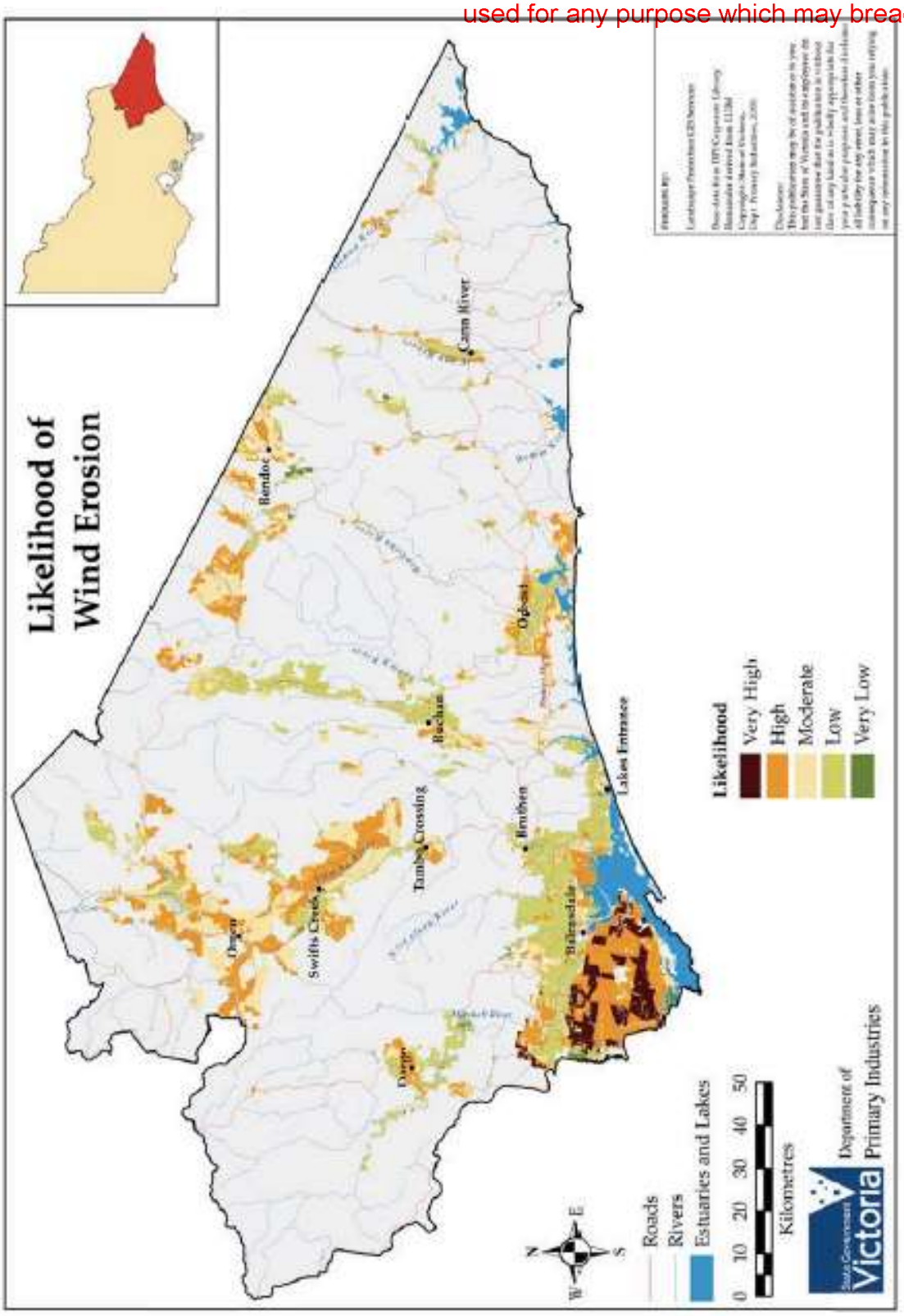


Figure 5 Planning Overlay showing site subject to Erosion Management Overlay (EMO)







Referring to East Gippsland Soil Erosion Management Plan, the area has the following risk designations (Fig 6-8 above)

- Sheet and Rill Erosion risk – Low to Moderate
- Gully and Tunnel Erosion Risk – Moderate – High
- Wind Erosion Risk – Low to Moderate

Given the above further investigation into geomorphic, soil and laboratory indicators over the proposed development area is warranted.

2.5 Potential for Slope Instability

Landslide modelling by Mazengarb (2013) has produced zones with distinct landslide risks is from the Tasmanian Government modelling of the state's geology and history of land sliding and is approximate and takes no account of rock type at a local scale. This is shown in Figure 4 below. This models conceptual parameters to determine slope thresholds for geological units.

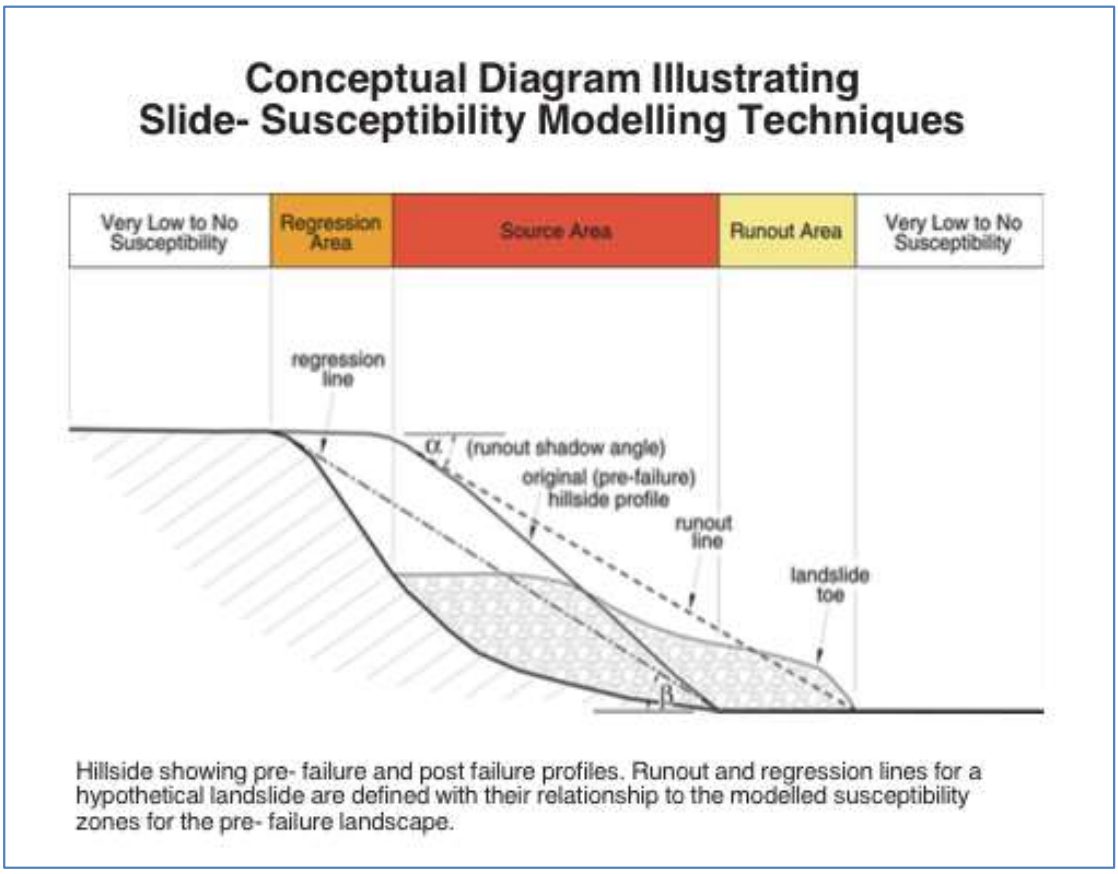


Figure 9 Landslide zoning conceptual diagram (Mazengarb, 2013)

The modelling above determines that slopes under 7 degrees with a 20m regression/run out buffer are inferred to have minimal potential for slope instability. This follows suggestions contained in Australian Geomechanics Guidelines (2007) for Good Hill Side Construction Practice as well as Mazengarb (2013).

There are three types of slope instability are defined, namely:

- *Deep Seated Instability Hazards*- failures of geological units where the failure plane extends below any unmapped superficial soil or regolith material that may exist onsite usually exceeding 5 meters (Mazengarb, 2004). This could occur due to down slope movement between bedding planes in either unconsolidated overburden sediments or the underlying older bedrock.

- *Debris Flow/Slide Hazards* - the action of unconsolidated sediments (often containing loose rock) mixing with water after a significant rainfall event(s) and flowing down slope (Mazengarb 2004). Also encompasses soil creep and runouts in watercourses.

- *Rock Fall Hazards* - an independent movement of rock or soil fragments through freefall, bouncing, rolling or sliding (Mazengarb, 2004).

2.6 Development Specific Criteria

A subdivisional development plan is presented in Figure 10.

2.7 Site Investigation

Geomorphic slope factors were assessed via a visual inspection of the site, soil and water factors were investigated by the drilling of geotechnical test bores to 2m or refusal on rock (which ever first). Soils were sampled at various depths from the ground surface to as an initial screening investigation to inform the requirement of follow up sampling. Probes were thoroughly cleaned between bores to prevent the possibility of cross-contamination. Samples were bagged and refrigerated for transportation to the laboratory for Emmerson Class Testing.

3. Results and Discussion

3.1 Field Reconnaissance

Field reconnaissance involved a site walk over to confirm geomorphology and the drilling of geotechnical bores in proposed development areas to facilitate soil sampling. Logs are presented in Appendix 2.

General comments from field reconnaissance include:

- The site is highly variable with respect to slope with undulating slight to moderate slopes associated with a high plain observed over north eastern areas of the site, parting to steeper areas in the west and south towards a drainage line in flatter areas in the gully floor.
- The site is covered with pasture and likely suffers from imperfect drainage through the wetter months of the year.
- The site has two distinct micro catchments biscected by a drainage line as shown in Figure 3.
- Most slopes over proposed development areas (where prosed building and effluent envelopes are positioned) are located on slopes of >7 degrees (see Figure 10).
- However some areas of the site have slopes above this threshold (see Figure 10).
- Extensive wombat burrowing was seen below the high plain stockdale unit. These burrows should be remediated to limit further sources on slope instability over time.

3.2 Laboratory Results

Selected samples at various depths were tested for Emerson Class. Results are presented in Appendix 2 and indicate:

- Samples from all bores returned an Emerson Class of EITHER Class 3 OR Class 7 (See Appendix 2).

3.3 Discussion

3.3.1 Wind, Sheet, Rill, Tunnel and Gully Erosion

Geotechnical reconnaissance found moderately deep loose SANDS (SC/SM) (Munro) sometimes over deep Sandy CLAYS (CL/CH)/ Clayey SANDS (SC) (Stockdale) mostly over 1.5 mbgs (Appendix 2). Light textured loosely packet topsoils are susceptible to wind erosion if stripped of vegetation for prolonged periods.

Results of analysis of selected soil samples from bores returned an Emerson Class designation of either Class 3 or Class 7. This indicates moderately sodic soils, and subsoils from this class may exhibit slaking which can lead to pinhole dispersion. The laboratory results potentially underestimate the risk of intercepting highly dispersive soil phases (Class 1 & Class 2.3) over the site with significant amount of soil disturbance combined with the fact that these phases are likely to vary over short distances.

It is noteworthy that where samples were of SAND textural classes (SP/SW) results of Emerson Testing should be dismissed as these are loose, non-aggregated materials with low clay contents. Similarly results where exchangeable sodium percentage is below 0.3meq/100g should also be dismissed. It should be highlighted that dispersive soils are notable in the subsoils of the Stockdale unit only.

Deep sandy topsoils, were present, can be eroded by wind and water if not managed correctly. This will lead to sheet and rill erosion with the loss of topsoil and potential sedimentation of waterways. It can also expose deeper subsoils with sodic phases which can lead to tunnel and gully erosion, particularly on slopes.

Given the potential presence of highly sodic soil phases over the site, the risk analysis presented in Section 3.4.1 has been prepared based upon the

assumption that highly sodic phase are likely to be disturbed by the current development plan.

3.3.2 Deep Seated Landslide, Debris, Slide/Flow and Rockfall Risks

Most slopes over proposed development areas (where prosed building and effluent envelopes are positioned) are located on slopes <7 degrees (see Figure 10). However, some areas of the site have slopes above this threshold.

Given the above the following assessment is warranted and the following strategies are recommended:

- **Slopes <7 degrees with buffer distances > 20m. –** Conduct Standard investigation to AS2870-2011 at building permit stage
- **Slopes <7 degrees without buffer distances > 20m or Slopes between 7-10 degrees -** Conduct site specific geotechnical investigations before building permit stage to determine risk and treat accordingly given specific development plans. The recommendations of the Australian Geomechanics Guidelines for Good Hillside Construction Practice must be adopted.
- **Slopes >10 degrees –** Engage a qualified Geotechnical Engineer or Engineering Geologist with experience in slope stability analysis and landslde risk assessment to conduct lot specific geotechnical investigations before building permit stage to determine risk and treat accordingly given specific development plans. The recommendations of the Australian Geomechanics Guidelines for Good Hillside Construction Practice must be adopted.
- Employ deepened foundation designs (subject to lot specific geotechnical investigations). Attempt founding upon hardpans stiff clays or where possible bedrock.
- Minimise site cutting and bulk earthworks
- Revegetate immediately after soil disturbance
- Manage soil water relations.

A qualitative erosion and slope stability risk assessment, in accordance with Australian Geomechanics Society (2007) is presented in Section 3.4.

Figure 10 Slope gradient thresholds over the proposed subdivision

3.4.1 Erosion Risk Assessment- Stockdale Soils

Table 1 – Summary erosion hazards, consequences and risk, with suggested treatment options and revised risk after treatment option implementation

Hazard: Soil erosion	Likelihood of occurrence	Consequences to life and property	Level of risk to life and property	Mitigation options to lower risk levels (see Section 4 for further details)	Level or risk after mitigation
Rill and Sheet Erosion	Possible	Medium	Moderate	Locate building envelopes on slopes <7 degrees. Excavate only in dry weather Cover excavations as soon as possible after construction. Chemical amelioration, re-vegetate and re-topsoil as soon as practical after disturbance Capture and reticulate all runoff around disturbed areas	**Moderate to Low**
Wind Erosion	Possible	Medium	Moderate	Avoid site de-vegetation. Excavate only in stable weather Cover excavations as soon as possible after construction. Chemical amelioration, re-vegetate and re-topsoil as soon as practical after disturbance	**Low**
Tunnel and Gully Erosion	Possible	Major	High	Minimise/avoid Trenching and other excavations, especially on slopes. Vegetate downslope swales (WSUD). Avoid culverts and trenching where possible Chemical amelioration, re-vegetate and re-topsoil. Use of weirs, rock lined swales to reduce water velocity. Cover excavations as soon as possible after construction. Excavate only in dry weather	**Moderate**

Concepts and terminology from AGS (2007) Practice Note Guidelines for Landslide Risk Management (See Appendix 3)

3.4.2 Erosion Risk Assessment- Munro Soils

Table 2 – Summary erosion hazards, consequences and risk, with suggested treatment options and revised risk after treatment option implementation

Hazard: Soil erosion	Likelihood of occurrence	Consequences to life and property	Level of risk to life and property	Mitigation options to lower risk levels (see Section 4 for further details)	Level or risk after mitigation
Rill and Sheet Erosion	Possible	Medium	Moderate	Locate building envelopes on slopes <7 degrees. Excavate only in dry weather Cover excavations as soon as possible after construction. Chemical amelioration, re-vegetate and re-topsoil as soon as practical after disturbance Capture and reticulate all runoff around disturbed areas Remediate existing burrow affected areas	**Moderate to Low**
Wind Erosion	Possible	Medium	Moderate	Avoid site de-vegetation. Excavate only in stable weather Cover excavations as soon as possible after construction. Chemical amelioration, re-vegetate and re-topsoil as soon as practical after disturbance	**Low**
Tunnel and Gully Erosion	Unlikely	Major	Moderate	Vegetate downslope swales (WSUD). Use of weirs, rock lined swales to reduce water velocity. Remediate existing burrow affected areas Excavate only in dry weather	**Low**

Concepts and terminology from AGS (2007) Practice Note Guidelines for Landslide Risk Management (See Appendix 3)

3.4.3 Slope Instability Risk Assessment for Slopes Above 7 Degree Thresholds

Table 3 –Summary of geotechnical hazards, consequences and risk, with suggested treatment options and revised risk after treatment option implementation

Hazard	Likelihood of occurrence	Consequences to property	Level of risk to property	Possible mitigation options	Likely level of risk after mitigation
Deep Seated Landslide	Unlikely	Major	Moderate	**Adopt building/land application envelopes 20m buffers from areas with slopes > 7 degrees – both up and downslope where possible** **Utilise deepened foundation designs (eg end bearing piles) in areas above this threshold** **Conduct site specific geotechnical investigations at building permit stage to determine risk and treat accordingly given specific development plans** **Avoid areas affected by burrowing and remediate existing burrow affected areas. See risk assessment of burrowing below for further analysis.** Lightweight, articulated, flexible construction methods Adequate reticulation of all stormwater to discharge points capable of accepting 200mm/d. Minimise/exclude bulk earthworks and site cutting Minimise/exclude bulk earthworks and site cutting – design driveways to have flattest route across its distance. Adequately stabilise all cuts with engineered retaining walls or Gabion Walls	**Moderate to Low**
Debris Slide/Slump/Creep	Possible	Medium	Moderate	**Adopt building/land application envelopes 20m buffers from areas with slopes > 7 degrees – both up and downslope where possible**	**Moderate to Low**

				Utilise deepened foundation designs (eg end bearing piles) in areas above this threshold **Conduct site specific geotechnical investigations at building permit stage to determine risk and treat accordingly given specific development plans** **Avoid areas affected by burrowing and remediate existing burrow affected areas. See risk assessment of burrowing below for further analysis.** Minimise/exclude soil disturbance and bulk earthworks Fill batters must be adequately stabilised Retain/promote deep rooted vegetation where it will not impact upon foundations. Foundations to be designed to cater for adverse soil water relations and founded on dense hardpans or bedrock) Lightweight, articulated, flexible construction methods Adequate and deep upslope drainage Irrigate wastewater downslope of all structures Minimise/exclude bulk earthworks and site cutting – design driveways to have flattest route across its distance. Adequately stabilise all cuts with engineered retaining walls or Gabion Walls	
Rock falls and topples	Unlikely	Medium	Low	Contain all liberated boulders	**Low**

Concepts and terminology from AGS (2007) Practice Note Guidelines for Landslide Risk Management (See Appendix 3

**Risk needs further assessment when finalised development plan available.)*

3.4.4 General Geotechnical Risk Assessment

Table 4 –Summary of geotechnical hazards, consequences and risk, with suggested treatment options and revised risk after treatment option implementation

Hazard	Likelihood of occurrence	Consequences to property	Level of risk to property	Possible mitigation options	Likely level of risk after mitigation
High to Extreme Soil Reactivity	Unlikely	Major	Moderate	Adequate lot specific site investigations in compliance with AS2870-2001 – Residential Slabs and Footings" in conjunction with lot specific development plans Appropriate management of soil/water relations through interceptor drainage, management of hardstand runoff both within lot and at a subdivisional scale.	**Low**
Subsidence or differential settlement	Possible	Medium	Moderate	Adequate lot specific site investigations in compliance with AS2870-2001 – Residential Slabs and Footings" in conjunction with lot specific development plans. Utilise deepened foundation designs (eg end bearing piles) to bedrock where possible and appropriate. Where bulk earthworks and site cutting/filling is planned do not place foundations into uncontrolled fill. See risk assessment of tunnel/gull erosion and burrowing for further analysis.	**Low**
Drainage	Possible	Medium	Moderate	Implement subdivisional stormwater plan including drainage design and capacity. Upslope interceptor drainage around all infrastructure Reticulation of all stormwater to legal discharge points Avoid lot development on permanent wet/marshy areas.	**Low**

Excavations and Uncontrolled Fill	Possible	Medium	Moderate	Minimise cut and fill earthworks where possible. Plan roading and critical infrastructure to run parallel to site contours where possible. Do not place foundations into un-controlled fill deposits. Adequately engineer all retaining walls for all cuts/fill.	**Low**
Existing Dams/wetlands/marshes and swamps	Likely	Major	Very High	Avoid development in these areas. Do not infill and develop dams	**Low**
Impacting Vegetation	Possible	Medium	Moderate	Where possible follow prescriptions of AS2870-2011 with respect to avoiding zone of influence of impacting vegetation on infrastructure. Where vegetation is cleared engage further geotechnical assessment post de-vegetation Installation of root barriers against all foundations and other critical infrastructure.	**Low**
Sinkholes/Burrows	Likely	Medium	High	Sinkholes unlikely across development areas, however see risk assessment of tunnel/gull erosion above for further analysis. **Burrows are evident and should be infilled with burrowing animals removed.** **All areas affected by burrowing must be quarantined from development** **Further geotechnical assessment of these areas required when areas have been remediated.**	**Moderate/Low**
Excavation Difficulties	Possible	Medium	Moderate	Lot specific assessment to determine potential excavation issues if hard rock encountered.	**Moderate/low**
Aggressive Soils	Possible	Medium	Moderate	Lot specific testing and preparation of management plan if found	**Low**

Acid Sulphate Soils	Possible	Medium	Moderate	An acid sulphate site reconnaissance, testing and management plan recommended pre subdivision development	**Low**
Collapsible Soils	Possible	Medium	Moderate	Lot specific testing and preparation of management plan if found. See risk assessment of tunnel/gull erosion and burrowing above for further analysis.	**Low**
Disturbed Areas	Possible	Medium	Moderate	Avoid disturbed areas where possible and rehabilitate as required. See risk assessment of burrowing above for further analysis. Do not place foundations in disturbed soil – deepened foundations required. Roading to be adequately excavated and stabilised with chemical methods and or emplacement of controlled fill	**Low**

4. Risk Assessment Conclusions

The risk assessments conducted above have found that the site is suitable for development provided that the individual geotechnical hazards identified are controlled. These measures are detailed in the risk assessments as well as in Section 5 below. **These recommendations seek to manage risks to life and property across both subdivisional and lot specific development stages to low and tolerable levels.**

This investigation and risk assessment **for soil erosion** over the proposed development areas has found:

- **Dispersive soil phases are likely to exist over the site (associated with Stockdale soil units and their intermediaries) and have the risk of causing tunnel and gully erosion over time if inappropriately managed. The presence and severity of these dispersive phases are likely to vary enormously over short distances.**
- **Deep sandy topsoils where disturbed present a further sheet and rill erosion risk via wind or water.**
- **The risk associated with site development creating soil erosion (including tunnel and gully erosion) is high**
- **Treatment measures MUST be adopted to limit this risk to life and property.**

This investigation and risk assessment for the **potential to create slope instability** over the proposed development areas has found:

- **The largest risk associated with the creation of instability is associated with site development on slopes >7 degrees**
- **Burrows are evident and should be infilled with burrowing animals removed.**

- **All areas affected by burrowing must be quarantined from development.**
- **Further geotechnical assessment of these areas required when areas have been remediated.**
- Treatment measures MUST be adopted to limit this risk to life and property.

Further general geotechnical risk assessment has found potential risks associated with:

- Soil Reactivity
- Drainage
- Subsidence/Differential Settlement
- Uncontrolled fill
- Existing dam/wetlands/swamps
- Impacting Vegetation
- Burrows/Sinkholes
- Excavation and Fill
- Aggressive Soil
- Acid Sulphate Soils
- Collapsible Soils
- Disturbed Areas

Risk treatment options, where required, are noted in the relevant section of the risk assessment matrix.

5. Management Strategies Recommendations

5.1 Erosion Risk Management Strategies Recommendations

Given the above the following GENERAL erosion risk management strategies are recommended to limit risk to life and property:

- Maintaining topsoils and minimising subsoil disturbance. Where vegetation is stripped, it should be replaced or stabilised with jute matting, hydro-seeding or similar as soon as possible after disturbance.
- Chemical amelioration of disturbed CLAYS (CL/CH) or clayey SANDS (SC) using gypsum at an application rate of 1kg/m^2, generally associated with Stockdale soils and their transitions.
- Conduct bulk earthworks throughout drier periods where possible.
- If possible do not construct culverts, trenches or drains in dispersive soils.
- Avoid/limit bulk earthworks or construction of new dams if possible.
- Adopt the recommendations of EPA Publication 960 Guidelines for Environmental Management – Doing it Right on Subdivisions (Appendix 3)
- **A Soil and Water Management Plan, detailing specific treatment measures must be commissioned before subdivision development as well as for all lot specific developments. This will detail specific treatment measures to controls specific risks for subdivisional development.**

With reference to the development plan (see Appendix 1) the following recommendations are made:

- ***Roadways/driveways MUST:***
    - Install roading via the flattest possible routes.
    - Have cambers slightly sloping down slope and roadside swales and batters MUST be revegetated following the principles of water sensitive urban design.
    - The use of road bars and diversion mounds to channel water away from roads is encouraged
    - Subgrade MUST be compacted, treated with gypsum and a suitable base layer must be rolled to limit infiltration into dispersive soils under roads.
    - Roadways should be completed as soon as possible after topsoil stripping. Road routes should be stripped in stages to limit erosion risk caused by disturbance and disturbed soil must not be left de-vegetated for prolonged periods, especially throughout wet periods.
    - If culverts and drains are absolutely necessary ensure that they are excavated in dispersive soils are capped with non - dispersive clays mixed with gypsum and topsoil and re – vegetated and monitored.
    - Construct rock weirs or line drains with rocks to reduce water velocity.
    - Follow the principals of water sensitive urban design

- ***Services installation MUST***:
    - Avoid trenching systems and use above ground piping or aerial cabling where possible, particularly in CLAYS (CL/CH) or clayey SANDS (SC) associated with Stockdale soils and their transitions.
    - Where underground service installation is absolutely necessary ensure dispersive soils are capped with non dispersive clays mixed with gypsum and topsoil and re –vegetated and monitored.
    - Avoid onsite trenching systems for stormwater particularly in CLAYS (CL/CH) or clayey SANDS (SC) associated with Stockdale soils and their transitionS. Construct lined rock weirs or line drains with rocks to reduce water velocity.
    - Follow the principals of water sensitive urban design for stormwater reticulation – use grassed swales, lined weir systems and encourage wetland to treat stormwater and reduce water velocity.
- ***Future Dwellings/Outbuildings Construction Methods***:

Given the presence of dispersive soils, mitigation should be undertaken as follows:

- Cut and fill areas are to be covered with 150mm topsoil with gypsum mixed at 1.0 kg/m^2 and re-vegetated. Areas are then to be mulched and track rolled. The areas are to be monitored and any signs of tunnel erosion are to be rectified immediately.
- Limit concentration of run-off from hardstands. Excavated ground levels are to fall away from the house so that no water pools.
- Trenching in dispersive soils is to be avoided. Avoid trenching of stormwater and water supply pipes from header tanks into the clay layer. Lay piping scratched max 100mm deep into the topsoil layer, cover with topsoil mounded over pipes and re-seed

immediately.

- ***Wastewater Systems MUST***;
    - Be designed as an near surface system (eg sand filter, mound or spray/drip irrigation NOT TRENCHES OR BEDS)
    - Water to be treated to secondary levels
    - All land application area must have vegetation maintained
    - Land application envelopes must be located downslope of building envelopes
    - Chemical amelioration of disturbed CLAYS (CL/CH) or clayey SANDS (SC) using gypsum at an application rate of 1kg/m^2, generally associated with Stockdale soils and their transitions.

5.2 Slope Stabiity Risk Management Strategies

Given the above the following GENERAL treatment measures are recommended to limit risk to life and property from slope instability:

- **Adopt building/land application envelopes with 20m regression/run out buffers from areas with slopes > 7 degrees – both up and downslope where possible.**

- Where this is not possible utilise the following treatment measures:
    - **Conduct site specific geotechnical investigations at building permit stage to determine risk and treat accordingly given specific development plans.**
    - **Incorporate deepened foundation systems**
    - **Avoid trench based land application of storm or wastewater**
    - **Adopt the recommendations of the Australian Geomechanics Society for Good Hillside Construction Practice (2007) (Appendix 3).**

- **Burrows are evident and should be infilled with burrowing animals removed.**
- **All areas affected by burrowing must be quarantined from development.**
- **Further geotechnical assessment of these areas required when areas have been remediated.**
- Minimise/exclude bulk earthworks and site cutting – design roading/driveways to have flattest route across its distance where possible.
- Adequately stabilise all cuts/fill with engineered retaining walls

5.3 Further Recommendations

Lastly it is recommended that:

- A Soil and Water Management Plan, detailing specific treatment measures must be commissioned before subdivision development as well as at the lot development stage for all lot specific developments. This will detail specific treatment measures to controls specific risks for the subdivision as well as for any given development proposal over any given lot.
- All future variations to either subdivisional development plans or risk treatment/management strategies/designs MUST be provided to Strata to ratify against this report. Failure to ensure this will void the modelling and recommendations contained within this report.
- Ongoing monitoring of all works for signs of erosion must be undertaken by subdivisional and individual lot owners/developers. If signs of erosion, slope instability or other geotechnical issues are observed then further advice should be sort by a suitably qualified person.
- The above recommendations/conditions should be included as permit conditions and if they are not implemented will void the modelling contained within this report.

Any questions or comments in relation to this investigation or its findings should be directed towards the author.

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6. References

- Standards Australia (1993) AS1726-1993 Geotechnical Site Investigations
- Standards Australia (2004) AS/NZS4360 - Risk Management
- Standards Australia (2007) AS3798 “Guidelines for Earthworks on commercial and residential subdivision”
- EPA Publication 960 Guidelines for Environmental Management – Doing it Right on Subdivisions
- East Gippsland Soil Erosion Management Plan
- Australian Geomechanics Society (2007) Landslide Risk Management. Australian Geomechanics 42(1) March 2007.
- Mazengarb (2010) Landslide Risk Modelling. MRT
- Doyle, R 2019 Expert Witness Report prepared by Dr Richard Barry Doyle in relation to a Review of Land Capability Assessment, Erosion and Slope Risks Assessment and Management Strategies and the Implications of their Findings at 30 Clifton West Road, Wy Yung

7. Appendices

This report contains the following appendices:

Appendix 1 Site Photographs
Appendix 2 Bore Logs & Laboratory Test Results
Appendix 3 Extracts EPA, Aust Geomechanics Guidelines (2007)
Appendix 4 Terms and Conditions

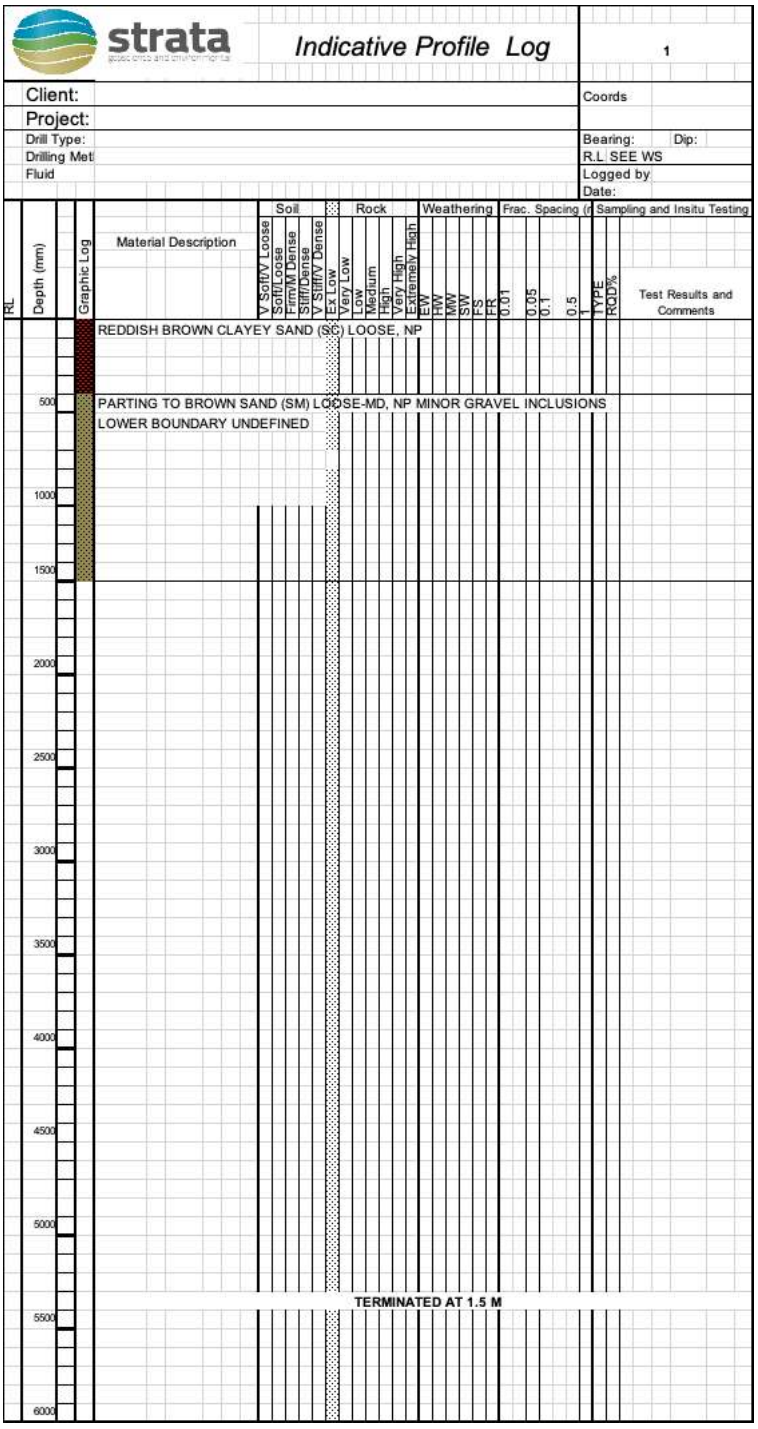
All appendices **must** accompany this report and be reproduced faithfully in **full colour**.

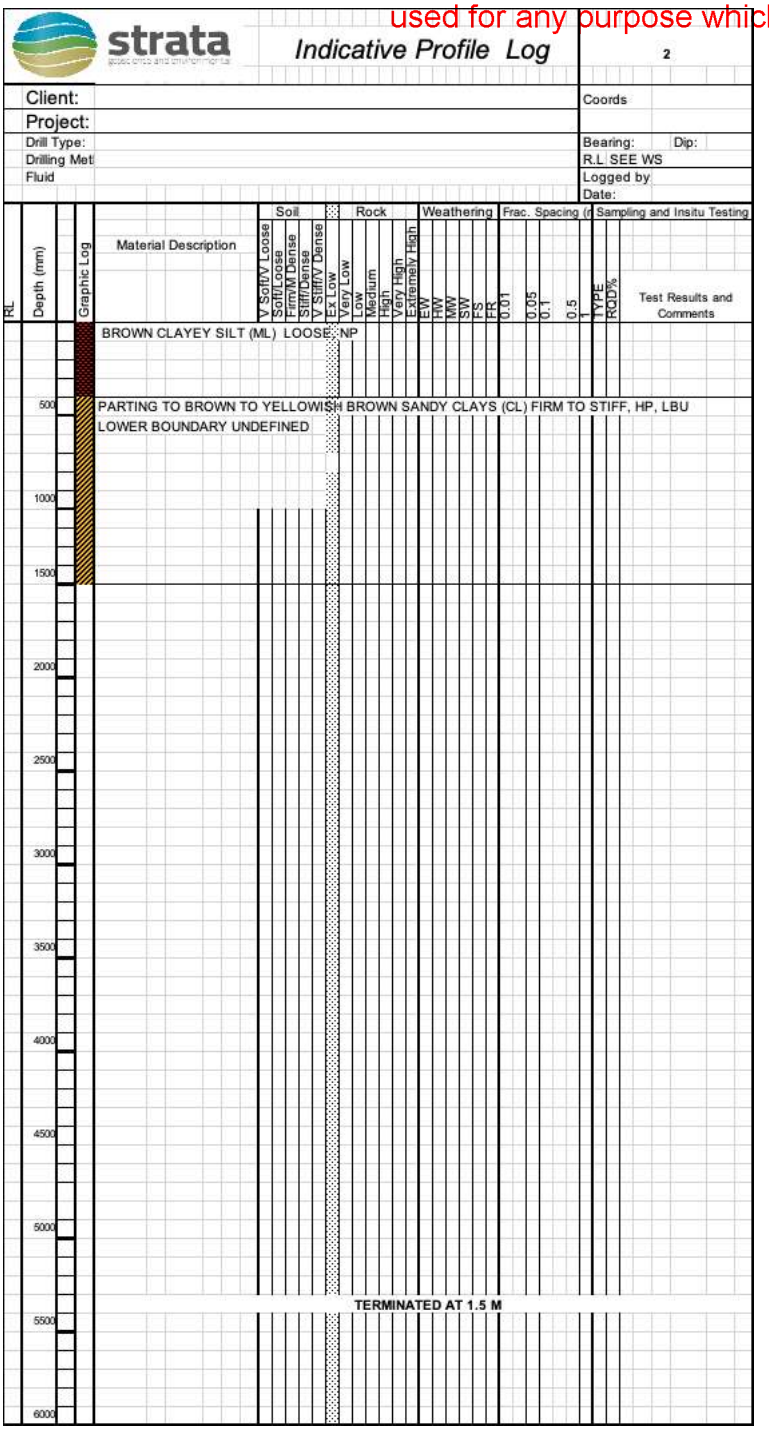
Appendix 1 Site Photographs

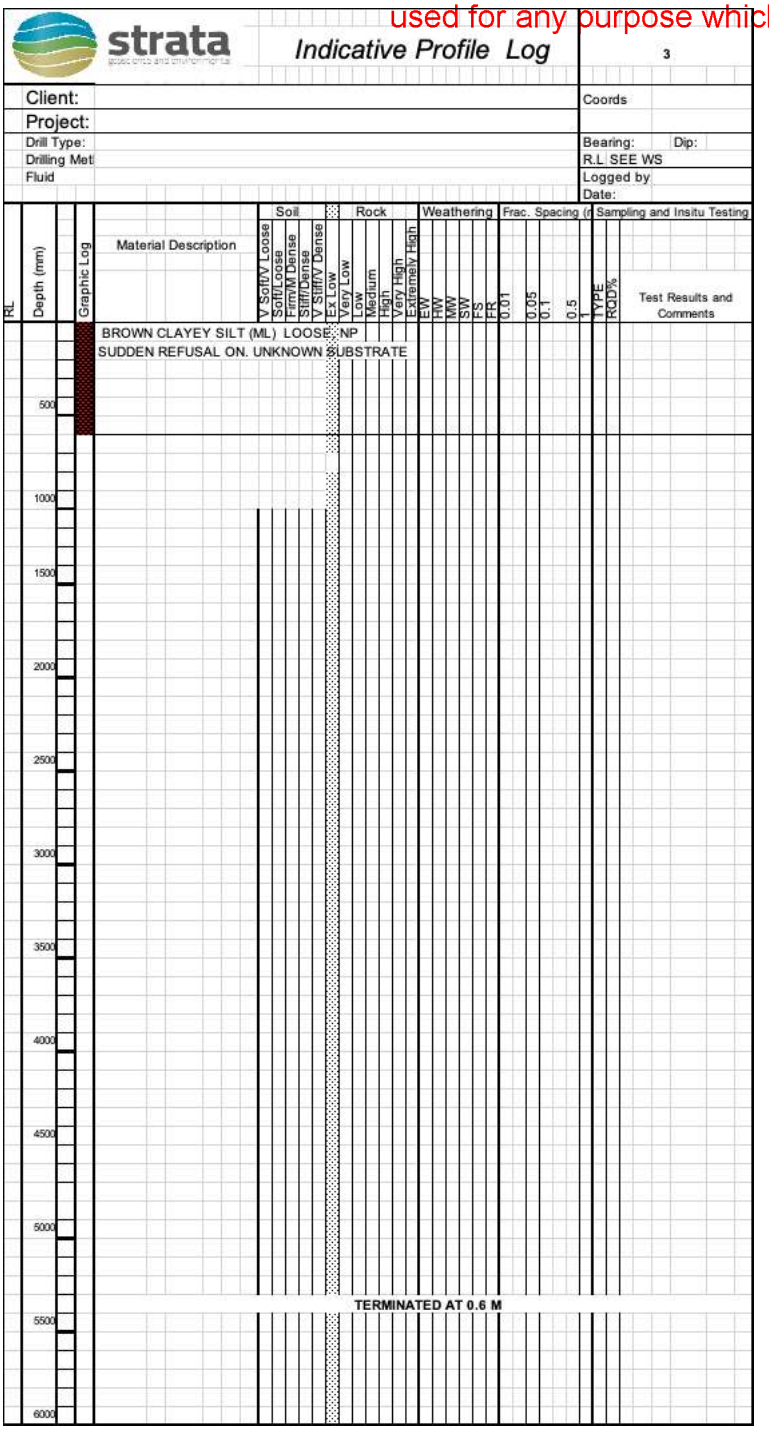
Plate 1 Looking east towards high plain of Stockdale unit showing steep slopes of Munro unit in the midground.

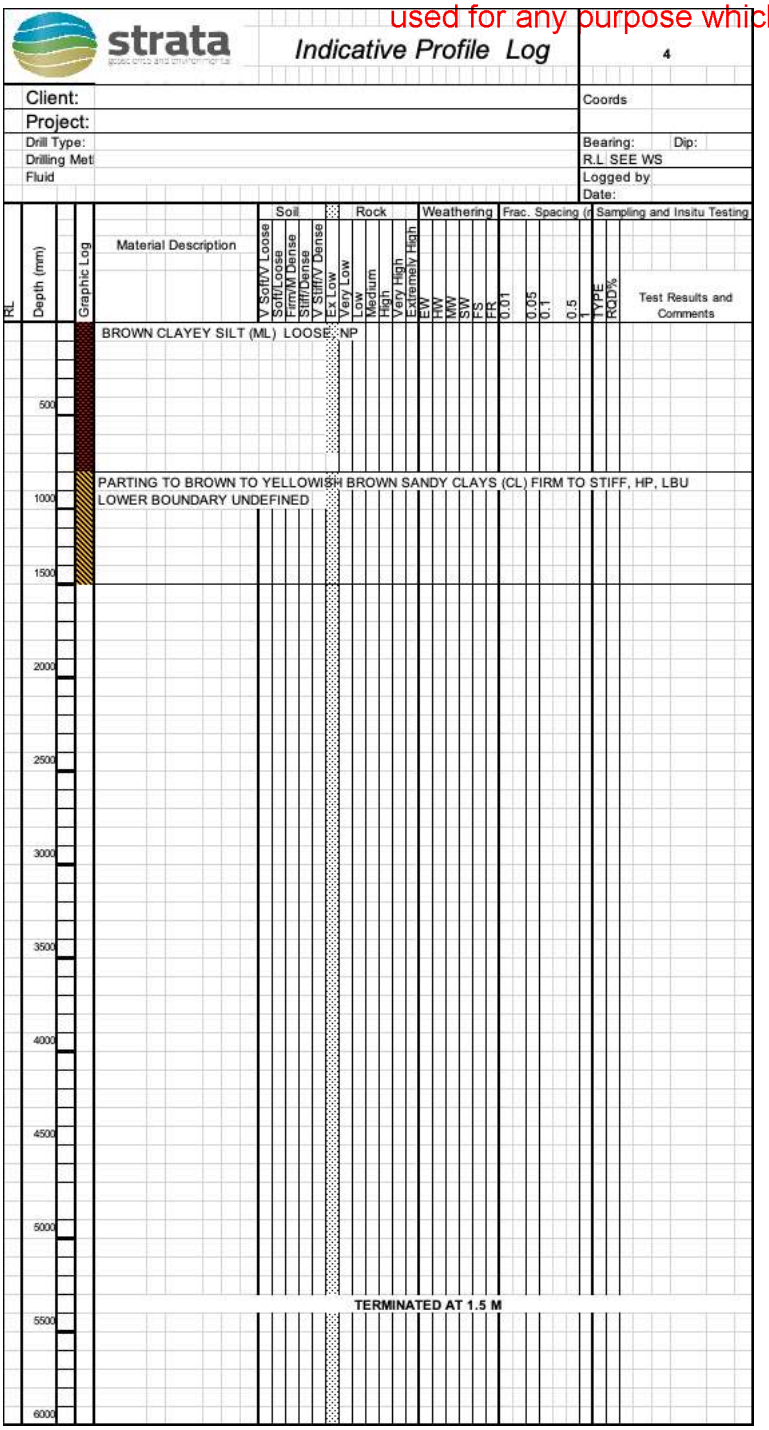
Plate 2 Extensive burrowing below Stockdale Unit are a potential source of land stability requiring remediation

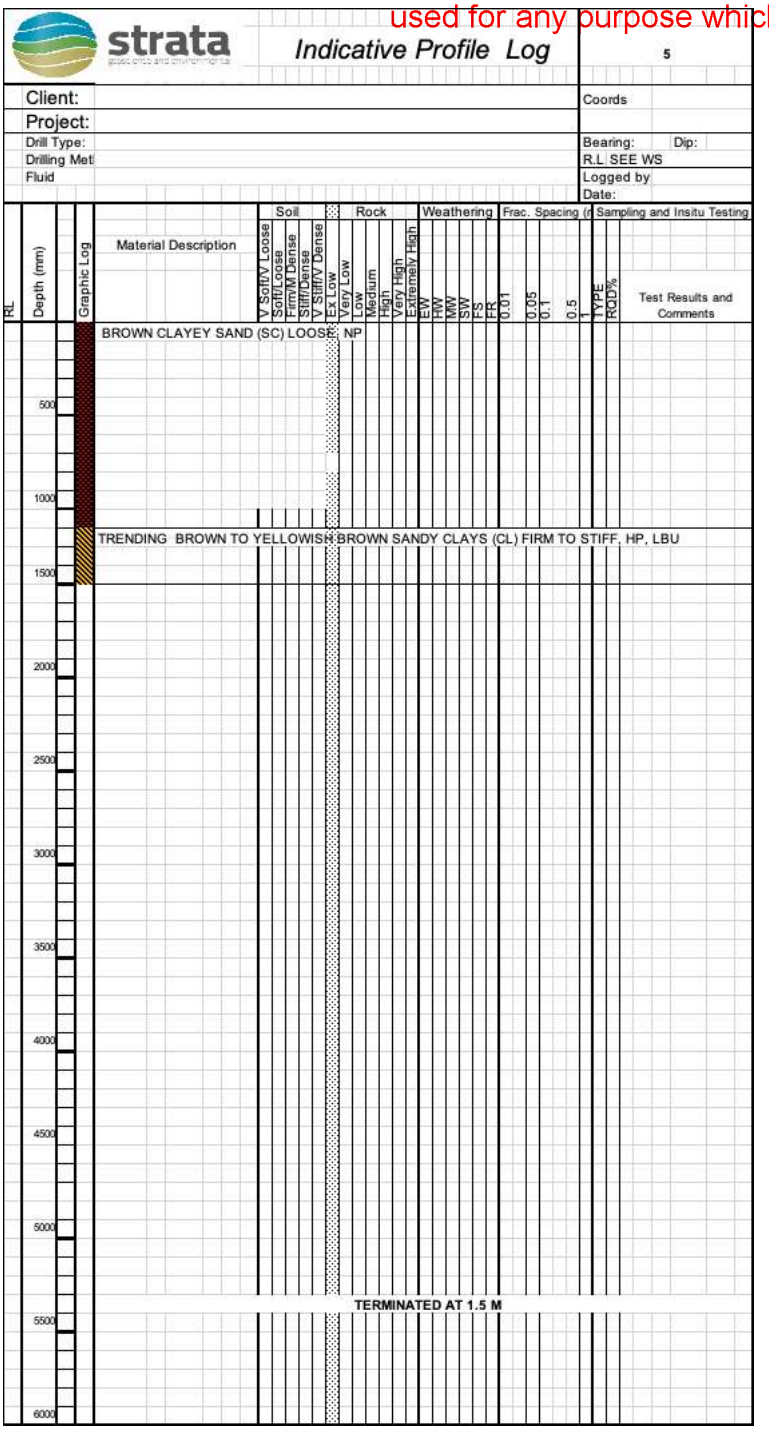
Appendix 2 Bore Logs and Emmerson Class Test Results

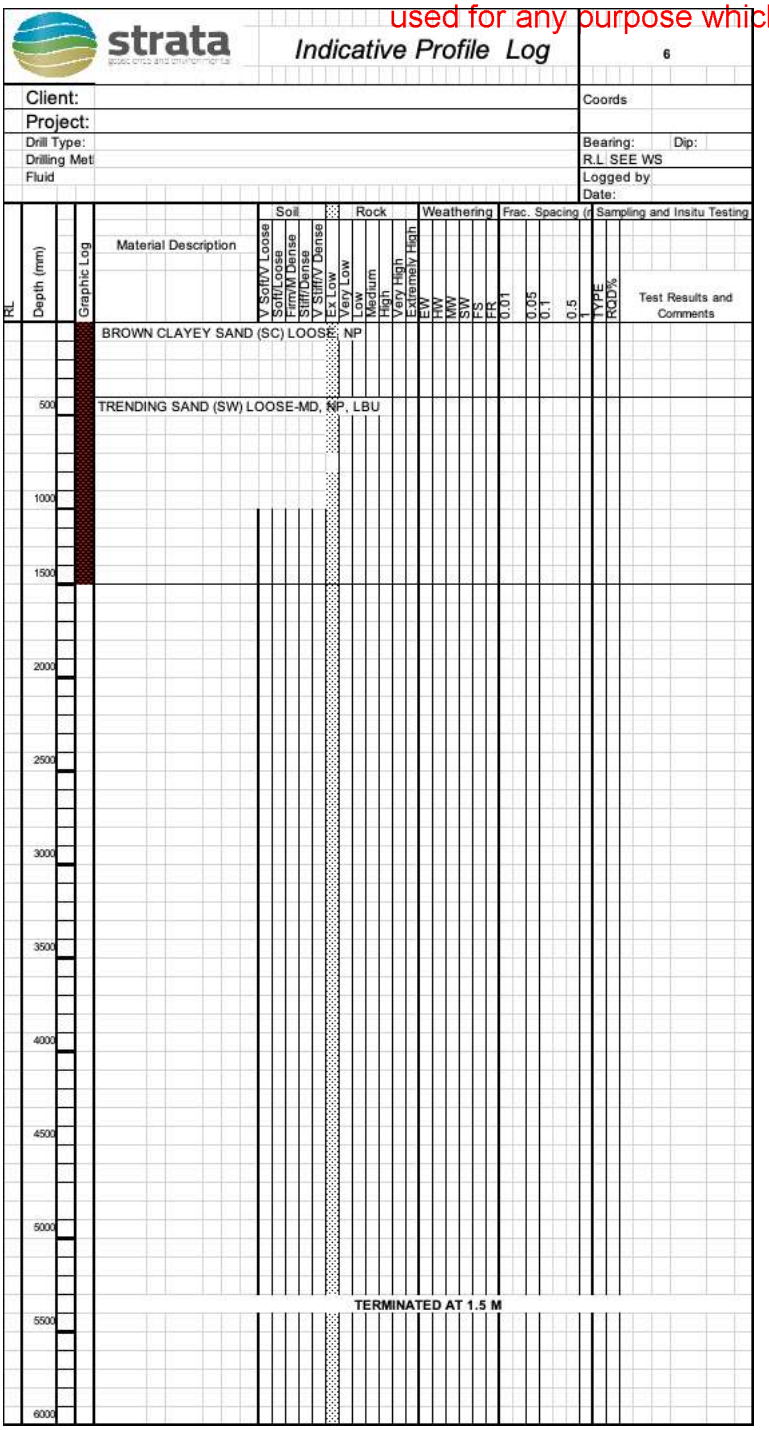


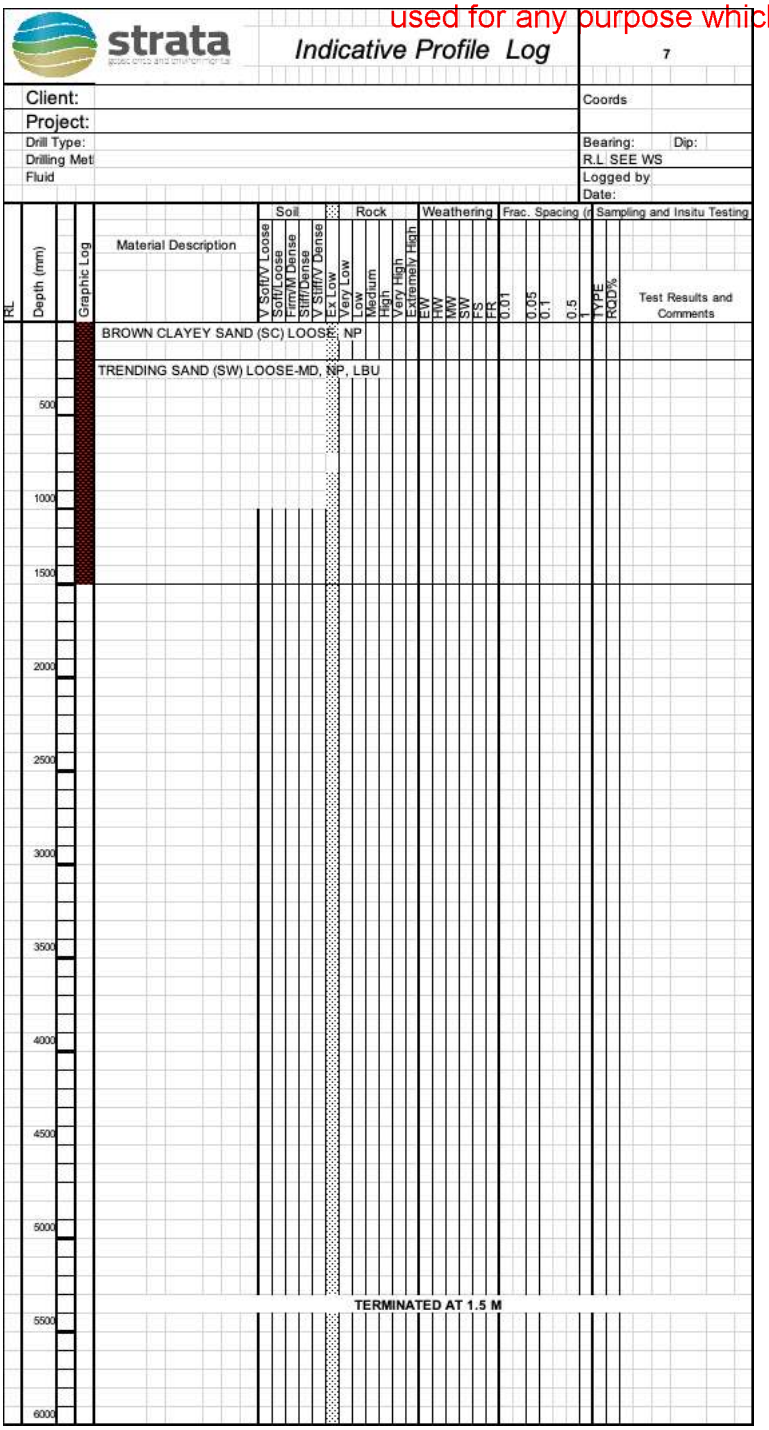


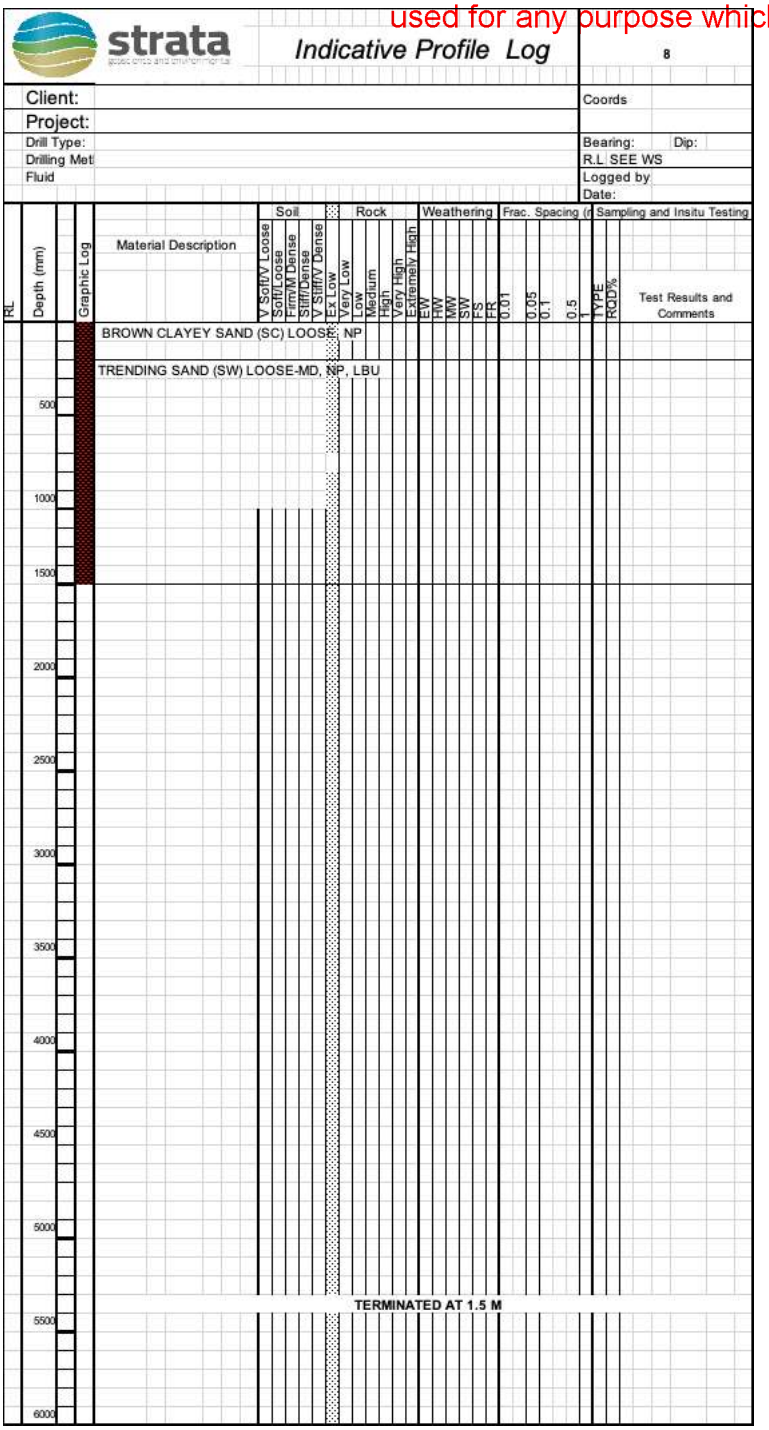


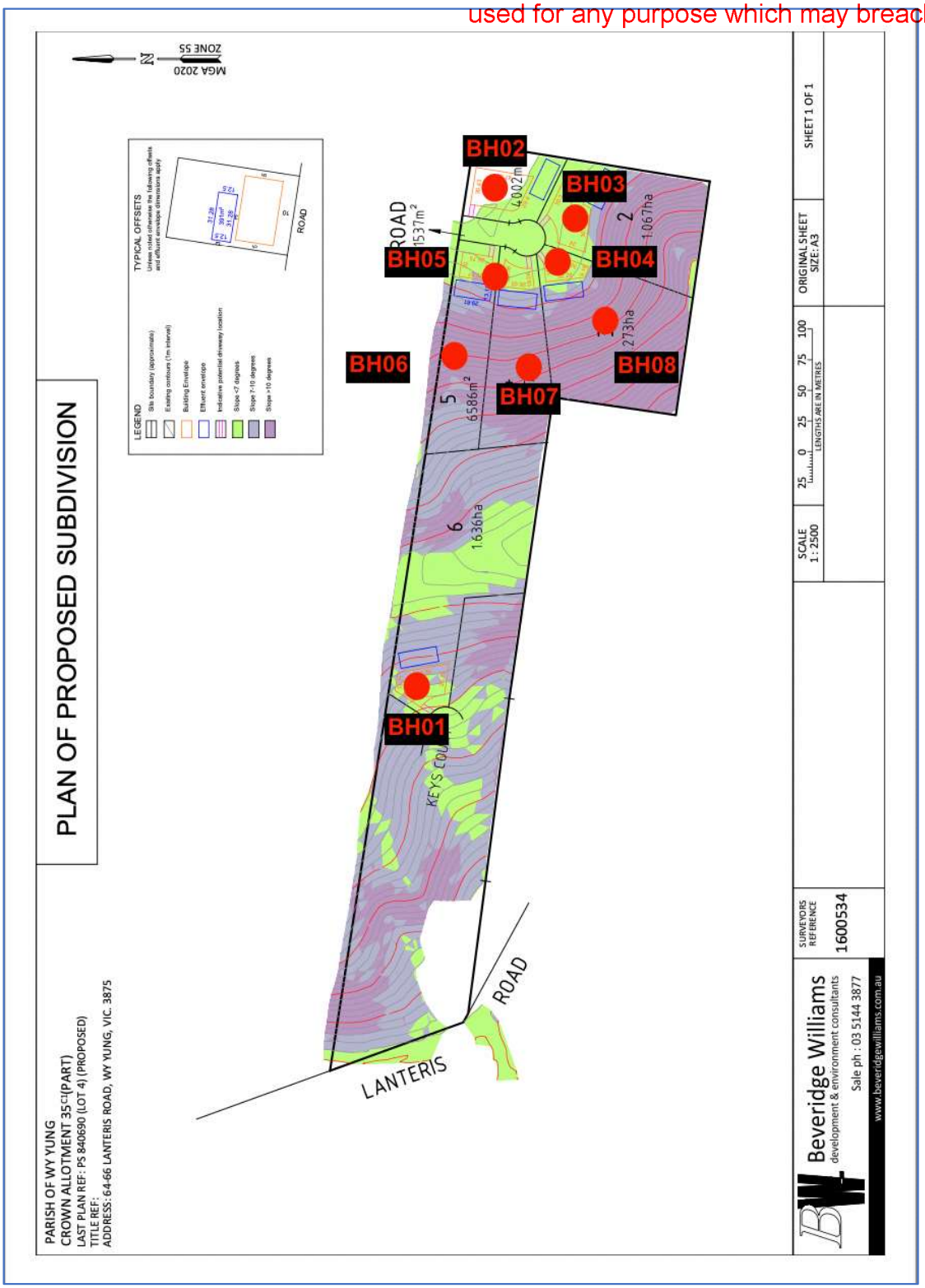












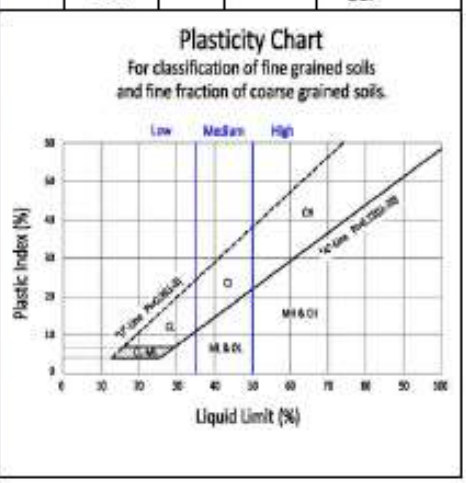
Geotechnical Terms and Symbols

The following information is intended to assist in the interpretation of terms and symbols used in geotechnical borehole logs, test pit logs and reports issued by or for the Queensland Department of Transport and Main Roads (TMR). More detailed information relating to specific test methods is available in the TMR Materials Testing Manual (MTM) and the relevant Australian Standards.

Soil Descriptions

Description and Classification of Soils for Geotechnical Purposes: Refer to AS1726-1993 (Appendix A).
The following chart (adapted from AS1726-1993, Appendix A, Table A1) is based on the Unified Soil Classification System (USCS).

Major Divisions		Particle size mm	USCS Group Symbol	Typical Names	Laboratory Classification				
					% < 0.075 mm (2)	Plasticity of fine fraction	$C_u = \frac{D_{60}}{D_{10}}$	$C_c = \frac{(D_{30})^2}{(D_{10})(D_{60})}$	NOTES
COARSE GRAINED SOILS (more than half of material less than 63 mm is larger than 0.075 mm)	BOULDERS	200							
	COBBLES	63							
	GRAVELS (more than half of coarse fraction is larger than 2.36 mm)	coarse 20	GW	Well graded gravels and gravel-sand mixtures, little or no fines	0-5	—	>4	Between 1 and 3	(1) Identify fines by the method given for fine-grained soils.
		medium 6	GP	Poorly graded gravels and gravel-sand mixtures, little or no fines, uniform gravels	0-5	—	Fails to comply with above		
		fine 2.36	GM	Silty gravels, gravel-sand-silt mixtures (1)	12-50	Below 'A' line or PI<4	—	—	
			GC	Clayey gravels, gravel-sand-clay mixtures (1)	12-50	Above 'A' line and PI>7	—	—	
	SANDS (more than half of coarse fraction is smaller than 2.36 mm)	coarse 0.6	SW	Well graded sands and gravelly sands, little or no fines	0-5	—	>6	Between 1 and 3	(2) Borderline classifications occur when the percentage of fines (fraction smaller than 0.075 mm size) is greater than 5% and less than 12%. Borderline classifications require the use of SP-SM, GW-GC.
		medium 0.2	SP	Poorly graded sands and gravelly sands, little or no fines	0-5	—	Fails to comply with above		
		fine 0.075	SM	Silty sands, sand silt mixtures (1)	12-50	Below 'A' line or PI<4	—	—	
			SC	Clayey sands, sand-clay mixtures (1)	12-50	Above 'A' line and PI>7	—	—	
FINE GRAINED SOILS (more than half of material less than 63 mm is smaller than 0.075 mm)	SILTS & CLAYS (Liquid Limit ≤50%)		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity	Use the gradation curve of material passing 63 mm for classification of fractions according to the criteria given in 'Major Divisions'				
			CL CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays					
			OL	Organic silts and clays of low plasticity					
	SILTS & CLAYS (Liquid Limit >50%)		MH	Inorganic silts, mic- aceous or dlato-maceous fine sands or silts, elastic silts					
			CH	Inorganic clays of high plasticity, fat clays					
			OH	Organic silts and clays of high plasticity					
	HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils					



Geotechnical Terms and Symbols

Soil Colour: Is described in the moist condition using black, white, grey, red, brown, orange, yellow, green or blue. Borderline cases can be described as a combination of two colours, with the weaker followed by the stronger. Modifiers such as pale, dark or mottled, can be used as necessary. Where colour consists of a primary colour with secondary mottling, it should be described as follows:

(Primary) mottled (Secondary). Refer to AS 1726-1993, A2.4 and A3.3.

Soil Moisture Condition: Is based on the appearance and feel of soil. Refer to AS 1726-1993, A2.5.

Term	Description
Dry	Cohesive soils; hard and friable or powdery, well dry of plastic limit. Granular soils; cohesionless and free-running.
Moist	Soil feels cool, darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.
Wet	Soil feels cool, darkened in colour. Cohesive soils usually weakened and free water forms on hands when handling. Granular soils tend to cohere and free water forms on hands when handling.

Consistency of Cohesive Soils: May be estimated using simple field tests, or described in terms of a strength scale. In the field, the undrained shear strength (s_u) can be assessed using a simple field tool appropriate for cohesive soils, in conjunction with the relevant calibration. Refer to AS 1726-1993, Table A4.

Consistency - Essentially Cohesive Soils					
Term	Field Guide	Symbol	SPT "N" Value	Undrained Shear Strength c_u (kPa)	Unconfined Compressive Strength q_u (kPa)
Very soft	Oozes between fingers when squeezed in hand.	VS	0-2	<12	<25
Soft	Easily moulded with fingers.	S	2-4	12-25	25-50
Firm	Can be moulded by strong pressure of fingers.	F	4-8	25-50	50-100
Stiff	Not possible to mould with fingers.	St	8-15	50-100	100-200
Very stiff		VSt	15-30	100-200	200-400
Hard	Can be indented with difficulty by thumb nail.	H	>30	>200	>400

Note: SPT - N to q_u correlation from Terzaghi and Peck, 1967. (General guide only).

Soil Particle Sizes	
Term	Size Range
BOULDERS	>200 mm
COBBLES	63-200 mm
Coarse GRAVEL	20-63 mm
Medium GRAVEL	6-20 mm
Fine GRAVEL	2.36-6 mm
Coarse SAND	0.6-2.36 mm
Medium SAND	0.2-0.6 mm
Fine SAND	0.075-0.2 mm
SILT	0.002-0.075 mm
CLAY	<0.002 mm

Consistency of Non-Cohesive Soils: Is described in terms of the density index, as defined in AS 1289.0-2000. This can be assessed using a field tool appropriate for non-cohesive soils, in conjunction with the relevant calibration. Refer to AS 1726-1993, Table A5; BS5930-1999, p117.

Consistency - Essentially Non-Cohesive Soils				
Term	Symbol	SPT N Value	Field Guide	Density Index (%)
Very loose	VL	0-4	Foot imprints readily	0-15
Loose	L	4-10	Shovels Easily	15-35
Medium dense	MD	10-30	Shovelling difficult	35-65
Dense	D	30-50	Pick required	65-85
Very dense	VD	>50	Picking difficult	85-100

Standard Penetration Test (SPT): Refer to. AS 1289.6.3.1-2004. Example report formats for SPT results are shown below:

Test Report	Penetration Resistance (N)	Explanation / Comment
4, 7, 11	N=18	Full penetration; N is reported on engineering borehole log
18, 27, 32	N=59	Full penetration; N is reported on engineering borehole log
4, 18, 30/15 mm	N is not reported	30 blows causes less than 100 mm penetration (3rd interval) – test discontinued
30/80 mm	N is not reported	30 blows causes less than 100 mm penetration (1st interval) – test discontinued
rw	N<1	Rod weight only causes full penetration
hw	N<1	Hammer and rod weight only causes full penetration
hb	N is not reported	Hammer bouncing for 5 consecutive blows with no measurable penetration – test discontinued

Rock Descriptions

Refer to AS 1726-1993 (Appendix A3.3) for the description and classification of rock material composition, including:

(a) Rock type (Table A5, (a) and (b))
(b) Grain size
(c) Texture and fabric
(d) Colour (describe as per soil).

The condition of a rock material refers to its weathering characteristics, strength characteristics and rock mass properties. Refer to AS 1726-1993 (Appendix A3 Tables A8, A9 and A10).

Weathering Condition (Degree of Weathering):

The degree of weathering is a continuum from fresh rock to soil. Boundaries between weathering grades may be abrupt or gradational.

Rock Material Weathering Classification		
Weathering Grade	**Symbol**	**Definition**
Residual Soil	RS	Soil-like material developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the material has not been significantly transported.
Extremely Weathered Rock	XW	Rock is weathered to such an extent that it has 'soil' properties, i.e. it either disintegrates or can be remoulded in water, but substance fabric and rock structure still recognisable.
Highly Weathered Rock	HW	Strong discolouration is evident throughout the rock mass, often with significant change in the constituent minerals. The intact rock strength is generally much weaker than that of the fresh rock.
Moderately Weathered Rock	MW	Modest discolouration is evident throughout the rock fabric, often with some change in the constituent minerals. The intact rock strength is usually noticeably weaker than that of the fresh rock.
Slightly Weathered Rock	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh Rock	FR	Rock shows no sign of decomposition or staining.

Notes:
1. Minor variations within broader weathering grade zones will be noted on the engineering borehole logs.
2. Extremely weathered rock is described in terms of soil engineering properties.
3. Weathering may be pervasive throughout the rock mass, or may penetrate inwards from discontinuities to some extent.
4. The 'Distinctly Weathered (DW)' class as defined in AS 1726-1993 is divided to incorporate HW and MW in the above table. The symbol DW should not be used.

Strength Condition (Intact Rock Strength):

Strength of Rock Material (Based on Point Load Strength Index, corrected to 50 mm diameter – $I_{s(50)}$. Field guide used if no tests available. Refer to AS 4133.4.1-2007.				
Term	**Symbol**	**Point Load Index (MPa)** $I_{s(50)}$		**Field Guide to Strength**
Extremely Low	EL	≤0.03		Easily remoulded by hand to a material with soil properties.
Very Low	VL	>0.03	≤0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 3 cm thick can be broken by finger pressure.
Low	L	>0.1	≤0.3	Easily scored with a knife; indentations 1 mm to 3 mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150 mm long by 50 mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium	M	>0.3	≤1.0	Readily scored with a knife; a piece of core 150 mm long by 50 mm diameter can be broken by hand with difficulty.
High	H	>1	≤3	A piece of core 150 mm long by 50 mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very High	VH	>3	≤10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
Extremely High	EH	>10		Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

Notes:
1. These terms refer to the strength of the rock material and not to the strength of the rock mass which may be considerably weaker due to the effect of rock defects.
2. Anisotropy of rock material samples may affect the field assessment of strength.

Geotechnical Terms and Symbols

Discontinuity Description: Refer to AS 1726-1993, Table A10.

Anisotropic Fabric	
BED	Bedding
FOL	Foliation
LIN	Mineral lineation
Defect Type	
LP	Lamination Parting
BP	Bedding Parting
FP	Cleavage / Foliation Parting
J, Js	Joint, Joints
SZ	Sheared Zone
CZ	Crushed Zone
BZ	Broken Zone
HFZ	Highly Fractured Zone
AZ	Alteration Zone
VN	Vein

Roughness (e.g. Planar, Smooth is abbreviated Pl / Sm)		Class
Stepped (Stp)	Rough or Irregular (Ro)	I
	Smooth (Sm)	II
	Slickensided (Sl)	III
Undulating (Un)	Rough (Ro)	IV
	Smooth (Sm)	V
	Slickensided (Sl)	VI
Planar (Pl)	Rough (Ro)	VII
	Smooth (Sm)	VIII
	Slickensided (Sl)	IX

Aperture		Infilling		
Closed	CD	No visible coating or infil	Clean	Cn
Open	OP	Surfaces discoloured by mineral/s	Stain	St
Filled	FL	Visible mineral or soil infill <1mm	Veneer	Vr
Tight	TI	Visible mineral or soil infill >1mm	Coating	Ct

Other	
Cly	Clay
Fe	Iron
Co	Coal
Carb	Carbonaceous
Sinf	Soil Infill Zone
Qz	Quartz
CA	Calcite
Chl	Chlorite
Py	Pyrite
Int	Intersecting
Inc	Incipient
DI	Drilling Induced
H	Horizontal
V	Vertical

Note: Describe 'Zones' and 'Coatings' in terms of composition and thickness (mm).

Discontinuity Spacing: On the geotechnical borehole log, a graphical representation of defect spacing vs depth is shown. This representation takes into account all the natural rock defects occurring within a given depth interval, excluding breaks induced by the drilling / handling of core. Refer to AS 1726-1993, BS5930-1999.

Defect Spacing			Bedding Thickness (Sedimentary Rock Stratification)	
Spacing/Width (mm)	Descriptor	Symbol	Descriptor	Spacing/Width (mm)
			Thinly Laminated	< 6
<20	Extremely Close	EC	Thickly Laminated	6 – 20
20 – 60	Very Close	VC	Very Thinly Bedded	20 – 60
60 – 200	Close	C	Thinly Bedded	60 – 200
200 – 600	Medium	M	Medium Bedded	200 – 600
600 – 2000	Wide	W	Thickly Bedded	600 – 2000
2000 – 6000	Very Wide	VW	Very Thickly Bedded	> 2000
>6000	Extremely Wide	EW		

Defect Spacing in 3D	
Term	Description
Blocky	Equidimensional
Tabular	Thickness much less than length or width
Columnar	Height much greater than cross section

Defect Persistence (areal extent)
Trace length of defect given in metres

Symbols

The list below provides an explanation of terms and symbols used on the geotechnical borehole, test pit and penetrometer logs.

Test Results			
PI	Plasticity Index	c'	Effective Cohesion
LL	Liquid Limit	c_u	Undrained Cohesion
LI	Liquidity Index	c'_R	Residual Cohesion
DD	Dry Density	ϕ'	Effective Angle of Internal Friction
WD	Wet Density	ϕ_u	Undrained Angle of Internal Friction
LS	Linear Shrinkage	ϕ'_R	Residual Angle of Internal Friction
MC	Moisture Content	c_v	Coefficient of Consolidation
OC	Organic Content	m_v	Coefficient of Volume Compressibility
WPI	Weighted Plasticity Index	c_{vs}	Coefficient of Secondary Compression

Test Symbols	
DCP	Dynamic Cone Penetrometer
SPT	Standard Penetration Test
CPTu	Cone Penetrometer (Piezocone) Test
PANDA	Variable Energy DCP
PP	Pocket Penetrometer Test
U50	Undisturbed Sample 50 mm (nominal diameter)
U100	Undisturbed Sample 100mm (nominal diameter)
UCS	Uniaxial Compressive Strength
Pm	Pressuremeter

Geotechnical Terms and Symbols

Test Results			
WLS	Weighted Linear Shrinkage	e	Voids Ratio
DoS	Degree of Saturation	ϕ'_{cv}	Constant Volume Friction Angle
APD	Apparent Particle Density	q_c / q_t	Piezocone Tip Resistance (corrected / uncorrected)
s_u	Undrained Shear Strength	q_d	PANDA Cone Resistance
q_u	Unconfined Compressive Strength	$I_{s(50)}$	Point Load Strength Index
R	Total Core Recovery	*RQD*	Rock Quality Designation

Test Symbols	
FSV	Field Shear Vane
DST	Direct Shear Test
PR	Penetration Rate
A	Point Load Test (axial)
D	Point Load Test (diametral)
L	Point Load Test (irregular lump)

28/11/13 Groundwater level on the date shown	Water Inflow	Water Outflow

eastwest
geo ag enviro

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t 02 6762 1733
f 02 6765 9109
abn 82 125 442 382
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ANALYSIS REPORT SOIL

PROJECT NO: EW241079		**Date of Issue:**	**23/05/2024**
Customer:	EUROFINS MELBOURNE	Report No:	1
Address:	6 Monterey Road DANDENONG SOUTH VIC 3175	Date Received:	16/05/2024
		Matrix:	Soil
Attention:	Savini Suduweli	Location:	1095997
Phone:	03 8564 5000	Sampler ID:	Client
Fax:		Date of Sampling:	9/05/2024
Email:	enviroreportsAU@eurofins.com	Sample Condition:	Acceptable

Comments:
3a = severe dispersion of the remould. 3b = moderate to slight dispersion of the remould.

Results apply to the samples as submitted. All pages of this report have been checked and approved for release.

Signed: Anne Michie

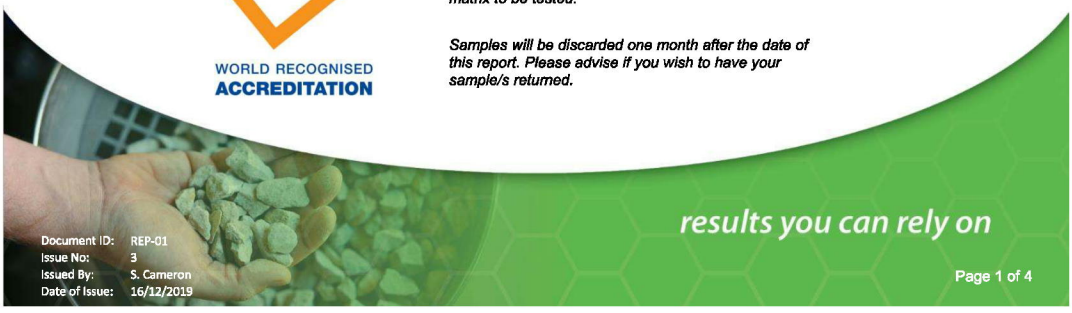
NATA

WORLD RECOGNISED ACCREDITATION

NATA Accredited Laboratory 12360
Accredited for compliance with ISO/IEC 17025 - Testing

This analysis relates to the sample submitted and it is the client's responsibility to make certain the sample is representative of the matrix to be tested.

Samples will be discarded one month after the date of this report. Please advise if you wish to have your sample/s returned.



Document ID: REP-01
Issue No: 3
Issued By: S. Cameron
Date of Issue: 16/12/2019

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ANALYSIS REPORT

PROJECT NO: EW241079 **Location: 1095997**

				CLIENT SAMPLE ID	24-My0030751	24-My0030752	24-My0030753	24-My0030754
				DEPTH	BH01 0.5M	BH02 0.5M	BH02 1.0M	BH03 0.5M
Test Parameter	Method Description	Method Reference	Units	LOR	241079-1	241079-2	241079-3	241079-4
Emerson Aggregate Test	Class	PMS-21	Number	na	3b	7	3a	7

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ANALYSIS REPORT

PROJECT NO: EW241079 **Location: 1095997**

					CLIENT SAMPLE ID	24-My0030755	24-My0030756	24-My0030757	24-My0030758
					DEPTH	BH04 0.5M	BH04 1.0M	BH05 0.5M	BH05 1.0M
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**		**241079-5**	**241079-6**	**241079-7**	**241079-8**
Emerson Aggregate Test	Class	PMS-21	Number	na		3b	3a	3b	3b

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ANALYSIS REPORT

PROJECT NO: EW241079 **Location: 1095997**

				CLIENT SAMPLE ID	24-My0030759	24-My0030760		
				DEPTH	BH06 0.5M	BH06 1.0M		
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**241079-9**	**241079-10**		
Emerson Aggregate Test	Class	PMS-21	Number	na	7	3b		

This Analysis Report shall not be reproduced except in full without the written approval of the laboratory.
Soils are air dried at 40°C and ground <2mm.
NB: LOR is the Lowest Obtainable Reading.

DOCUMENT END

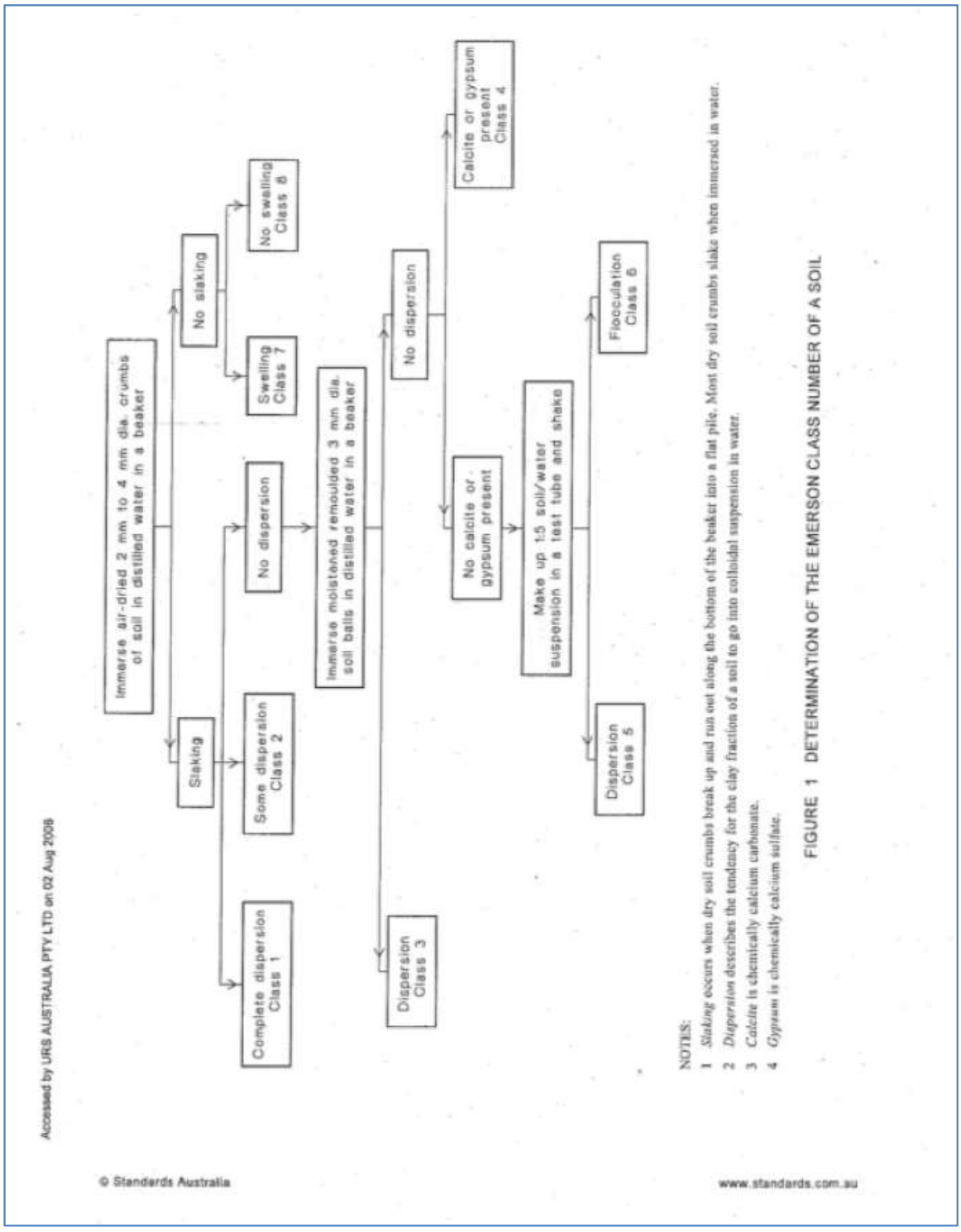

FIGURE 1 DETERMINATION OF THE EMERSON CLASS NUMBER OF A SOIL

DISPERSION SUBCLASSES FOR TYPE 2 AND 3 AGGREGATES

1	Slight milkiness
2	Obvious milkiness, less than 50% of the aggregate affected
3	Obvious milkiness, greater than 50% of the aggregate affected
4	Total dispersion leaving only sand grains

Note: Class 2 (4) is equivalent to Class 1.

SLAKING

In situations where the degree of slaking is considered important, a slaking subclass is allowed:

0	No change
1	Aggregate breaks open but remains intact
2	Aggregate breaks down into smaller aggregates
3	Aggregate breaks down completely into sand grains

Appendix 3 Extracts from EPA Publication 960

Control Measure	Soil Type			Flow Type			Erosion and Sediment Control Type				Cost		
	Course	Fine	Dispersive	Sheet	Concentrated	In Stream	Diverts Run-off	Protects Soil Surface	Reduces Run-off Velocity	Filters /Settles Sediment	Installation	Maintenance	Lifecycle
Lined channel down slope water diversion	S	S	S	US	S	US	VH	VH	N	N	H	M	M/H
Energy dissipater	S	S	S	US	S	US	H	H	VH	L	M/H	M	M
Retain existing vegetation	S	S	S	S	S	S	N	VH	H	M	N	N	N
Temporary fence areas of retained vegetation	S	S	S	S	S	S	N	VH	H	M	M	L/M	M

S= Suitable, S*= Limited Performance, U= Unsuitable

N=Negligible, L= Low, M= Moderate, H= High, VH= Very High, N/A= Not Applicable

4-5 Performance Summary of Environmental Protection Measures for Erosion and Sediment Management (cont.)

Control Measure	Soil Type			Flow Type			Erosion and Sediment Control Type				Cost		
	Course	Fine	Dispersive	Sheet	Concentrated	In Stream	Diverts Run-off	Protects Soil Surface	Reduces Run-off Velocity	Filters /Settles Sediment	Installation	Maintenance	Lifecycle
Erosion prevention cont.													
Stabilisation matting	S	S	S	S	S	US	N	VH	L/M	L	H	L/M	M/H
Grassing- hand sown	S	S	S	S	S *establish prior to flow	US	N	M/H	M/H	L/M	M/H	L/M	M
Grassing- hydroseeding	S	S	S	S	S *establish prior to flow	US	N	M/H	M/H	L/M	H/VH	L	H
Grassing- hydromulching	S	S	S	S	S *establish prior to flow	US	N	H/VH	M/H	L/M	VH	L	H/VH
Mulch	S	S	US	S	US	US	N	H/VH	M/H	L	H/VH	L	H

Control Measure	Soil Type			Flow Type			Erosion and Sediment Control Type				Cost		
	Course	Fine	Dispersive	Sheet	Concentrated	In Stream	Diverts Run-off	Protects Soil Surface	Reduces Run-off Velocity	Filters /Settles Sediment	Installation	Maintenance	Lifecycle
Progressive revegetation	S	S	S	S	S	S	N	VH	M/H	L/M	N	L*only if damaged	N
Rock armouring	S	S	S* With Geotextile	S	S	S	N	VH	H	M/H	H	M	M/H
Ripping smooth soil surfaces	S	S*	US	S	US	US	N	N	M	L	M	M	M

S= Suitable, S*= Limited Performance, U= Unsuitable

N= Negligible, L= Low, M= Moderate, H= High, VH= Very High, N/A= Not Applicable

4.5 Performance Summary of Environmental Protection Measures for Erosion and Sediment Management (cont.)

Control Measure	Soil Type			Flow Type			Erosion and Sediment Control Type				Cost		
	Course	Fine	Dispersive	Sheet	Concentrated	In Stream	Diverts Run-off	Protects Soil Surface	Reduces Run-off Velocity	Filters /Settles Sediment	Installation	Maintenance	Lifecycle
Sediment retention structures													
Straw bales	S	S*	US	S	US	US	L/M	N	L/M	M	M/H	M/H	M/H
Silt fence	S	S*	US	S	US	US	L	N	L	M	M	M	M
Grass filter strip	S	S*	US	S	S	US	N	N	M/H	M	N	L/M	L
Straw bale/ silt fence sediment trap	S	S*	US	S	S	US	M	N	M/H	M/H	M/H	M/H	M/H
Rock groyne/ bund	S	S*	US	S	S	S*	N	N	H	M/H	M/H	M	M
Coir logs	S	S*	US	S	S	US	M	N	H	M	H/VH	L/M	M

Control Measure	Soil Type			Flow Type			Erosion and Sediment Control Type				Cost		
	Course	Fine	Dispersive	Sheet	Concentrated	In Stream	Diverts Run-off	Protects Soil Surface	Reduces Run-off Velocity	Filters /Settles Sediment	Installation	Maintenance	Lifecycle
Synthetic straw bale replacements and logs	S	S*	US	S	S	S*	N	N	H	M/H	H/VH	L/M	M
Straw bale and stone sediment trap	S	S*	US	S	S	US	N	N	M	M	M/H	M	M
Silt fence sediment trap	S	S*	US	S	S	US	N	N	L	M	M	M	M
Sediment basin	S	S*	US	S	S	US	N	N	H	H	VH	H	VH
Floating silt curtain	S	S*	US	US	US	S	N	N	N	M/H	H	L	M/H

S= Suitable, S*= Limited Performance, U= Unsuitable

N= Negligible, L= Low, M= Moderate, H= High, VH= Very High, N/A= Not Applicable

4.5 Performance Summary of Environmental Protection Measures for Erosion and Sediment Management (cont.)

Control Measure	Soil Type			Flow Type			Erosion and Sediment Control Type				Cost		
	Course	Fine	Dispersive	Sheet	Concentrated	In Stream	Diverts Run-off	Protects Soil Surface	Reduces Run-off Velocity	Filters /Settles Sediment	Installation	Maintenance	Lifecycle
Synthetic composite silt curtain	S	S*	S*	US	US	S	N	N	N	M/H	H	L	M/H
Sediment retention structure (cont).													
Synthetic composite standpipe filter	S	S*	S*	N/A	N/A	N/A	N	N	N	M/H	M/H	L	M
Sandbag sediment barrier	S	US	US	US	S	US	N	N	M	L/M	L/M	L/M	L/M
Gravel sausage	S	S*	US	US	S	US	N	N	M	M	L/M	L/M	L/M
Block and gravel kerb inlet filter	S	US	US	US	S	US	N	N	N	M	M	L/M	M

EPA Victoria

Control Measure	Soil Type			Flow Type			Erosion and Sediment Control Type				Cost		
	Course	Fine	Dispersive	Sheet	Concentrated	In Stream	Diverts Run-off	Protects Soil Surface	Reduces Run-off Velocity	Filters /Settles Sediment	Installation	Maintenance	Lifecycle
Sediment Retention Structure (cont.)													
Silt fence under grate	S	S*	US	S	S	US	N	N	N	M	L	M/H	M
Temporary pit lid	S	S*	US	S	S	US	N	N	N	M/H	M/H	L/M	M
Silt fence drop inlet protection	S	S*	US	S	US	US	N	N	N	M	L/M	M	M
Straw bale drop inlet protection	S	S*	US	S	S*	US	N	N	N	M	L/M	M/H	M
Straw bale and silt fence drop inlet protection	S	S*	US	S	S	US	N	N	N	M/H	L/M	M	M

S= Suitable, S*= Limited Performance, U= Unsuitable

N= Negligible, L= Low, M= Moderate, H= High, VH= Very High, N/A= Not Applicable

4.5 Performance Summary of Environmental Protection Measures for Erosion and Sediment Management (cont.)

Control Measure	Soil Type			Flow Type			Erosion and Sediment Control Type				Cost		
	Course	Fine	Dispersive	Sheet	Concentrated	In Stream	Diverts Run-off	Protects Soil Surface	Reduces Run-off Velocity	Filters /Settles Sediment	Installation	Maintenance	Lifecycle
Mesh and aggregate drop inlet protection	S	US	US	S	US	US	N	N	N	M	L/M	M	M
Culvert entry gravel filter	S	US	US	S	S	US	N	N	N	M	L/M	M	M
Silt filter bung	S	S	S*	S	S	US	N	N	N	H/VH	M	L/M	M
Keeping mud off roads													
Minimise number of access points	S	S	S	N/A	N/A	N/A	N	N	N	N	N	N	N
Minimise wet weather vehicle access	S	S	S	N/A	N/A	N/A	N	N	N	N	L	L	L

EPA Victoria

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Control Measure	Soil Type			Flow Type			Erosion and Sediment Control Type				Cost		
	Course	Fine	Dispersive	Sheet	Concentrated	In Stream	Diverts Run-off	Protects Soil Surface	Reduces Run-off Velocity	Filters /Settles Sediment	Installation	Maintenance	Lifecycle
Rumble grid	S	S*	S*	N/A	N/A	N/A	N	N	N	N	VH	M	H
Gravel access point	S	S*	S*	N/A	N/A	N/A	N	N	N	N	VH	M	H
Physical scrape of material from Vehicles	S*	S*	S*	N/A	N/A	N/A	N	N	N	N	M/L	VH	M/H
Street sweeper	S	S*	S*	N/A	N/A	N/A	N	N	N	N	N/A	H	H
Dewatering Controls													

S= Suitable, S*= Limited Performance, U= Unsuitable

N= Negligible, L= Low, M= Moderate, H= High, VH= Very High, N/A= Not Applicable

4-5 Performance Summary of Environmental Protection Measures for Erosion and Sediment Management (cont.)

Control Measure	Soil Type			Flow Type			Erosion and Sediment Control Type				Cost		
	Course	Fine	Dispersive	Sheet	Concentrated	In Stream	Diverts Run-off	Protects Soil Surface	Reduces Run-off Velocity	Filters /Settles Sediment	Installation	Maintenance	Lifecycle
Water quality monitoring- out sourced	S	S	S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	H/VH
Water quality monitoring-self sampled, processed by lab.	S	S	S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	H
Water quality monitoring- self sampled and processed	S	S	S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	M
Pump sacks	S	S*	US	N/A	N/A	N/A	N	N	N	H	M	L/M	M
Flocculants	S	S	S	N/A	N/A	N/A	N	N	N	VH	N/A	N/A	M/H
Settling tanks	S	S*	US	N/A	N/A	N/A	N	N	N	M	H/VH	M	H

S= Suitable, S*= Limited Performance, U= UnsuitableN= Negligible, L= Low, M= Moderate, H= High, VH= Very High, N/A= Not Applicable

Table 7: Performance Summary of Environmental Protection Measures for Sediment and Erosion Management

EPA Victoria

Extracts From Australian Geomechanics Journals (2007)

PRACTICE NOTE GUIDELINES FOR LANDSLIDE RISK MANAGEMENT 2007

APPENDIX C: – QUALITATIVE TERMINOLOGY FOR USE IN ASSESSING RISK TO PROPERTY (CONTINUED)

QUALITATIVE RISK ANALYSIS MATRIX – LEVEL OF RISK TO PROPERTY

LIKELIHOOD		CONSEQUENCES TO PROPERTY (With Indicative Approximate Cost of Damage)				
	Indicative Value of Approximate Annual Probability	1: CATASTROPHIC 200%	2: MAJOR 60%	3: MEDIUM 20%	4: MINOR 5%	5: INSIGNIFICANT 0.5%
A – ALMOST CERTAIN	10^{-1}	VH	VH	H	H	M or L(5)
B – LIKELY	10^{-2}	VH	VH	H	M	L
C – POSSIBLE	10^{-3}	H	H	M	M	VL
D – UNLIKELY	10^{-4}	H	M	L	L	VL
E – RARE	10^{-5}	M	L	L	VL	VL
F – BARELY CREDIBLE	10^{-6}	L	VL	VL	VL	VL

Notes: (5) For Cell A5, may be subdivided such that a consequence of less than 0.1% is Low Risk.
(6) When considering a risk assessment it must be clearly stated whether it is for existing conditions or with risk control measures which may not be implemented at the current time.

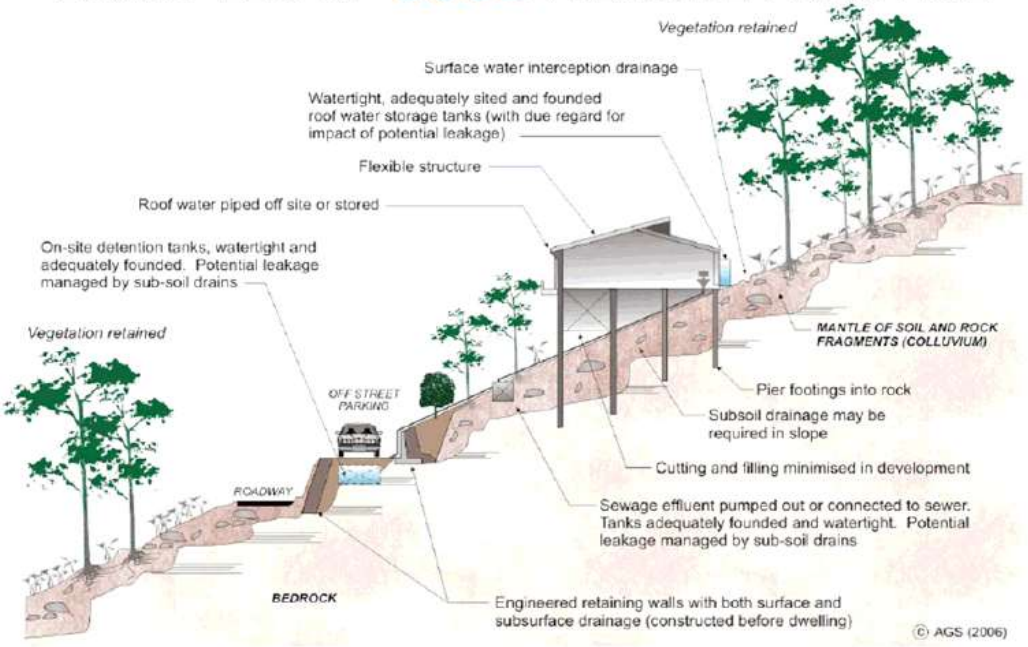
RISK LEVEL IMPLICATIONS

Risk Level		Example Implications (7)
VH	VERY HIGH RISK	Unacceptable without treatment. Extensive detailed investigation and research, planning and implementation of treatment options essential to reduce risk to Low; may be too expensive and not practical. Work likely to cost more than value of the property.
H	HIGH RISK	Unacceptable without treatment. Detailed investigation, planning and implementation of treatment options required to reduce risk to Low. Work would cost a substantial sum in relation to the value of the property.
M	MODERATE RISK	May be tolerated in certain circumstances (subject to regulator's approval) but requires investigation, planning and implementation of treatment options to reduce the risk to Low. Treatment options to reduce to Low risk should be implemented as soon as practicable.
L	LOW RISK	Usually acceptable to regulators. Where treatment has been required to reduce the risk to this level, ongoing maintenance is required.
VL	VERY LOW RISK	Acceptable. Manage by normal slope maintenance procedures.

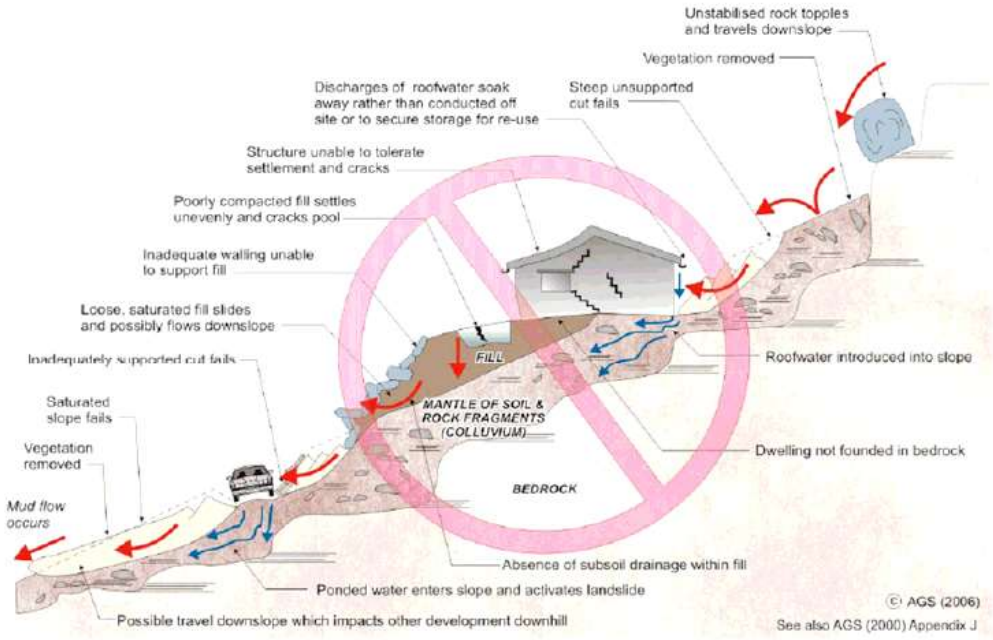
Note: (7) The implications for a particular situation are to be determined by all parties to the risk assessment and may depend on the nature of the property at risk; these are only given as a general guide.

PRACTICE NOTE GUIDELINES FOR LANDSLIDE RISK MANAGEMENT 2007

EXAMPLES OF GOOD HILLSIDE PRACTICE



EXAMPLES OF POOR HILLSIDE PRACTICE



PRACTICE NOTE GUIDELINES FOR LANDSLIDE RISK MANAGEMENT 2007

APPENDIX G - SOME GUIDELINES FOR HILLSIDE CONSTRUCTION

	GOOD ENGINEERING PRACTICE	*POOR ENGINEERING PRACTICE*
ADVICE		
GEOTECHNICAL ASSESSMENT	Obtain advice from a qualified, experienced geotechnical practitioner at early stage of planning and before site works.	Prepare detailed plan and start site works before geotechnical advice.
PLANNING		
SITE PLANNING	Having obtained geotechnical advice, plan the development with the risk arising from the identified hazards and consequences in mind.	Plan development without regard for the Risk.
DESIGN AND CONSTRUCTION		
HOUSE DESIGN	Use flexible structures which incorporate properly designed brickwork, timber or steel frames, timber or panel cladding. Consider use of split levels. Use decks for recreational areas where appropriate.	Floor plans which require extensive cutting and filling. Movement intolerant structures.
SITE CLEARING	Retain natural vegetation wherever practicable.	Indiscriminately clear the site.
ACCESS & DRIVEWAYS	Satisfy requirements below for cuts, fills, retaining walls and drainage. Council specifications for grades may need to be modified. Driveways and parking areas may need to be fully supported on piers.	Excavate and fill for site access before geotechnical advice.
EARTHWORKS	Retain natural contours wherever possible.	Indiscriminatory bulk earthworks.
CUTS	Minimise depth. Support with engineered retaining walls or batter to appropriate slope. Provide drainage measures and erosion control.	Large scale cuts and benching. Unsupported cuts. Ignore drainage requirements
FILLS	Minimise height. Strip vegetation and topsoil and key into natural slopes prior to filling. Use clean fill materials and compact to engineering standards. Batter to appropriate slope or support with engineered retaining wall. Provide surface drainage and appropriate subsurface drainage.	Loose or poorly compacted fill, which if it fails, may flow a considerable distance including onto property below. Block natural drainage lines. Fill over existing vegetation and topsoil. Include stumps, trees, vegetation, topsoil, boulders, building rubble etc in fill.
ROCK OUTCROPS & BOULDERS	Remove or stabilise boulders which may have unacceptable risk. Support rock faces where necessary.	Disturb or undercut detached blocks or boulders.
RETAINING WALLS	Engineer design to resist applied soil and water forces. Found on rock where practicable. Provide subsurface drainage within wall backfill and surface drainage on slope above. Construct wall as soon as possible after cut/fill operation.	Construct a structurally inadequate wall such as sandstone flagging, brick or unreinforced blockwork. Lack of subsurface drains and weepholes.
FOOTINGS	Found within rock where practicable. Use rows of piers or strip footings oriented up and down slope. Design for lateral creep pressures if necessary. Backfill footing excavations to exclude ingress of surface water.	Found on topsoil, loose fill, detached boulders or undercut cliffs.
SWIMMING POOLS	Engineer designed. Support on piers to rock where practicable. Provide with under-drainage and gravity drain outlet where practicable. Design for high soil pressures which may develop on uphill side whilst there may be little or no lateral support on downhill side.	
DRAINAGE		
SURFACE	Provide at tops of cut and fill slopes. Discharge to street drainage or natural water courses. Provide general falls to prevent blockage by siltation and incorporate silt traps. Line to minimise infiltration and make flexible where possible. Special structures to dissipate energy at changes of slope and/or direction.	Discharge at top of fills and cuts. Allow water to pond on bench areas.
SUBSURFACE	Provide filter around subsurface drain. Provide drain behind retaining walls. Use flexible pipelines with access for maintenance. Prevent inflow of surface water.	Discharge roof runoff into absorption trenches.
SEPTIC & SULLAGE	Usually requires pump-out or mains sewer systems; absorption trenches may be possible in some areas if risk is acceptable. Storage tanks should be water-tight and adequately founded.	Discharge sullage directly onto and into slopes. Use absorption trenches without consideration of landslide risk.
EROSION CONTROL & LANDSCAPING	Control erosion as this may lead to instability. Revegetate cleared area.	Failure to observe earthworks and drainage recommendations when landscaping.
DRAWINGS AND SITE VISITS DURING CONSTRUCTION		
DRAWINGS	Building Application drawings should be viewed by geotechnical consultant	
SITE VISITS	Site Visits by consultant may be appropriate during construction/	
INSPECTION AND MAINTENANCE BY OWNER		
OWNER'S RESPONSIBILITY	Clean drainage systems; repair broken joints in drains and leaks in supply pipes. Where structural distress is evident see advice. If seepage observed, determine causes or seek advice on consequences.	

Appendix 4 Terms and Conditions

Scope of Work
These Terms and Conditions apply to any services provided to you ("the Client") by Strata Geoscience and Environmental Pty Ltd ("Strata"). By continuing to instruct Strata to act after receiving the Terms and Conditions or not objecting to any of the Terms and Conditions the Client agrees to be bound by these Terms and Conditions, and any other terms and conditions supplied by Strata from time to time at Strata's sole and absolute discretion. The scope of the services provided to the Client by Strata is limited to the services and specified purpose agreed between Strata and the Client and set out in the correspondence to which this document is enclosed or annexed ("the Services"). Strata does not purport to advise beyond the Services.

Third Parties
The Services are supplied to the Client for the sole benefit of the Client and must not be relied upon by any person or entity other than the Client. Strata is not responsible or liable to any third party. All parties other than the Client are advised to seek their own advice before proceeding with any course of action.

Provision of Information
The Client is responsible for the provision of all legal, survey and other particulars concerning the site on which Strata is providing the Services, including particulars of existing structures and services and features for the site and for adjoining sites and structures. The Client is also responsible for the provision of specialised services not provided by Strata. If Strata obtains these particulars or specialised services on the instruction of the Client, Strata does so as agent of the Client and at the Client's expense. Strata is not obliged to confirm the accuracy and completeness of information supplied by the Client or any third party service provider. The Client is responsible for the accuracy and completeness of all particulars or services provided by the Client or obtained on the Client's behalf. Strata is not liable, and accepts no responsibility, for any claim, demand, charge, loss, damage, injury or expense whatsoever suffered by the Client or any other person or entity resulting from the failure of the Client or third party to provide accurate and complete information. In the event additional information becomes available to the Client, the Client must inform Strata in writing of that information as soon as possible. Further advice will be provided at the Client's cost. Any report is prepared on the assumption that the instructions and information supplied to Strata has been provided in good faith and is all of the information relevant to the provision of the Services by Strata. Strata is not liable, and accepts no responsibility, for any claim, demand, charge, loss, damage, injury or expense whatsoever if Strata has been supplied with insufficient, incorrect, incomplete, false or misleading information.

Integrity
Any report provided by Strata presents the findings of the site assessment. While all reasonable care is taken when conducting site investigations and reporting to the Client, Strata does not warrant that the information contained in any report is free from errors or omissions. Strata is not liable, and accepts no responsibility, for any claim, demand, charge, loss, damage, injury or expense whatsoever resulting from errors in a report. Any report should be read in its entirety, inclusive of any summary and annexures. Strata does not accept any responsibility where part of any report is relied upon without reference to the full report.

Project Specific Criteria
Any report provided by Strata will be prepared on the basis of unique project development plans which apply only to the site that is being investigated. Reports provided by Strata do not apply to any project other than that originally specified by the Client to Strata. The Report must not be used or relied upon if any changes to the project are made. The Client should engage Strata to further advise on the effect of any change to the project. Further advice will be provided at the Client's cost. Strata is not liable, and accepts no responsibility, for any claim, demand, charge, loss, damage, injury or expense whatsoever where any change to the project is made without obtaining a further written report from Strata. Changes to the project may include, but are not limited to, changes to the investigated site or neighbouring sites, for instance, variation of the location of proposed building envelopes/footprints, changes to building design which may impact upon building settlement or slope stability, or changes to earthworks, including removal (site cutting) or deposition of sediments or rock from the site.

Subsurface Variations with Time
Any report provided by Strata is based upon subsurface conditions encountered at the time of the investigation. Conditions can and do change significantly and unexpectedly over a short period of time. For example groundwater levels may fluctuate over time, affecting latent soil bearing capacity and ex-situ/insitu fill sediments may be placed/removed from the site. Changes to the subsurface conditions that were encountered at the time of the investigation void all recommendations made by Strata in any report. Strata is not liable, and accepts no responsibility, for any claim, demand, charge, loss, damage, injury or expense whatsoever resulting from any change to the subsurface conditions that were encountered at the time of the investigation. In the event of a delay in the commencement of a project or if additional information becomes available to the Client about a change in conditions

becomes available to the Client, the Client should engage Strata to make a further investigation to ensure that the conditions initially encountered still exist. Further advice will be provided at the Client's cost. Without limiting the generality of the above statement, Strata does not accept liability where any report is relied upon after three months from the date of the report, (unless otherwise provided in the report or required by the Australian Standard which the report purports to comply with), or the date when the Client becomes aware of any change in condition. Any report should be reviewed regularly to ensure that it continues to be accurate and further advice requested from Strata where applicable.

Interpretation
Site investigation identifies subsurface conditions only at the discrete points of geotechnical drilling, and at the time of drilling. All data received from the geotechnical drilling is interpreted to report to the Client about overall site conditions as well as their anticipated impact upon the specific project. Actual site conditions may vary from those inferred to exist as it is virtually impossible to provide a definitive subsurface profile which accounts for all the possible variability inherent in earth materials. This is particularly pertinent to some weathered sedimentary geologies or colluvial/alluvial clast deposits which may show significant variability in depth to refusal over a development area. Rock incongruities such as joints, dips or faults may also result in subsurface variability. Soil depths and composition can vary due to natural and anthopogenic processes. Variability may lead to differences between the design depth of bored/driven piers compared with the actual depth of individual piers constructed onsite. It may also affect the founding depth of conventional strip, pier and beam or slab footings, which may result in increased costs associated with excavation (particularly of rock) or materials costs of foundations. Founding surface inspections should be commissioned by the Client prior to foundation construction to verify the results of initial site characterisation. Strata is not liable, and accepts no responsibility, for any claim, demand, charge, loss, damage, injury or expense whatsoever resulting from any variation from the site conditions inferred to exist.

Strata is not responsible for the interpretation of site data or report findings by other parties, including parties involved in the design and construction process. The Client must seek advice from Strata about the interpretation of the site data or report.

Report Recommendations
Any report recommendations provided by Strata are only preliminary. A report is based upon the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until earthworks and/or foundation construction is almost complete. Where variations in conditions are encountered, Strata should be engaged to provide further advice. Further advice will be provided at the Client's cost. Strata is not liable, and accepts no responsibility, for any claim, demand, charge, loss, damage, injury or expense whatsoever if the results of selective point sampling are not indicative of actual conditions throughout an area or if the Client becomes aware of variations in conditions and does not engage Strata for further advice.

Geo-environmental Considerations
Where onsite wastewater site investigation and land application system designs are provided by Strata, reasonable effort will be made to minimise environmental risks associated with the disposal of effluent within site boundaries with respect to relevant Australian guidelines and industry best practise at the time of investigation. Strata is not liable, and accepts no responsibility, for any claim, demand, charge, loss, damage, injury or expense whatsoever resulting from changes to either the project or site conditions that affect the onsite wastewater land application system's ability to safely dispose of modelled wastewater flows.

Strata does not guarantee septic trench and bed design life beyond 10 years from installation, given the influence various household chemicals have on soil structural decline and premature trench failure in some soil types. Strata is not liable, and accepts no responsibility, for poor system performance where the Client cannot show that septic tanks have been de-sludged every three years or AWTS systems have been serviced in compliance with the manufacturer's recommendations. Strata is not liable, and accepts no responsibility, for any loss associated with the selection of inappropriate plants for irrigation areas. Strata is not liable, and accepts no responsibility, for any expense whatsoever or loss associated with modification of design works requested by the permit authority. Strata is not liable and accepts no responsibility for any loss or poor system performance where both interim and final inspections are not commissioned throughout system construction.

Strata does not consider site contamination, unless the Client specifically instructs Strata to consider the site contamination in writing. If a request is made by the Client to consider site contamination, Strata will provide additional terms and conditions that will apply to the engagement.

Copyright and Use of Documents
Copyright in all drawings, reports, specifications, calculations and other documents provided by Strata or its employees in connection with the Services remain vested in Strata. The Client has a licence to use the documents for the purpose of completing the project. However, the Client must not otherwise use the documents, make copies of the documents or amend the documents unless express approval in writing is given in advance by Strata. The Client must not publish or allow to be published, in whole or in part, any document provided by Strata or the name or professional affiliations of Strata, without first obtaining the written consent of Strata as to the form and context in which it is to appear.

If, during the course of providing the Services, Strata develops, discovers or first reduces to practice a concept, product or process which is capable of being patented then such concept, product or process is and remains the property of Strata and:

(a) the Client must not use, infringe or otherwise appropriate the same other than for the purpose of the project without first obtaining the written consent of Strata; and

(b) the Client is entitled to a royalty free licence to use the same during the life of the works comprising the project.

Digital Copies of Report

If any report is provided to the Client in an electronic copy except directly from Strata, the Client should verify the report contents with Strata to ensure they have not been altered or varied from the report provided by Strata.

6-lot subdivision, vegetation removal & carrying out of roadworks
Town Planning Report

7 Keys Court, Wy Yung

Client

Issued
29/5/2025

Beveridge Williams

Introduction

Beveridge Williams has been engaged by . . . to prepare and submit a planning permit application that seeks approval to subdivide its land at 7 Keys Court, Wy Yung into six lots. The proposed development will also lead to the 'presumed loss' of five native trees.

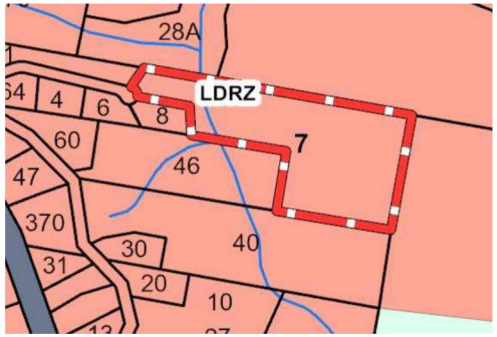
This report demonstrates that the proposed subdivision responds to the site's specific characteristics and is consistent with all relevant Planning Policies within the East Gippsland Planning Scheme.

Table 1 below provides an overview of the subject sites and the permit application.

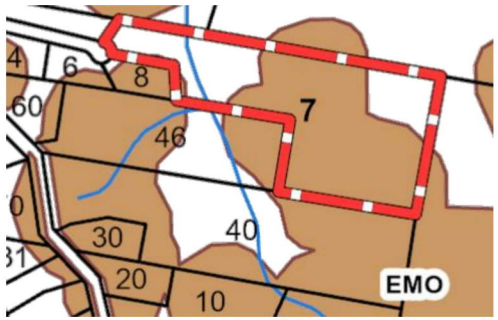
Table 1. Site & Application Details

Address	7 Keys Court, Wy Yung
Title Particulars	Lot 4 on Plan of Subdivision No. 840690K (Vol: 12375, Fol: 347) – see page 3.
Restrictions:	Section 173 agreement AV292985M, which does not prohibit the proposal and a 3m wide drainage easement in the northwest portion – see page 3.
Area & topography:	5.921 hectares formed in a flat irregular shape – see page 3.
Reticulated Services:	Water, electricity & telecommunications – see page 4.
Regional Growth Plan:	The site sits within the sub regional network formed around Bairnsdale & Paynesville in the Growth Plan. Bairnsdale is identified as a 'Regional Centre" in which Growth is 'Promoted' – see opposite
Zone:	Low Density Residential Zone (LDRZ) – see the Zoning map below.
Overlays:	Erosion Management – see the Overlay map below.
Heritage Sensitivity:	None – see the heritage sensitivity map below.
Permit Triggers:	**Clause 32.03-3**: A permit is required to subdivide land in the LDRZ. **Clause 44.01-2**: A permit is required to develop land affected by the EMO. **Clause 52.17-1**: A permit is required to remove native vegetation.
Responsible Authority:	East Gippsland Shire Council
Applicant:	
Applicant Contact:	Chris Curnow, Principal Town Planner - Beveridge Williams P: 5144 3877 E: curnowc@bevwill.com.au

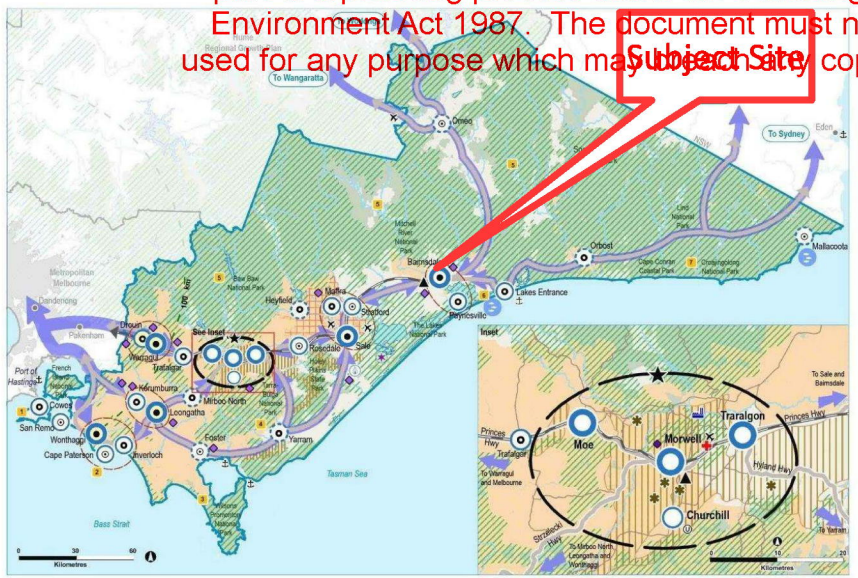
ZONING MAP



EROSION MANAGEMENT OVERLAY MAP



GIPPSLAND REGIONAL GROWTH PLAN



SETTLEMENTS

Regional city - Latrobe City* · Regional centre · Town · Small town

*Latrobe City is the grouping of Traralgon, Morwell, Moe and Churchill

Promote growth · Support growth · Sustainable change · Designated identified growth centre in Plan Melbourne(1)

Sub regional network · Areas within 100 km of central Melbourne · Melbourne's urban area

(1) Plan Melbourne (Chapter 6 – State of Cities) identifies Warragul/Drouin, Wonthaggi and Leongatha as peri-urban towns with potential to attract housing and population growth out of Melbourne

CONNECTIVITY AND TRANSPORT

Networks supporting movement and access · Potential freight and logistics precincts

Key road corridor · Key rail corridor · Arterial road (insert map only) · Airport · Port

ECONOMIC DEVELOPMENT

Food manufacturing hubs · Key agriculture and forestry land · Macalister Irrigation District

Brown coal reserves · Power station · Longford gas plant · Australian Paper Maryvale

Organic recycling facility · University · Hospital · Fishing port

STRATEGIC TOURISM INVESTMENT AREAS

1 Phillip Island · 2 Bunurong Coast · 3 Wilsons Promontory National Park · 4 Tarra-Bulga National Park

5 Australian Alps · 6 Gippsland Lakes · 7 Croajingolong National Park

ENVIRONMENT

Areas containing high value terrestrial habitat · Public land · Lakes · Rivers

Site Description

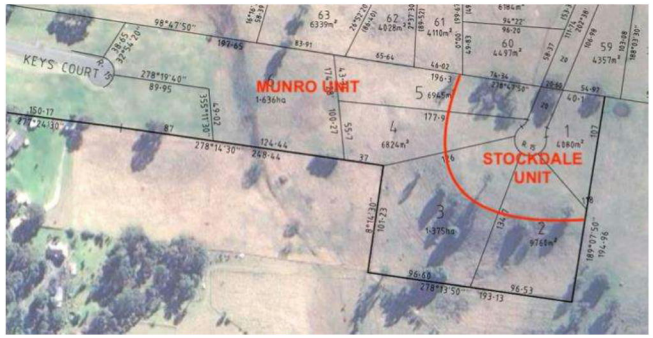
The subject site has area of 5.921 hectares formed in an irregular shape – see below. It is vacant of improvements, apart from post and wire fencing along its boundaries and drain under an easement in the northwest portion. Some scattered native trees are growing in the northeast and southwest portions of the land. It falls from an upper terrace in the northeast corner towards a north-south running gully that bisects the western portion of the land – see page 4. A geotechnical engineer has inspected the site and it shows no obvious signs of erosion or landslip.

Section 173 agreement AV292985m affects the land – see the title search statement below. This agreement sets requirements for installation of water tanks and secondary wastewater treatment systems for each lot.

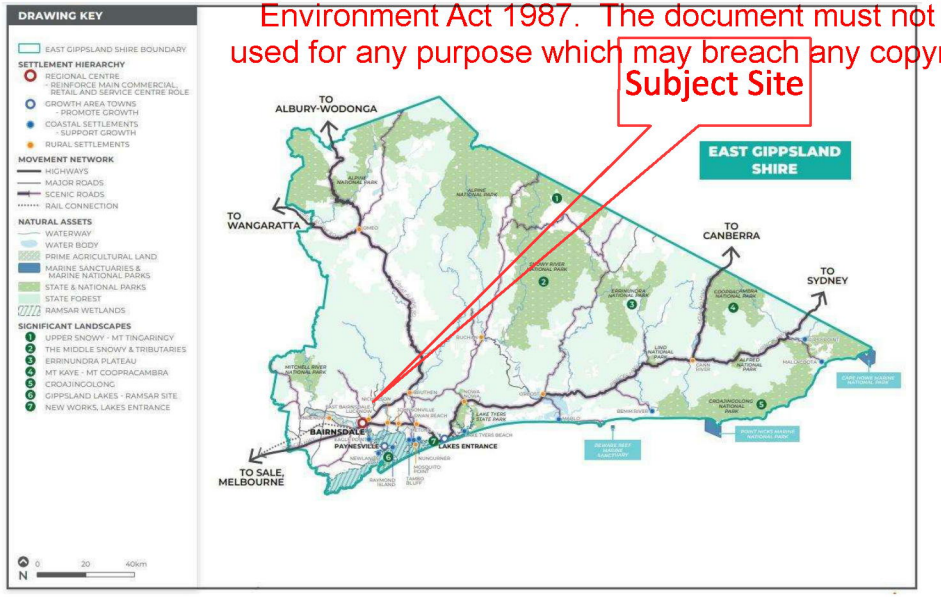
The property is not recognized as being 'Prime Agricultural Land', as shown opposite. The lower terrace, which covers the western portion of the land has soils from the 'Munro' unit, while the upper terrace has soils from the 'Stockdale' unit – see below.

A 3-metre wide drainage easement that is set aside in favour of Council runs around the western end of the northern perimeter to allow stormwater from the lot and Keys Court to discharge to the declared watercourse – see below.

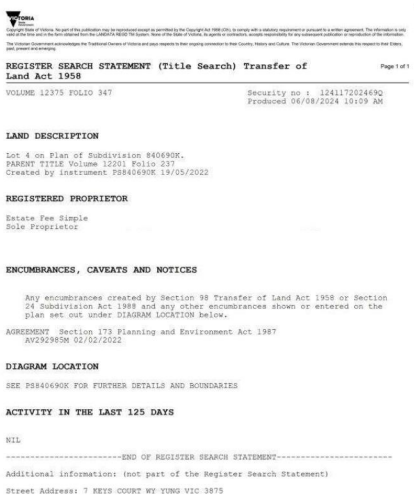
SOIL MAP (SOURCE: SLOPE & EROSION RISK ASSESSMENT)



EAST GIPPSLAND STRATEGIC FRAMEWORK PLAN



TITLE SEARCH STATEMENT



REGISTER SEARCH STATEMENT (Title Search) Transfer of Land Act 1958

VOLUME 12375 FOLIO 347 — Security no : 124117024690 Produced 06/08/2024 10:09 AM

LAND DESCRIPTION

Lot 4 on Plan of Subdivision 840690K.
PARENT TITLE Volume 12201 Folio 237
Created by instrument PS840690K 19/05/2022

REGISTERED PROPRIETOR

Estate Fee Simple
Sole Proprietor

ENCUMBRANCES, CAVEATS AND NOTICES

Any encumbrances created by Section 98 Transfer of Land Act 1958 or Section 24 Subdivision Act 1988 and any other encumbrances shown or entered on the plan set out under DIAGRAM LOCATION below.

AGREEMENT Section 173 Planning and Environment Act 1987
AV292985M 02/02/2022

DIAGRAM LOCATION

SEE PS840690K FOR FURTHER DETAILS AND BOUNDARIES

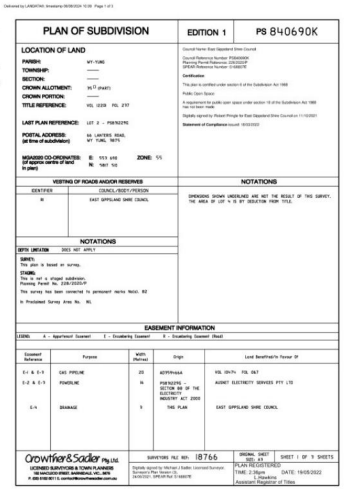
ACTIVITY IN THE LAST 125 DAYS

NIL

----------END OF REGISTER SEARCH STATEMENT----------

Additional information: (not part of the Register Search Statement)

Street Address: 7 KEYS COURT WY YUNG VIC 3875



PLAN OF SUBDIVISION — EDITION 1 — PS 840690K

LOCATION OF LAND
PARISH: WY YUNG
TOWNSHIP:
SECTION:
CROWN ALLOTMENT: 31 (PART)
CROWN PORTION:
TITLE REFERENCE: VOL 12220 FOL 237
LAST PLAN REFERENCE: LOT 2 - PS876270E
POSTAL ADDRESS: 56 LANTERS ROAD, WY YUNG, 3875
MGA2020 CO-ORDINATES: E: 553 690 N: 5861 50
ZONE: 55

VESTING OF ROADS AND/OR RESERVES
COUNCIL/BODY/PERSON: EAST GIPPSLAND SHIRE COUNCIL

NOTATIONS
DEPTH LIMITATION: DOES NOT APPLY
SURVEY: This plan is based on survey.
STAGING: This is not a staged subdivision. Planning Permit No. 226/2020/P
This survey has been connected to permanent marks No(s). 82 In Proclaimed Survey Area No. 91.

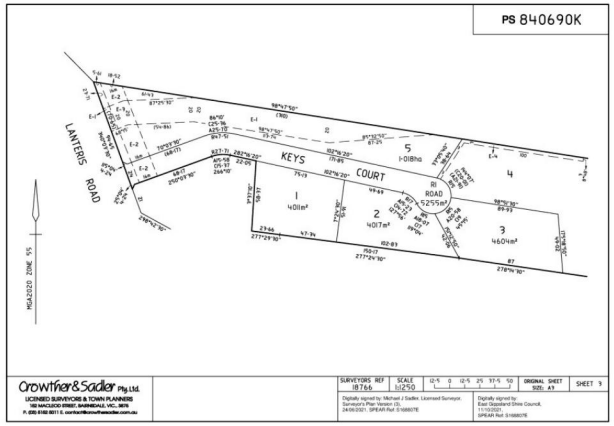
NOTATIONS
DIMENSIONS SHOWN UNDERLINED ARE NOT THE RESULT OF THIS SURVEY. THE AREA OF LOT 4 IS BY DEDUCTION FROM TITLE.

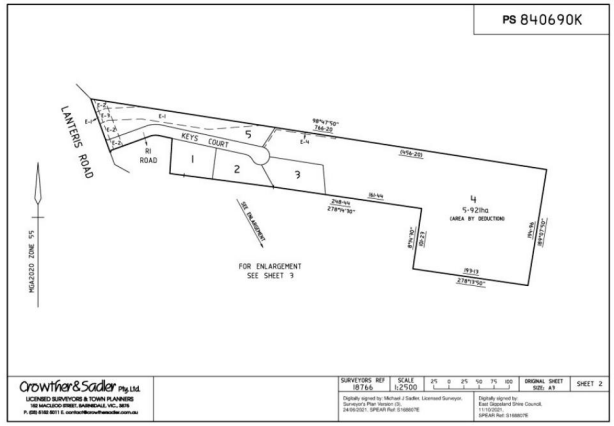
EASEMENT INFORMATION
LEGEND: A - Appurtenant Easement E - Encumbering Easement R - Encumbering Easement (Road)

Easement Reference	Purpose	Width (Metres)	Origin	Land Benefited/In Favour Of
E-1 & E-5	GAS PIPELINE	20	AD999444A	VOL 10474 FOL 047
E-2 & E-5	POWERLINE	16	PS819270J SECTION 88 OF THE ELECTRICITY INDUSTRY ACT 2000	AUSNET ELECTRICITY SERVICES PTY LTD
E-4	DRAINAGE	3	THIS PLAN	EAST GIPPSLAND SHIRE COUNCIL

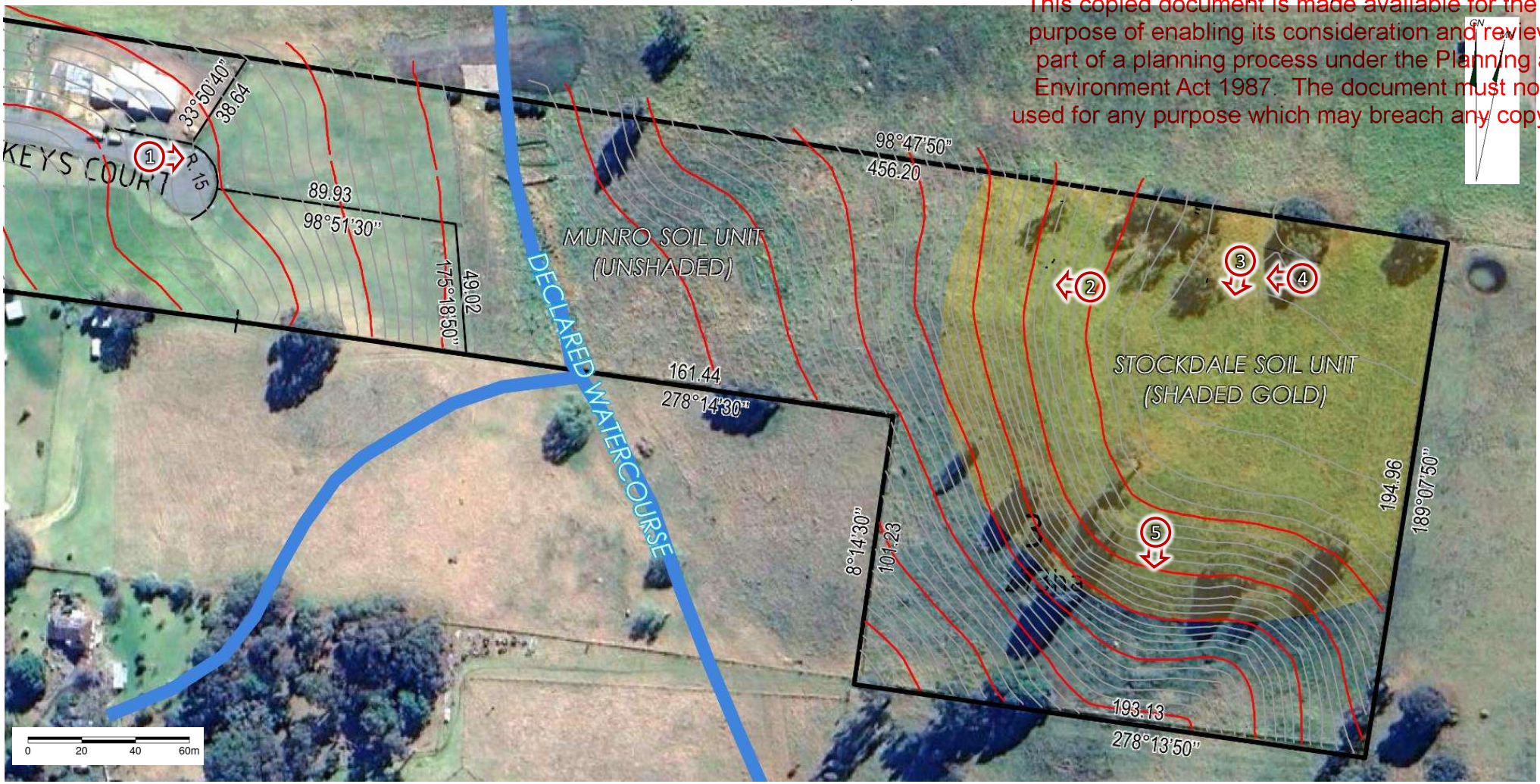
Crowther & Sadler Pty Ltd — LICENSED SURVEYORS & TOWN PLANNERS — 192 MACLEOD STREET, BAIRNSDALE, VIC, 3875 — P: (03) 5152 5011 E: contact@crowthersadler.com.au
SURVEYORS FILE REF: 18766
ORIGINAL SHEET SIZE: A3 — SHEET 1 OF 3 SHEETS
PLAN REGISTERED — TIME: 2.35pm — DATE: 19/05/2022 — Assistant Registrar of Titles

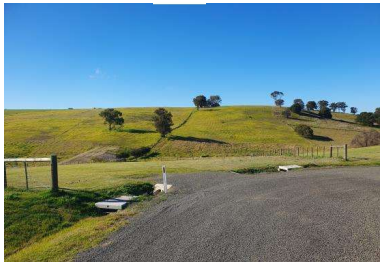
PLAN OF SUBDIVISION NO. 605965K





DIMENSIONED AERIAL PHOTOGRAPH OF THE SUBJECT SITE WITH 1m ELEVATION CONTOURS, SOIL UNITS AND THE DECLARED WATERCOURSE (BLUE LINE) SHOWN.





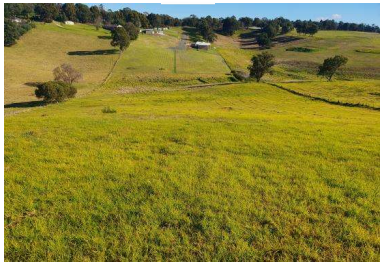
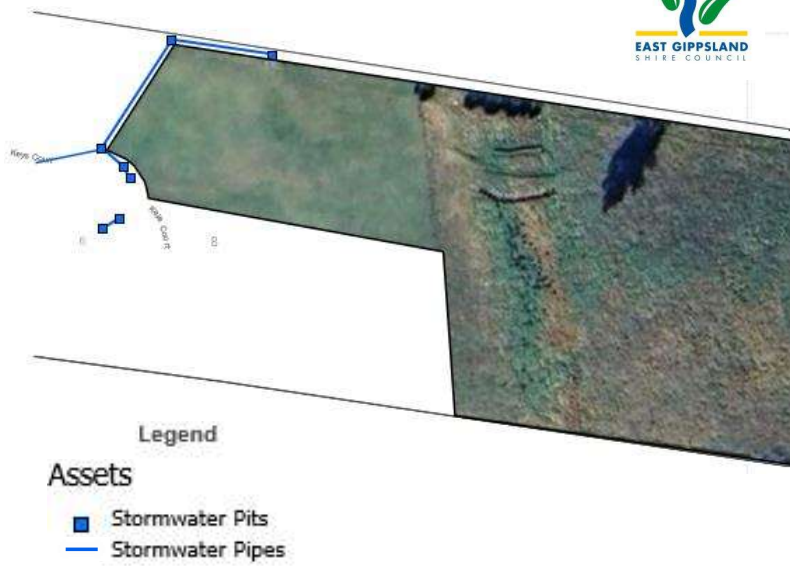
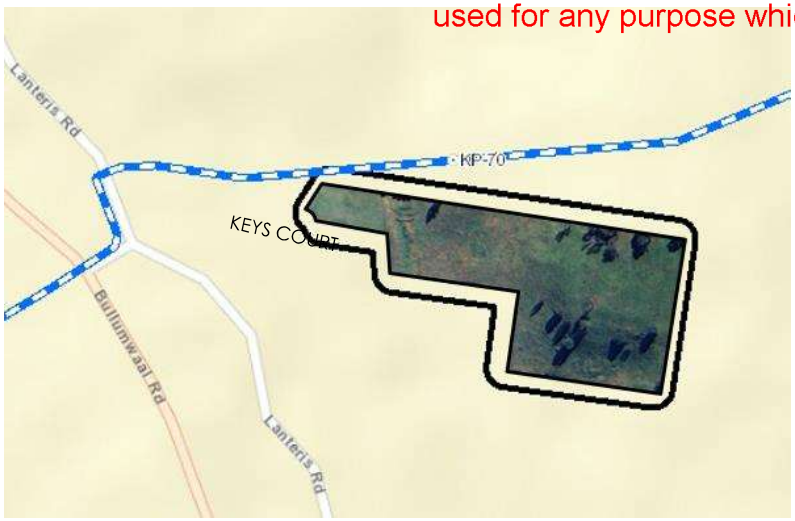


Photo Montage: Subject Site | Address 7 Keys Court, Wy Yung | Version: 1 | Reference: 1600534 | Issued: 29/05/2025

STORMWATER DRAINAGE



NATURAL GAS (HIGH PRESSURE PIPELINE)



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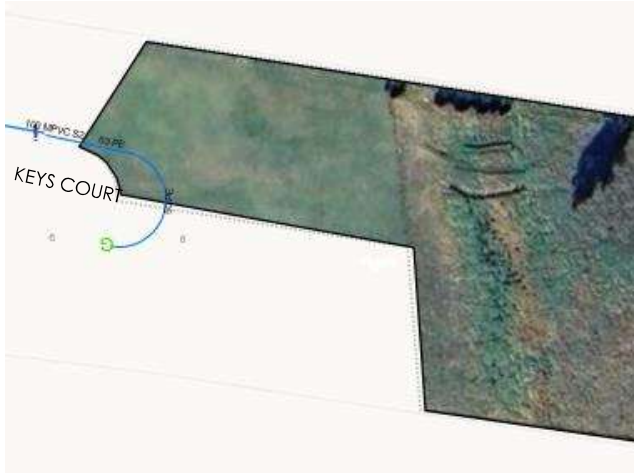
ELECTRICITY

LEGEND – Overview Plot of Electricity Assets

SYMBOL	NAME
	Low Voltage Underground Cable
	High Voltage Underground Cable
	Underground Cable
	Underground Pit
	Low Voltage Pole to Underground Pit
or	Low Voltage Pole
	Underground Street Lighting Cable
	Underground Street Lighting Cable
	High Voltage & Low Voltage Pole
	22kV High Voltage Pole, 66kV Pole
	High Voltage Overhead Line
	Overhead Line
	High Voltage Overhead Line
	Earthing Overhead Line
	Substation Pole, Kiosk Substation, Indoor Substation, Ground Type Substation

This Legend relates to the Plot provided in response to your DBYD request.
The Plot is to be used as a guide only and not for Excavation purposes.

WATER



East Gippsland Water

Legend
Hydrant
Water Main
Stop Valve (Open)

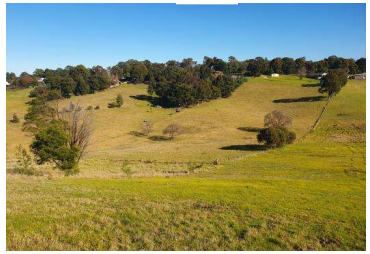
Adjoining Land

The subject site abuts:

DIMENSIONED AERIAL PHOTOGRAPH OF THE SUBJECT SITE (OUTLINED BLACK) WITH ADJOINING PROPERTIES & SETBACKS TO NEARBY DWELLINGS LABELLED

- 28A Hylton Vista along its 456.2 metre long north boundary for a distance of approximately 120 metres at the west end. This property has area of 3.379 hectares formed in an irregular shape with a declared watercourse running through its centre. It is set aside as a reserve for municipal purposes and contains a large wetland & retarding basin that forms part of the broader stormwater management system associated with the Clifton Acres estate to the north. The declared watercourse continues on into the subject site;
- 35 Hylton Vista along the balance of its north boundary. This property has area of approximately 82.04 hectares formed in an irregular shape. It has been developed in its northern portion as Stage 2 of the Clifton Acres estate; although, titles have not yet been issued for the lots that have been constructed. The southern portion will form Stage 4 of the estate, although construction of this stage has not yet commenced. As such, the land adjoining the subject site remains cleared and covered in pasture grass;
- 330 Eastwood Road along its entire 194.96 metre long east boundary. This property has area of approximately 58 hectares formed across 2 irregular shaped parcels. It contains a shed that is located approximately 990 metres from the common boundary with the subject site, but is otherwise largely devoid of improvements apart from open farm fencing. Clifton Creek snakes through the two parcels that make up the property in a roughly north-south direction. The same declared watercourse that traverses through the subject site also reaches into the western portion of this land. Riparian vegetation is growing along both sides of the creek, along with another copse of vegetation on its east side near the southern end. It is understood that this land is used for cattle grazing;
- 40 Lanteris Road along the centre of its south boundary for a distance of 193.13 metres at the eastern end. This land has area of approximately 6 hectares formed in an irregular shape and is used for low density residential purposes. It accommodates a single dwelling that is located approximately 15 metres from its west boundary frontage to Lanteris Road and 300 metres from the common boundary with the subject site. The property is bisected by the same declared watercourse as runs through the subject site and falls towards it from the east and west sides. Access to this land is gained via a crossover to Lanteris Road situated near the dwelling. Otherwise, there are outbuildings and landscaping vegetation in the western portion of the land around the dwelling and open, post and wire fencing along boundaries;
- 46 Lanteris Road along the centre of its south boundary for a distance of 262.67 metres. This land has area of approximately 3.25 hectares formed in an irregular shape. It is vacant of improvements. The property is also bisected by the same declared watercourse as runs through the subject site and falls towards it from the east and west sides. Access to this land is gained via a crossover to Lanteris Road at the south end of the west boundary road frontage;
- 8 Keys Court along the 138.95 metre long western balance of its south boundary. This property has area of 4,604m² formed in an irregular shape. It is vacant of improvements and gains access via a crossover to Keys Court at the west end of its curved, northwest boundary road frontage;
- Keys Court along its 60.55 metre long western boundary for a distance of 21.91 metres at the curved south end. This road reserve has a width of 20 metres and connects back to Lanteris Road at its western end. It forms a court-bowl at the abuttal with the subject site. The reserve contains a two-way, un-marked, bitumen sealed roadway, with grassed swale drainage down both sides. There are no street trees or footpaths within the road reserve;
- 1 Keys Court along the 38.64 metre long northern balance of its west boundary. This property has area of 1.018 hectares formed in a long, thin, irregular shape that occupies the full northern side of Keys Court. A single dwelling is located in the eastern portion. This dwelling is located approximately 10 metres from the south boundary frontage to Keys Court and 15 metres from the common boundary with the subject site. Access to the land is gained via a crossover to Keys Court opposite the dwelling. The north, east and west boundaries are fenced with open post and wire treatments.

DIMENSIONED AERIAL PHOTOGRAPH OF THE SUBJECT SITE (OUTLINED BLACK) WITH ADJOINING PROPERTIES & PHOTO LOCATIONS LABELLED



The Proposal (6-lot subdivision)

It is proposed to subdivide the land into six lots. Proposed Lots 1-5 will gain access via a new subdivisional road that will join up with a subdivisional road that will shortly be constructed as part of Stage 4 of the Wy Yung Acres estate to the north. This road reserve will bring with it reticulated electricity, water and telecommunications, which will be made available to the new lots. The subdivisional layout that has been approved for Stage 4 can be seen overlaid opposite.

Lot 6 will comprise the balance of the land. It will be accessible via the subject site's existing frontage to Keys Court and enjoy access to reticulated electricity and water via existing supplies.

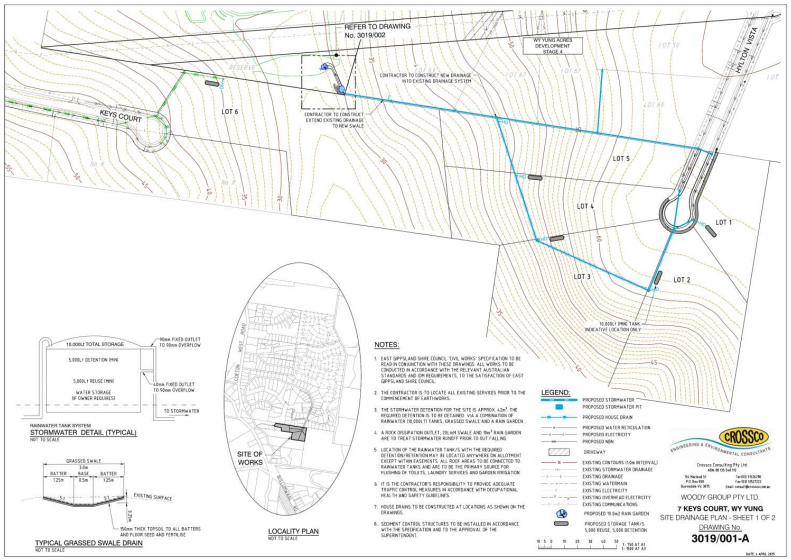
The proposed earthworks will involve excavation for road construction & laying of reticulated water and electricity services and burying of a drainage pipe through lots 2-6. These assets and a road section can be seen in the plan prepared by Crossco Engineering below.

The proposed lots have been designed in accordance with the findings of the erosion & slope risk assessment that accompanies this application. The extent of grade change across the land is provided in degrees in the image below.

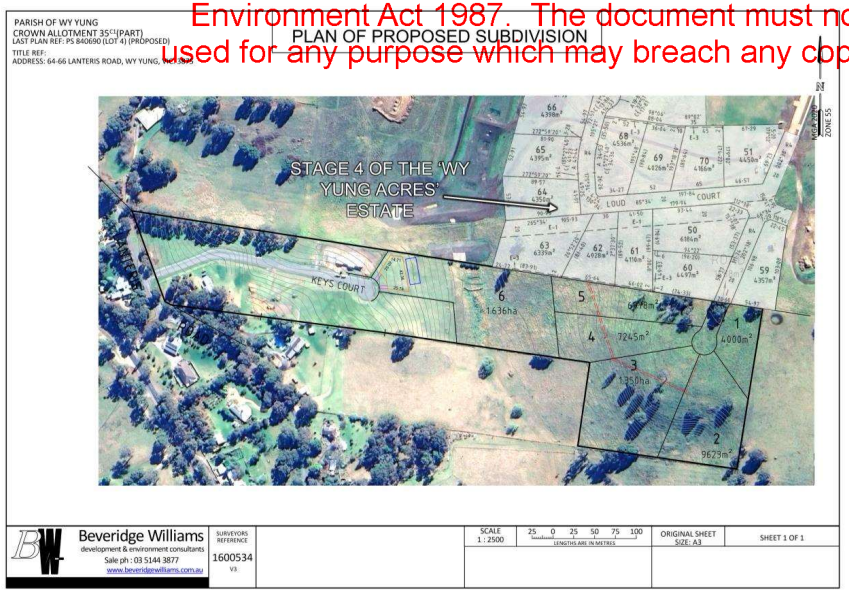
This analysis has led to the identification of building and wastewater management envelopes shown opposite. These envelopes are designed to avoid the risk of erosion & landslip or impacts upon water quality in the broader catchment.

The proposed development will likely lead to the removal of 7 native trees, of which 2 will become exempt from the need for a planning permit prior to removal upon sale of Lots 59 & 60 in stage 4 of the adjoining estate. The remaining 5 trees, which are all 'presumed lost', are discussed overleaf.

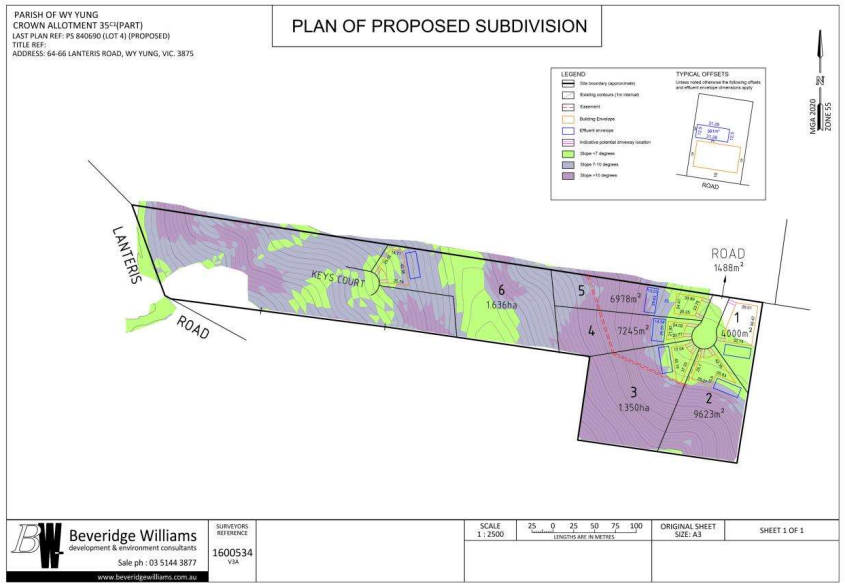
PROPOSED SERVICING PLAN & SWALE SECTION (CROSSCO ENGINEERING)



PROPOSED PLAN OF SUBDIVISION WITH THE PLAN OF STAGE 4 OF THE ADJOINING ESTATE OVERLAID



PROPOSED PLAN WITH BUILDING & EFFLUENT ENVELOPES AND THE SLOPE ACROSS THE 6 LOTS SHOWN IN 0°-7°, 7°-10° & 10°+ RANGES



The Proposal (Vegetation Removal)

The developable portions of Lots 1 & 5 collectively contain 2 mature native trees that are located within 4m of the existing north boundary. There is a native tree with a 95cm DBH within Lot 4 that will be within 4 metres of the common boundary with Lot 5 when that lot is created. Four native trees with diameters at breast height of 20cm, 38cm, 67cm and 76cm respectively are located within the proposed road reserve.

The Schedule to **Clause 44.01** exempts "*removal of the minimum extent of vegetation necessary for the establishment and maintenance of fences*".

Meanwhile, **Clause 52.17** exempts the removal of trees within 4 metres of a boundary if it is "*necessary to enable the construction of a boundary fence between properties in different ownership*".

So, the trees within 4m of the north boundary of Lots 1 & 5 will automatically become exempt from the need for a planning permit under **Clauses 44.01** & **52.17** once Stage 4 of the adjoining Wy Yung Acres estate is created and Lots 59 & 60 are sold and fencing is required, as they will site within 4m of a boundary with properties going into separate ownership. These trees are outlined yellow below.

The potential loss of the tree within 4m of the boundary between proposed Lots 4 & 5 will occur as a direct result of the proposed subdivision. This means that, along with the four trees in the road reserve that will definitely require removal, it must also be 'presumed lost'. These 5 trees are outlined red in the photograph below with their respective DBHs labelled and also shown in the photos opposite.

A Native Vegetation Removal Report has been prepared to establish an appropriate offset for the loss of these 5 trees. A copy is provided with this application demonstrating that an offset credit equivalent to 0.036 General Habitat Units will be purchased through a broker.

AERIAL PHOTO OF TREES LIKELY TO BE LOST AS A RESULT OF THE PROPOSED SUBDIVISION WITH THE ONES THAT WILL BE EXEMPT FROM THE NEED FOR A PERMIT PRIOR TO REMOVAL OUTLINED YELLOW AND THE ONES THAT ARE PRESUMED LOST AND WILL REQUIRE OFFSETTING OUTLINED RED

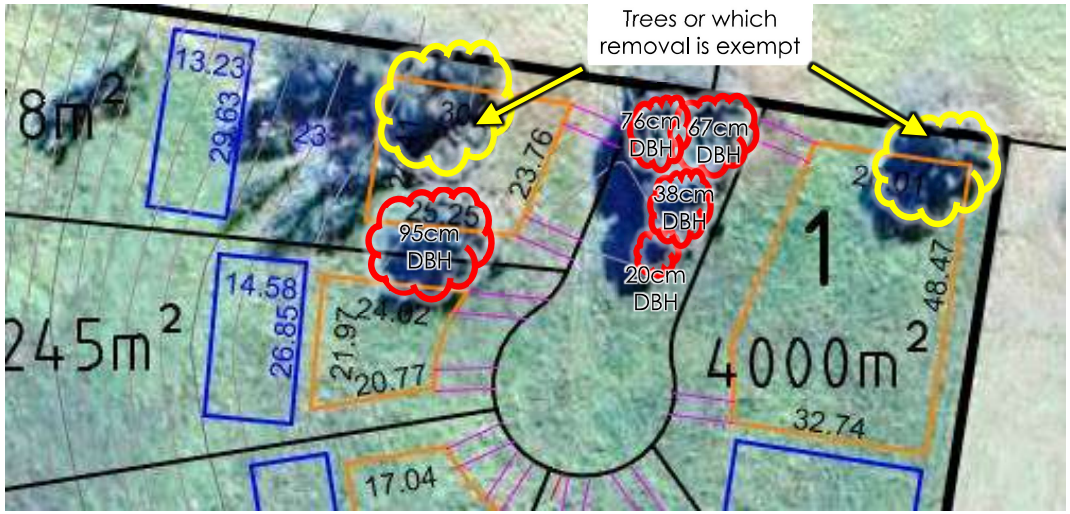


PHOTO OF TREE WITHIN 4m OF PROPOSED LOT 5s NORTH BOUNDARY

PHOTO OF TREE WITHIN 4m OF PROPOSED LOT 1s NORTH BOUNDARY

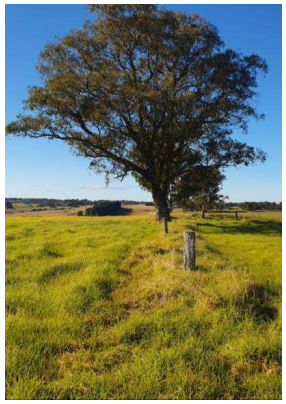


PHOTO OF 2 TREES WITHIN THE ROAD RESERVE THAT ARE PROPOSED TO BE REMOVED WITH THEIR DBHs SHOWN

PHOTO OF THE TREE BOUNDARY B/W LOTS 4 & 5 THAT IS 'PRESUMED LOST' WITH ITS 95cm DBH SHOWN

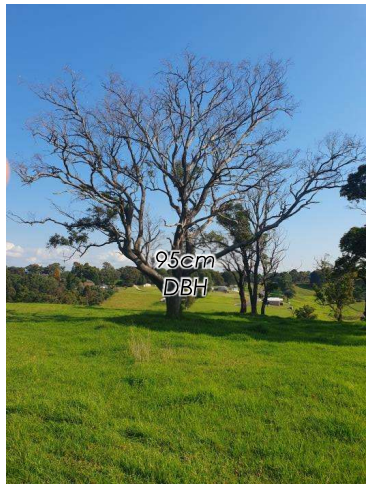
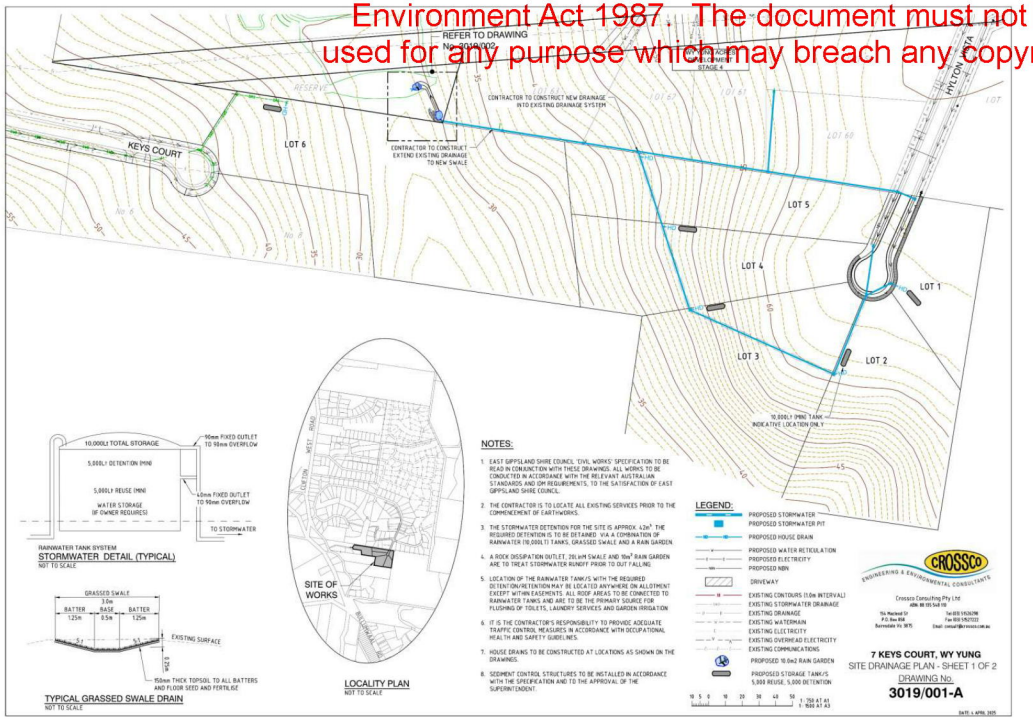


PHOTO OF THE 2 TREES WITHIN THE ROAD RESERVE THAT ARE PROPOSED TO BE REMOVED WITH THEIR DBHs SHOWN

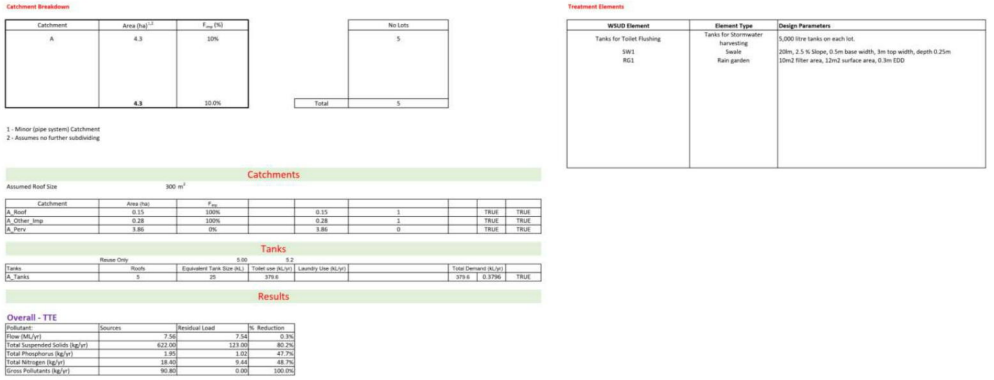
Clause 56.07 Assessment

Standard	Is the standard met?
C22	Yes. As shown opposite, Lot 6 will enjoy access to reticulated water via the existing main in Keys Court. Proposed Lots 1-5 will gain access to reticulated water via a new main that will be constructed as part of Stage 4 of the Wy Yung Acres Estate & extended up the proposed new subdivisional road.
C23	Not applicable. Wy Yung does not have a reticulated recycled stormwater system.
C24	Yes. As discussed in the Land Capability Assessment accompanying this application, each proposed lot will require a 391m² effluent dispersal envelope. The building & effluent envelope plan on the previous page demonstrates how these envelopes can be accommodated within each proposed lot in accordance with the septic tank code of practice.
C25	Yes. Stormwater pits in the court bowl will connect to pipes under easements within Lots 2-5 that will lead to a stormwater treatment asset within the adjoining Council drainage reserve at 28A Hylton Vista. The pipe alignments and treatment and detention calculations are provided opposite & below. From that asset stormwater will outfall to the same declared watercourse that traverses through the subject site. Stormwater from proposed Lot 6 will outfall to the Council asset within the existing drainage easement that runs along the lot's northern perimeter. This outcome will ensure that water quality within the Clifton Creek & Gippsland Lakes catchment is not impacted.

PROPOSED SERVICING PLAN & SWALE SECTION (CROSSCO ENGINEERING)



MUSIC MODELLING FOR STORMWATER TREATMENT (CROSSCO ENGINEERING)


Catchment Breakdown

Catchment	Area (ha)[1,2]	F_{imp} (%)
A	4.3	10%
	4.3	10.0%

	No Lots
	5
Total	5

1 - Minor (pipe system) Catchment
2 - Assumes no further subdividing

Catchments

Assumed Roof Size 300 m²

Catchment	Area (ha)	F_{imp}							
A_Roof	0.15	100%			0.15	1		TRUE	TRUE
A_Other_Imp	0.28	100%			0.28	1		TRUE	TRUE
A_Perv	3.86	0%			3.86	0		TRUE	TRUE

Tanks

	Reuse Only		5.00	0.2				
Tanks	Roofs	Equivalent Tank Size (kL)	Toilet use (kL/yr)	Laundry Use (kL/yr)			Total Demand (kL/yr)	
A_Tanks	5	25	379.6				379.6 0.3796	TRUE

Results

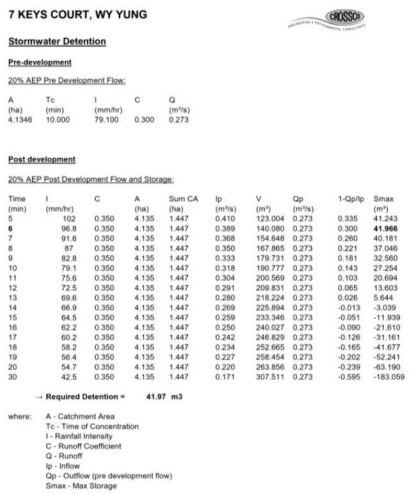
Overall - TTE

Pollutant	Sources	Residual Load	% Reduction
Flow (ML/yr)	7.56	7.54	0.3%
Total Suspended Solids (kg/yr)	622.00	123.00	80.2%
Total Phosphorus (kg/yr)	1.95	1.02	47.7%
Total Nitrogen (kg/yr)	18.40	9.44	48.7%
Gross Pollutants (kg/yr)	90.80	0.00	100.0%

Treatment Elements

WSUD Element	Element Type	Design Parameters
Tanks for Toilet Flushing	Tanks for Stormwater harvesting	5,000 litre tanks on each lot.
SW1	Swale	20lm, 2.5 % Slope, 0.5m base width, 3m top width, depth 0.25m
RG1	Rain garden	10m2 filter area, 12m2 surface area, 0.3m EDD

DETENTION MODELLING FOR DRAINAGE (CROSSCO ENGINEERING)


7 KEYS COURT, WY YUNG

Stormwater Detention

Pre-development

20% AEP Pre Development Flow:

A (ha)	Tc (min)	I (mm/hr)	C	Q (m³/s)
4.1346	10.000	79.100	0.300	0.273

Post development

20% AEP Post Development Flow and Storage:

Time (min)	I (mm/hr)	C	A (ha)	Sum CA (ha)	Ip (m³/s)	V (m³)	Qp (m³/s)	1-Qp/Ip	Smax (m³)
5	102	0.350	4.135	1.447	0.410	123.004	0.273	0.335	41.243
6	96.8	0.350	4.135	1.447	0.389	140.080	0.273	0.300	**41.966**
7	91.6	0.350	4.135	1.447	0.368	154.648	0.273	0.260	40.181
8	87	0.350	4.135	1.447	0.350	167.865	0.273	0.221	37.046
9	82.8	0.350	4.135	1.447	0.333	179.731	0.273	0.181	32.560
10	79.1	0.350	4.135	1.447	0.318	190.777	0.273	0.143	27.254
11	75.6	0.350	4.135	1.447	0.304	200.569	0.273	0.103	20.694
12	72.5	0.350	4.135	1.447	0.291	209.831	0.273	0.065	13.603
13	69.6	0.350	4.135	1.447	0.280	218.224	0.273	0.026	5.644
14	66.9	0.350	4.135	1.447	0.269	225.894	0.273	-0.013	-3.039
15	64.5	0.350	4.135	1.447	0.259	233.346	0.273	-0.051	-11.939
16	62.2	0.350	4.135	1.447	0.250	240.027	0.273	-0.090	-21.610
17	60.2	0.350	4.135	1.447	0.242	246.829	0.273	-0.126	-31.161
18	58.2	0.350	4.135	1.447	0.234	252.665	0.273	-0.165	-41.677
19	56.4	0.350	4.135	1.447	0.227	258.454	0.273	-0.202	-52.241
20	54.7	0.350	4.135	1.447	0.220	263.856	0.273	-0.239	-63.190
30	42.5	0.350	4.135	1.447	0.171	307.511	0.273	-0.595	-183.059

→ Required Detention = **41.97 m3**

where: A - Catchment Area
Tc - Time of Concentration
I - Rainfall Intensity
C - Runoff Coefficient
Q - Runoff
Ip - Inflow
Qp - Outflow (pre development flow)
Smax - Max Storage


7 KEYS COURT, WY YUNG

Stormwater Detention

Orifice Design

Discharge Control Pipe out of Tanks

20% AEP Pre Development Discharge (m³/s)	0.04542 each lot
Level of Water (m)	1.000
Invert Level of Outlet Pipe (m)	0.000
Bernoulli's Equation:	$V_{out} = \sqrt{(2gh)}$ where h = 100 - 99=1.0
Outlet Velocity, V_{out} (m/s)	4.43
Pipe Flow Equation:	Q = VA where A = pipe area
Outlet Pipe Diameter (m)	0.090
Orifice Plate Diameter (m)	0.040
Coefficient of Orifice Plate Discharge	0.650
Post Development Discharge, Q (m³/s)	0.0036

Proposed 40mm outlet from each tank

Planning Assessment

Any significant effects the environment, including contamination of land, may have on the use or development:

The land is not recognized as having been exposed to contamination and there are no other identified significant environmental effects that are likely to impact the proposed development.

The Municipal Planning Strategy and the Planning Policy Framework:

Bairnsdale is recognised in the Gippsland Regional Growth Plan at **Clause 11.01-1R** as a 'Regional Centre' where Council should 'Promote Growth'. The subject site falls within the sub-regional network formed around Bairnsdale & Paynesville' in the plan – see opposite.

As shown previously, the subject site is surrounded by low density residential zoned land that forms part of a large growth front. More specifically, there are:

- 5 low density residential lots in the court bowl that provides access to it from the west side, i.e. the Keys Court estate;
- A 208-lot low density residential development under construction on its north side, i.e. the 'Wy Yung Acres' estate;
- 2 parcels of low density residential zoned land with limited potential for further development due to their sloping topography on its south side, i.e. 40 & 46 Lanteris Road; and,
- A split-zoned parcel of land, which is comprised of approximately 12.45ha of Low Density Residential Zoned land and 45.6 hectares of Farming Zoned land, on its east side. It is noted that the Low Density Residential Zoned portion occupies the full extent of the abuttal with the subject site.

In accordance with the objective of the Gippsland Regional Growth Plan, which is shown opposite, it is proposed to subdivide the subject site into six lots with areas of 4,000m² (Lot 1), 9,623m² (Lot 2), 1.35 hectares (Lot 3), 7,245m² (Lot 4), 6,978m² (Lot 5) and 1.636 hectares (Lot 6), respectively. Each proposed lot can contain a building envelope that will be similar in size and shape to those prevailing in the adjoining Keys Court and Wy Yung Acres estates. These envelopes are also designed to mitigate against the risk of erosion that is prevalent across the steeper portions of the site.

Each lot will also be able to accommodate an effluent dispersal envelope of 391m² that can achieve appropriate boundary, building & watercourse setbacks to comply with the Septic Tank Code of Practice, as shown opposite.

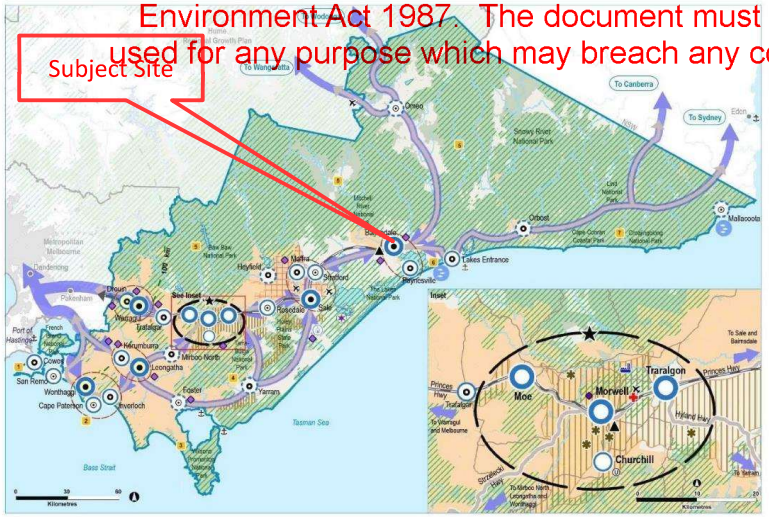
Reticulated electricity, water and telecommunications to proposed Lots 1-5 will be provided via service extensions being carried out within Stages 2 & 4 of the adjoining Wy Yung Acres estate. Reticulated electricity & water are already available within Keys Court to service proposed Lot 6.

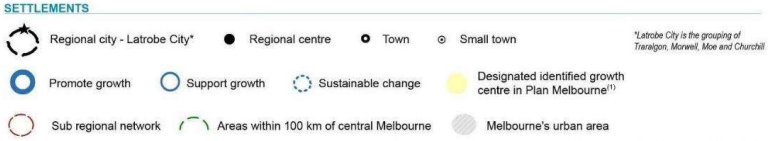
In accordance with the stormwater management plan prepared in support of this application, the proposed lots will be drained to the stormwater management assets within 28A Hylton Vista in the manner shown opposite.

As such, the proposal accords with the policy objectives of:

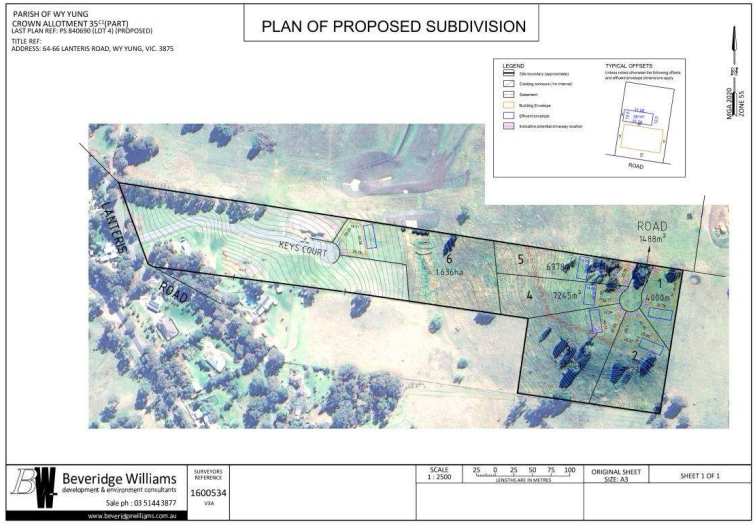
- **Clause 02.04** as it will not lead to a loss of prime agricultural land, as recognized in the East Gippsland Strategic Framework Plan;
- **Clause 11.01-1R** as it will facilitate growth in the sub regional network around a Regional Centre that is identified as being an appropriate place to promote growth in the Gippsland Regional Growth Plan;
- **Clauses 11.01-1S, 16.01-1S** and **16.01-2S,** as it will facilitate infill development of under-utilised land located within an established residential area that will enjoy access to 8 kilometres of walk/cycle paths and a Council recreation reserve that is slated for construction in Stage 5 of the Wy Yung Acres Estate. This will assist in relieving housing supply and affordability shortages;
- **Clauses 11.01-1L & 15.01-4S** as it will utilise existing infrastructure and encourage increased housing choice within easy driving distance of the shopping, public transport, education and passive & active recreation

GIPPSLAND REGIONAL GROWTH PLAN





PROPOSED PLAN OF SUBDIVISION WITH BUILDING & EFFLUENT ENVELOPES



Planning Assessment (continued)

opportunities available within Bairnsdale. This will facilitate positive social, environmental and economic impacts to the local neighbourhood and wider community; and,

- **Clauses 13.03-1S**, as each of the proposed lots can accommodate dwellings that can be constructed & drained and have their on-site wastewater managed without creating impacts upon Clifton Creek, or the broader Gippsland Lakes catchment area; and,
- **Clauses 15.01-3S, 15.01-5S, 16.01-3S** as it will provide for variability of lot size and facilitate housing diversity without having a negative impact upon the establishing character of the growth front.

The purpose of the zone, overlays or other provision:

The proposed development has been designed to comply with the purpose of **Clause 32.03** by providing for low density residential development on lots in a manner that allows for wastewater to be treated and retained on site.

The proposed development has been designed to comply with the purpose of **Clause 44.01** by providing room within each proposed lot for a dwelling to be constructed on a flatter portion where the risk of erosion, landslip and land degradation can be adequately mitigated.

The proposed development has been designed to comply with the purpose of **Clause 52.17** by protecting the significant trees growing across the southern portion of proposed Lots 2 & 3 and offsetting the likely loss of a tree within proposed Lot 5 and 4 within the new road alignment.

Any matter required to be considered in the zone, overlay or other provision:

The proposed development has been designed to comply with the decision guidelines set out at **Clause 32.03-6** by:

- Applying building & effluent envelopes that accord with the land capability assessment and serve to protect the existing declared watercourse that runs through the western portion of the land;
- Creating lots that can be connected to reticulated electricity, water and telecommunications;
- Creating lots that can accommodate a 391m² effluent dispersal field in sufficiently flat areas;
- Avoiding the creation of lots exceeding 2ha in area; and,
- Satisfying the standards of **Clause 56.07**.

The proposed development complies with the application requirements set out at **Clause 44.01-6** & Point 4.0 of the Schedule to **Clause 44.01** by:

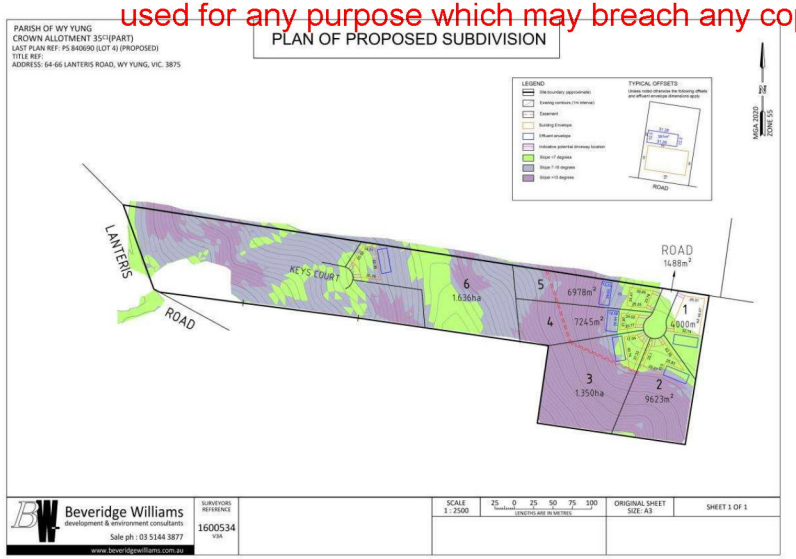
- Providing all of the information required for a site and surrounds plan across the earlier sections of this report;
- Detailing the location of necessary earthworks, i.e. for roads, roadside swales, underground water & electricity services, drainage pipe installation through lots 2-6;
- Proposing appropriate building envelopes for each of the proposed lots, as shown above; and,
- Including a geotechnical risk assessment, which accompanies this report.

The proposed development has been designed to comply with the requirements set out at **Clause 52.17-2** by including a native vegetation removal report that includes all of the information listed in the *Guidelines*.

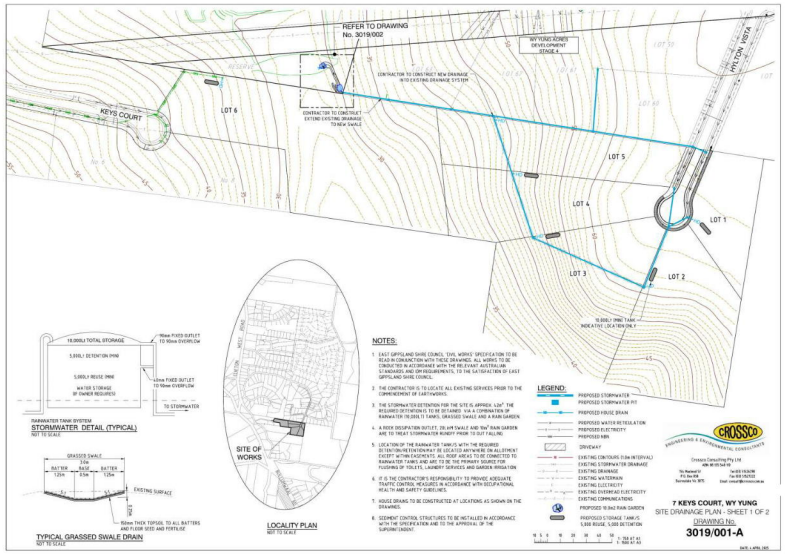
The Orderly Planning of the Area:

The proposed development has been designed to facilitate the more intense development of an underutilised site within the Wy Yung low density growth front, without detracting from the character of the adjoining estates. This will increase housing diversity and density on land in a growth front that has access to reticulated water and electricity. Council has consistently granted planning permits in similar circumstances. So, approval will represent a consistent, or orderly approach to planning.

PROPOSED BUILDING & EFFLUENT ENVELOPE PLAN WITH SLOPE MAPPING



PROPOSED SERVICING PLAN & SWALE SECTION (CROSSCO ENGINEERING)



Planning Assessment (continued)

The effect on the environment, human health and amenity of the area:

The proposed development can accommodate 6 new dwellings in a similar manner to those in the estates surrounding. These dwellings will be hundreds of metres from any of the long established dwellings in the area and not impact upon the integrity of the declared watercourse traversing through the land or the catchment it feeds. This will mitigate against any potential health, environmental and amenity impacts.

The subject site presently only abuts the Council drainage reserve at 28A Hylton Vista and what will become Stage 4 of that estate. Although, it will also soon abut the new road reserve that will be constructed within Stage 4 of the Wy Yung Acres Estate and 5 lots, i.e. Lots 59-63, within that estate. The proposed subdivision has been designed to avoid impacts upon these two public reserves, with the area in the gully adjacent to 28A Hylton Vista left undeveloped and the new road designed to match up perfectly with the road reserve in Stage 4 of the Wy Yung Acres Estate. The proposal is anticipated to add 45 extra vehicle movements per day onto the Hylton Vista. Hylton Vista is a high quality bitumen sealed road that will provide improved access back to Bairnsdale once an upgrade to the intersection of Bullumwaal & Clifton West Roads is completed. This upgrade will have been finished prior to the registration of Stage 4 of that estate. Hence, the new lots will enjoy excellent road access to Bairnsdale once they are created. Otherwise, the fact that the subject site could already have a dwelling constructed on it with access from Keys Court means that it will not add any extra vehicle movements onto that road.

The proximity of the land to any public land.

The subject site is not proximal to any public land, apart from Keys Court road reserve and the drainage reserve within 28A Hylton Vista.

Factors likely to cause or contribute to land degradation, salinity or reduce water quality

The building and effluent envelopes and drainage outfall outcome shown opposite have been designed to mitigate the likelihood of land degradation and/or a reduction in water quality within the declared watercourse running through the site or the broader Clifton Creek / Gippsland Lakes catchment. There is not recognized to be an issue with salinity on the subject site.

Whether the proposed development is designed to maintain or improve the quality of stormwater within and exiting the site.

As discussed previously, the proposed lots will drain to a stormwater treatment asset within 28A Hylton Vista, with outfall from it to the existing declared watercourse within the same land. These drainage assets will be protected by an easement within the Lots 2-5. The minimal amount of runoff from the new lots can be dealt with in this manner without over-burdening the receiving system or impacting other land that shares this common means of drainage.

The extent and character of native vegetation and the likelihood of its destruction.

There is an exemption to remove 2 trees that are presently growing on the north boundaries of Lots 1 & 5 as they would obstruct the establishment of re-fencing by the future separate owners of Lots 59 & 60 within Stage 4 of the Wy Yung Acres estate. Another tree within Lot 5 is presumed lost due to its location relative to the new boundaries, whilst there are also 4 trees within the new road reserve alignment that will be lost as a result of road construction, as shown opposite. The loss of these 5 trees will be offset through the purchase of a credit. The remaining trees fall will be protected by virtue of the fact that a permit will be required for their removal under **Clause 52.17**.

Whether native vegetation is to be or can be protected, planted or allowed to regenerate.

As above.

The degree of flood, erosion or fire hazard associated with the location of the land and the use, development or management of the land so as to minimise any such hazard.

The land is not recognised as being susceptible to flood or fire. Erosion risk will be mitigated through the use of building and effluent envelopes that restrict development to the flatter portions of each lot and the imposition of controls on construction, as recommended in the slope risk assessment.

PROPOSED SERVICING PLAN & SWALE SECTION (CROSSCO ENGINEERING)

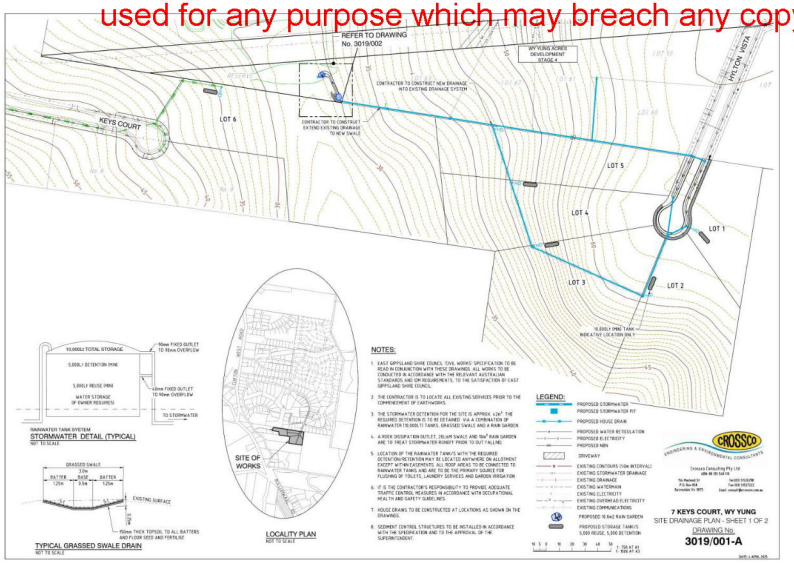
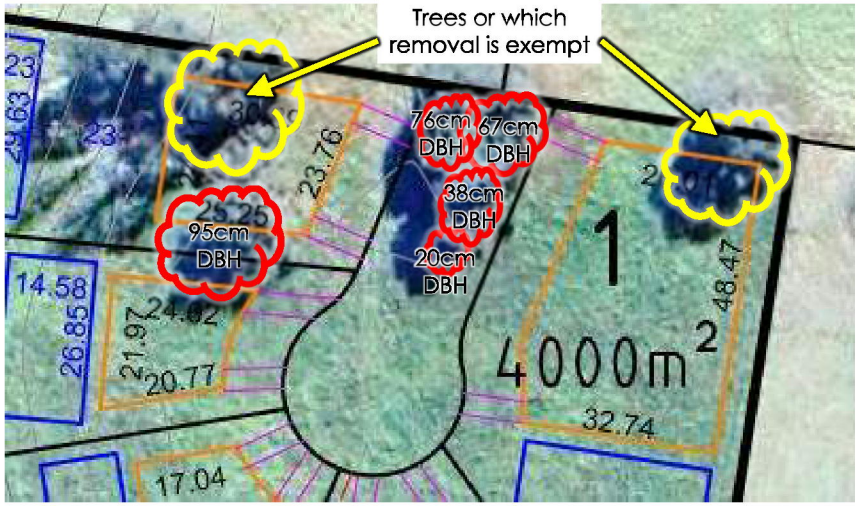


PHOTO OF TREES NOT REQUIRING A PERMIT FOR REMOVAL OUTLINED YELLOW & THE ONES THAT ARE 'PRESUMED LOSS' OUTLINED RED



Planning Assessment (continued)

The adequacy of loading and unloading facilities and any associated amenity, traffic flow and road safety impacts.

Each proposed lot will have ample room to accommodate loading/unloading associated with residential uses. As such, it will avoid creating unsafe traffic behaviour on Hylton Vista and the broader road network.

The impact the use or development will have on the current and future development and operation of the transport system.

The proposed development relies upon Keys Court and the new road being created in Stage 4 of the Wy Yung Acres estate for access. Given these roads are/will be formed with 2-way, bitumen sealed pavements, the access arrangement is appropriate and can amply accommodate safe and efficient vehicle movements from the new lots.

The suitability of the land for subdivision

The subject site is zoned to allow Low Density Residential development and will have frontage to reticulated electricity wires & water mains once Stage 4 of the adjoining Wy Yung Acres estate is registered. It will be only a 10-minute drive from the regional centre of Bairnsdale via bitumen roads in excellent condition. So, the proposed density strikes the appropriate balance between neighbourhood character and access to services.

The existing use and possible future development of the land and nearby land.

Surrounding land to the north, south and west is either used for or begin developed for low density residential purposes. The land to the east is used for farming purposes, but is zoned to allow low density residential development. The subject site is unlikely to be able to be further developed due to the topographical constraints and the presence of a declared watercourse.

The availability of subdivided land in the locality, and the need for the creation of further lots.

Lots in the adjoining Wy Yung Acres estate are selling very briskly off the plan. So, there would appear to be good demand for vacant low density residential land in this part of Wy Yung.

The effect of development on the use or development of other land which has a common means of drainage.

As discussed previously, the proposed lots will drain to a stormwater treatment asset within 28A Hylton Vista, with outfall from it to the existing declared watercourse within the same land. These drainage assets will be protected by easements within the Lots 2-5. The minimal amount of runoff from the new lots can be dealt with in this manner without over-burdening the receiving system or impacting other land that shares this common means of drainage.

The subdivision pattern having regard to the physical characteristics of the land including existing vegetation.

The majority of trees within the land are situated in the southern halves of Lots 2 & 3 and on the north boundaries of Lots 1 & 5. The trees within Lots 2 & 3 are all located outside of the proposed building envelopes for those lots and, thus, will not require removal to facilitate development. Five trees will be lost as a result of the proposed development. Hence, it is appropriate that they be 'presumed lost' and offset.

The density of the proposed development.

As shown above, the proposed development provides 6 lots with areas ranging from 4,000m² to 1.636 hectares. This density fits in neatly between that prevailing in the properties around the subject site.

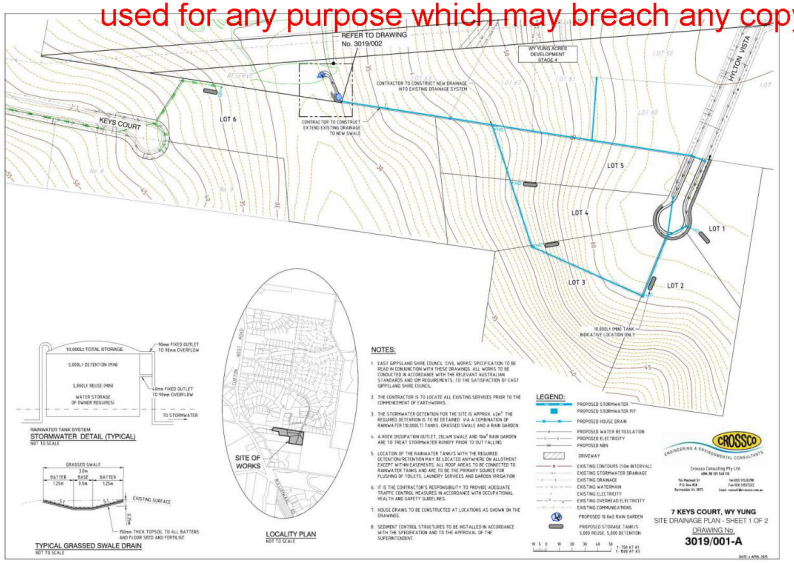
The area and dimensions of each lot in the subdivision.

The area and dimension of each lot in the subdivision can be seen on the plan opposite.

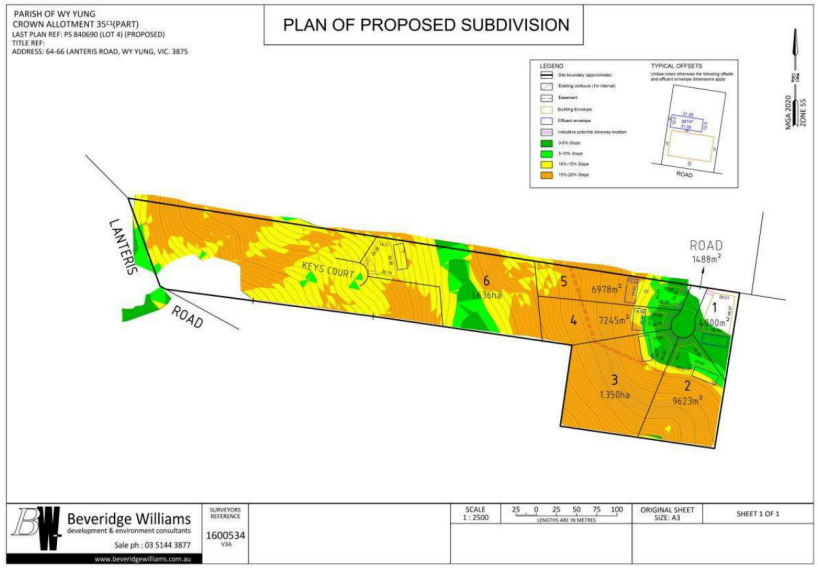
The layout of roads having regard to their function and relationship to existing roads.

Proposed Lots 1-5 will rely upon a short court bowl across flat land that will connect to the new road being created in Stage 4 of the adjoining Wy Yung Acres estate. Proposed Lot 6 will rely upon Keys Court. The new court providing access to Lots 1-5 will, like the road in Wy Yung Acres estate, be formed with a 2-way, bitumen sealed

PROPOSED DRAINAGE PLAN (CROSSCO ENGINEERING)



PROPOSED BUILDING & EFFLUENT ENVELOPE PLAN WITH SLOPE MAPPING SHOWN IN PERCENT RANGES



Planning Assessment (continued)

pavement sitting within a 20 metre wide road reserve. As such, it will merely provide an appropriate short extension to the subdivisional road within the adjoining estate over a flat area where erosion risk is minimal.

The movement of pedestrians & vehicles throughout the subdivision and the ease of access to all lots.

The proposed development will create one new road reserve, i.e. the court bowl fronting Lots 1-5. This court bowl will match the road reserve width of the adjoining subdivisional road within Stage 4 of the Wy Yung Acres estate and have similar pavement width and swale drains. This will ensure safe and easy access to the lots for vehicles and pedestrians.

The provision and location of reserves for public open space and other community facilities.

The development does not include an area of public open space. Given its limited scope, this is appropriate.

The staging of the subdivision.

The proposed subdivision is not intended to be staged.

The design and siting of buildings having regard to safety and the risk of spread of fire.

As shown opposite, each proposed lot can accommodate a new dwelling that will enjoy ample boundary setbacks to avoid leading to an unacceptable risk of fire spreading.

The provision of off-street parking.

As shown opposite, each proposed lot retains space to accommodate provisions for off-street parking.

The provision and location of common property.

No common property is proposed or required.

The functions of any body corporate.

Not applicable.

The availability and provision of utility services, including water, sewerage, drainage, electricity & gas.

As shown opposite, upon completion of Stage 4 of the adjoining Wy Yung Acres estate, proposed Lots 1-5 will enjoy access to reticulated water & electricity via assets within the new road reserve. Proposed Lot 6 will enjoy access to water & electricity via existing supplies in Keys Court.

If the land is not sewered and no provision has been made for the land to be sewered, the capacity of the land to treat and retain all sewage and sullage within the boundaries of each lot.

The land capability assessment included with this application identified that each proposed lot will need access to a 391m² effluent dispersal area. The envelope plan above shows how these dispersal areas can be accommodated within each lot in conjunction with an adequately large building envelope situated on suitably flat portions of the property.

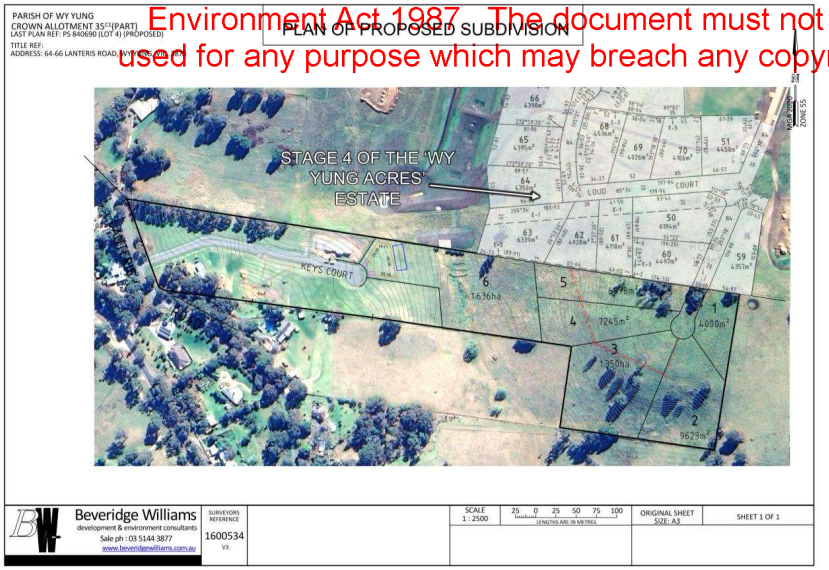
Whether, in relation to subdivision plans, native vegetation can be protected through subdivision and siting of open space areas.

As discussed previously, seven native trees are 'presumed lost' as a result of the proposed subdivision, with 5 requiring that a permit be issued prior to removal. The loss of these trees is as a result of the need to align the new road to connect to the road reserve in the adjoining estate. These trees will be offset through purchase of a credit.

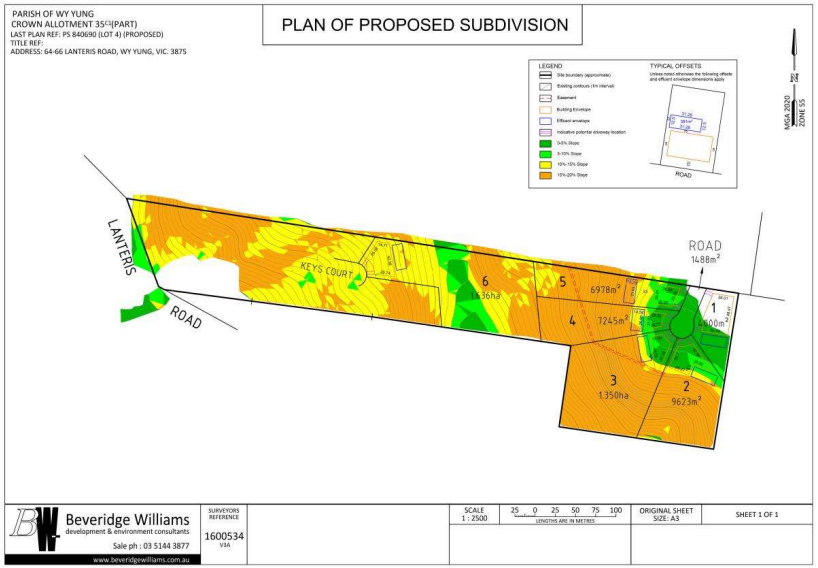
The impact the development will have on the current and future development & operation of the transport system.

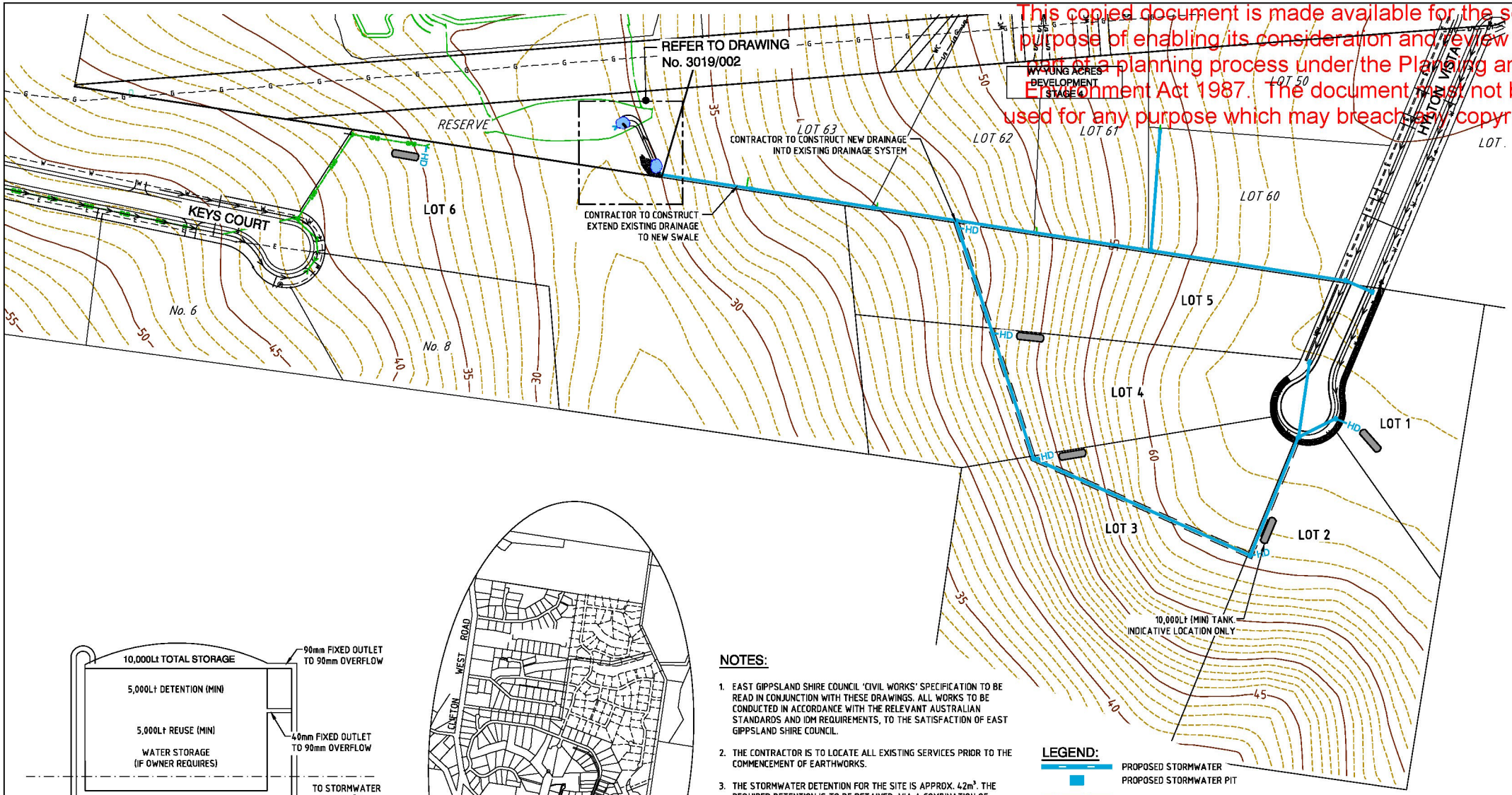
As shown above, the proposed development relies upon Keys Court and the new road being created in Stage 4 of the adjoining Wy Yung Acres estate. Given these roads are/will be formed with 2-way, bitumen sealed pavements, the access arrangement is appropriate and can amply accommodate safe and efficient vehicle movements from the new lots. Access to the regional centre of Bairnsdale will shortly be improved through the completion of an upgrade to the intersection of Bullumwaal and Clifton West Roads. This upgrade must be completed prior to the registration of Stage 4 of the Wy Yung Acres estate. Hence, it will be available prior to the creation of the lots proposed through this application.

PROPOSED PLAN OF SUBDIVISION WITH STAGE 4 OF THE ADJOINING ESTATE SHOWN



PROPOSED BUILDING & EFFLUENT ENVELOPE PLAN WITH SLOPE MAPPING IN PERCENTAGE RANGES

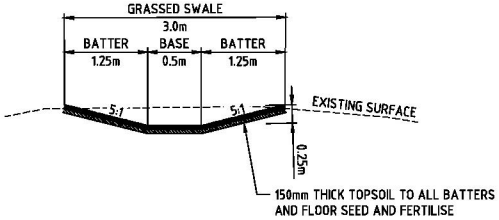




RAINWATER TANK SYSTEM

STORMWATER DETAIL (TYPICAL)

NOT TO SCALE



TYPICAL GRASSED SWALE DRAIN

NOT TO SCALE

LOCALITY PLAN

NOT TO SCALE

NOTES:

1. EAST GIPPSLAND SHIRE COUNCIL 'CIVIL WORKS' SPECIFICATION TO BE READ IN CONJUNCTION WITH THESE DRAWINGS. ALL WORKS TO BE CONDUCTED IN ACCORDANCE WITH THE RELEVANT AUSTRALIAN STANDARDS AND IDM REQUIREMENTS, TO THE SATISFACTION OF EAST GIPPSLAND SHIRE COUNCIL.
2. THE CONTRACTOR IS TO LOCATE ALL EXISTING SERVICES PRIOR TO THE COMMENCEMENT OF EARTHWORKS.
3. THE STORMWATER DETENTION FOR THE SITE IS APPROX. 42m³. THE REQUIRED DETENTION IS TO BE DETAINED VIA A COMBINATION OF RAINWATER (10,000LT) TANKS, GRASSED SWALE AND A RAIN GARDEN.
4. A ROCK DISSIPATION OUTLET, 20LinM SWALE AND 10m² RAIN GARDEN ARE TO TREAT STORMWATER RUNOFF PRIOR TO OUT FALLING
5. LOCATION OF THE RAINWATER TANK/S WITH THE REQUIRED DETENTION/RETENTION MAY BE LOCATED ANYWHERE ON ALLOTMENT EXCEPT WITHIN EASEMENTS. ALL ROOF AREAS TO BE CONNECTED TO RAINWATER TANKS AND ARE TO BE THE PRIMARY SOURCE FOR FLUSHING OF TOILETS, LAUNDRY SERVICES AND GARDEN IRRIGATION
6. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE ADEQUATE TRAFFIC CONTROL MEASURES IN ACCORDANCE WITH OCCUPATIONAL HEALTH AND SAFETY GUIDELINES.
7. HOUSE DRAINS TO BE CONSTRUCTED AT LOCATIONS AS SHOWN ON THE DRAWINGS.
8. SEDIMENT CONTROL STRUCTURES TO BE INSTALLED IN ACCORDANCE WITH THE SPECIFICATION AND TO THE APPROVAL OF THE SUPERINTENDENT.

LEGEND:

- PROPOSED STORMWATER
- PROPOSED STORMWATER PIT
- PROPOSED HOUSE DRAIN
- PROPOSED WATER RETICULATION
- PROPOSED ELECTRICITY
- PROPOSED NBN
- DRIVEWAY
- EXISTING CONTOURS (1.0m INTERVAL)
- EXISTING STORMWATER DRAINAGE
- EXISTING DRAINAGE
- EXISTING WATERMAIN
- EXISTING ELECTRICITY
- EXISTING OVERHEAD ELECTRICITY
- EXISTING COMMUNICATIONS
- PROPOSED 10.0m2 RAIN GARDEN
- PROPOSED STORAGE TANK/S 5,000 REUSE, 5,000 DETENTION

10 5 0 10 20 30 40 50
1 : 750 AT A1
1 : 1500 AT A3

CROSSCO ENGINEERING & ENVIRONMENTAL CONSULTANTS
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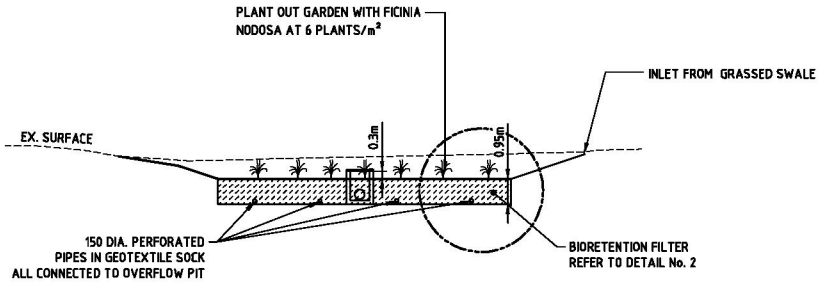
7 KEYS COURT, WY YUNG

SITE DRAINAGE PLAN - SHEET 1 OF 2

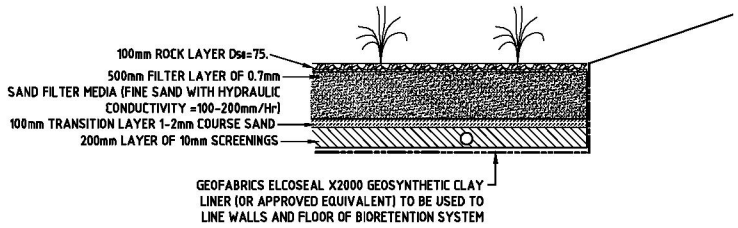
DRAWING No.

3019/001A

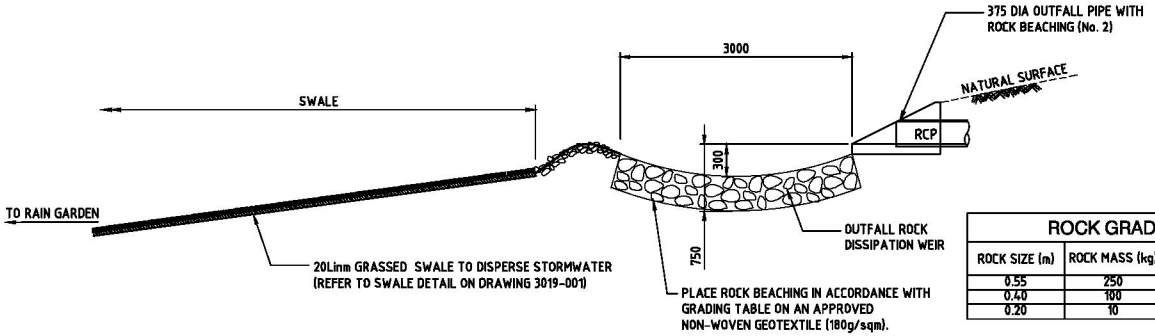
DATE: 4 APRIL 2025



DETAIL No. 1
RAIN GARDEN DETAIL
NOT TO SCALE

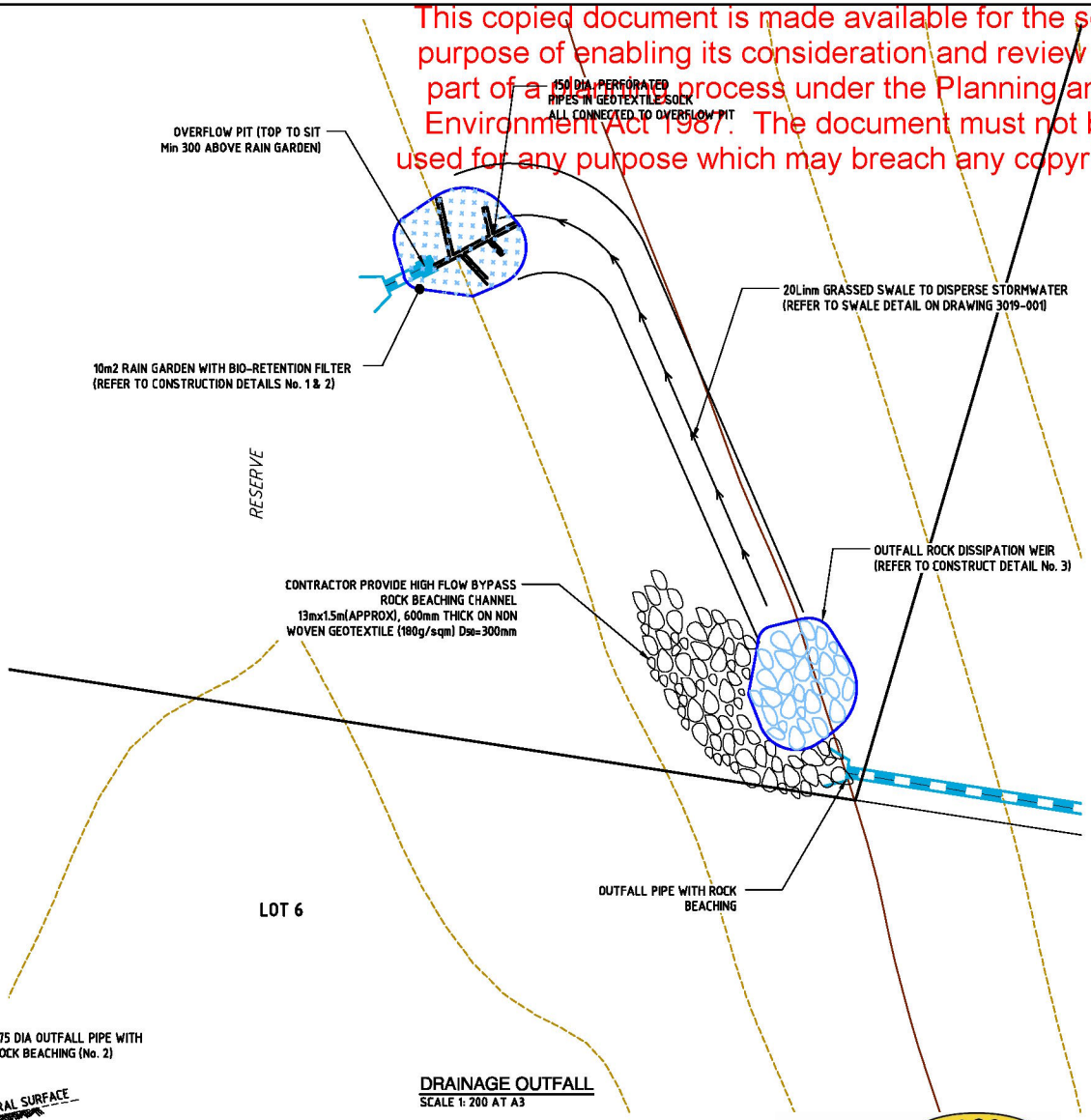


DETAIL No. 2
RAIN GARDEN - BIO-RETENTION FILTER
NOT TO SCALE



ROCK GRADING		
ROCK SIZE (m)	ROCK MASS (kg)	MIN % OF ROCK LARGER THAN
0.55	250	0
0.40	100	50
0.20	10	90

DETAIL No. 3
ROCK DISAPATION OUTFALL
NOT TO SCALE



DRAINAGE OUTFALL
SCALE 1: 200 AT A3

2 1 0 2 4 6 8
1 : 100 (A1)
1 : 200 (A3)

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7 KEYS COURT, WY YUNG
SITE DRAINAGE PLAN - SHEET 2 OF 2
DRAWING No.
3019/002A
DATE: 4 APRIL 2025

7 KEYS COURT, WY YUNG

Stormwater Detention

Pre-development

20% AEP Pre Development Flow:

A (ha)	Tc (min)	I (mm/hr)	C	Q (m³/s)
4.1346	10.000	79.100	0.300	0.273

Post development

20% AEP Post Development Flow and Storage:

Time (min)	I (mm/hr)	C	A (ha)	Sum CA (ha)	Ip (m³/s)	V (m³)	Qp (m³/s)	1-Qp/Ip	Smax (m³)
5	102	0.350	4.135	1.447	0.410	123.004	0.273	0.335	41.243
6	96.8	0.350	4.135	1.447	0.389	140.080	0.273	0.300	**41.966**
7	91.6	0.350	4.135	1.447	0.368	154.648	0.273	0.260	40.181
8	87	0.350	4.135	1.447	0.350	167.865	0.273	0.221	37.046
9	82.8	0.350	4.135	1.447	0.333	179.731	0.273	0.181	32.560
10	79.1	0.350	4.135	1.447	0.318	190.777	0.273	0.143	27.254
11	75.6	0.350	4.135	1.447	0.304	200.569	0.273	0.103	20.694
12	72.5	0.350	4.135	1.447	0.291	209.831	0.273	0.065	13.603
13	69.6	0.350	4.135	1.447	0.280	218.224	0.273	0.026	5.644
14	66.9	0.350	4.135	1.447	0.269	225.894	0.273	-0.013	-3.039
15	64.5	0.350	4.135	1.447	0.259	233.346	0.273	-0.051	-11.939
16	62.2	0.350	4.135	1.447	0.250	240.027	0.273	-0.090	-21.610
17	60.2	0.350	4.135	1.447	0.242	246.829	0.273	-0.126	-31.161
18	58.2	0.350	4.135	1.447	0.234	252.665	0.273	-0.165	-41.677
19	56.4	0.350	4.135	1.447	0.227	258.454	0.273	-0.202	-52.241
20	54.7	0.350	4.135	1.447	0.220	263.856	0.273	-0.239	-63.190
30	42.5	0.350	4.135	1.447	0.171	307.511	0.273	-0.595	-183.059

→ **Required Detention = 41.97 m3**

where:
A - Catchment Area
Tc - Time of Concentration
I - Rainfall Intensity
C - Runoff Coefficient
Q - Runoff
Ip - Inflow
Qp - Outflow (pre development flow)
Smax - Max Storage

7 KEYS COURT, WY YUNG

Stormwater Detention

Orifice Design

Discharge Control Pipe out of Tanks

20% AEP Pre Development Discharge (m^3/s)	0.04542 each lot
Level of Water (m)	1.000
Invert Level of Outlet Pipe (m)	0.000
Bernoulli's Equation:	$V_{out} = \sqrt{(2gh)}$ where h = 100 - 99=1.0
Outlet Velocity, V_{out} (m/s)	4.43
Pipe Flow Equation:	Q = VA where A = pipe area
Outlet Pipe Diameter (m)	0.090
Orifice Plate Diameter (m)	0.040
Coefficient of Orifice Plate Discharge	0.650
Post Development Discharge, Q (m^3/s)	0.0036

Proposed 40mm outlet from each tank

Catchment Breakdown

Catchment	Area (ha)[1,2]	F_{imp} (%)
A	4.3	10%
	4.3	10.0%

	No Lots
	5
Total	5

1 - Minor (pipe system) Catchment
2 - Assumes no further subdividing

Treatment Elements

WSUD Element	Element Type	Design Parameters
Tanks for Toilet Flushing	Tanks for Stormwater harvesting	5,000 litre tanks on each lot.
SW1	Swale	20m @ 2.5% slope, 0.5m base width, 3m top width, depth 0.25m
RG1	Rain garden	10m2 filter area, 12m2 surface area, 0.3m EDD

Catchments

Assumed Roof Size 300 m^2

Catchment	Area (ha)	F_{imp}						
A_Roof	0.15	100%		0.15	1		TRUE	TRUE
A_Other_Imp	0.28	100%		0.28	1		TRUE	TRUE
A_Perv	3.86	0%		3.86	0		TRUE	TRUE

Tanks

Reuse Only 5.00 5.2

Tanks	Roofs	Equivalent Tank Size (kL)	Toilet use (kL/yr)	Laundry Use (kL/yr)		Total Demand (kL/yr)		
A_Tanks	5	25	379.6			379.6	0.3796	TRUE

Results

Overall - TTE

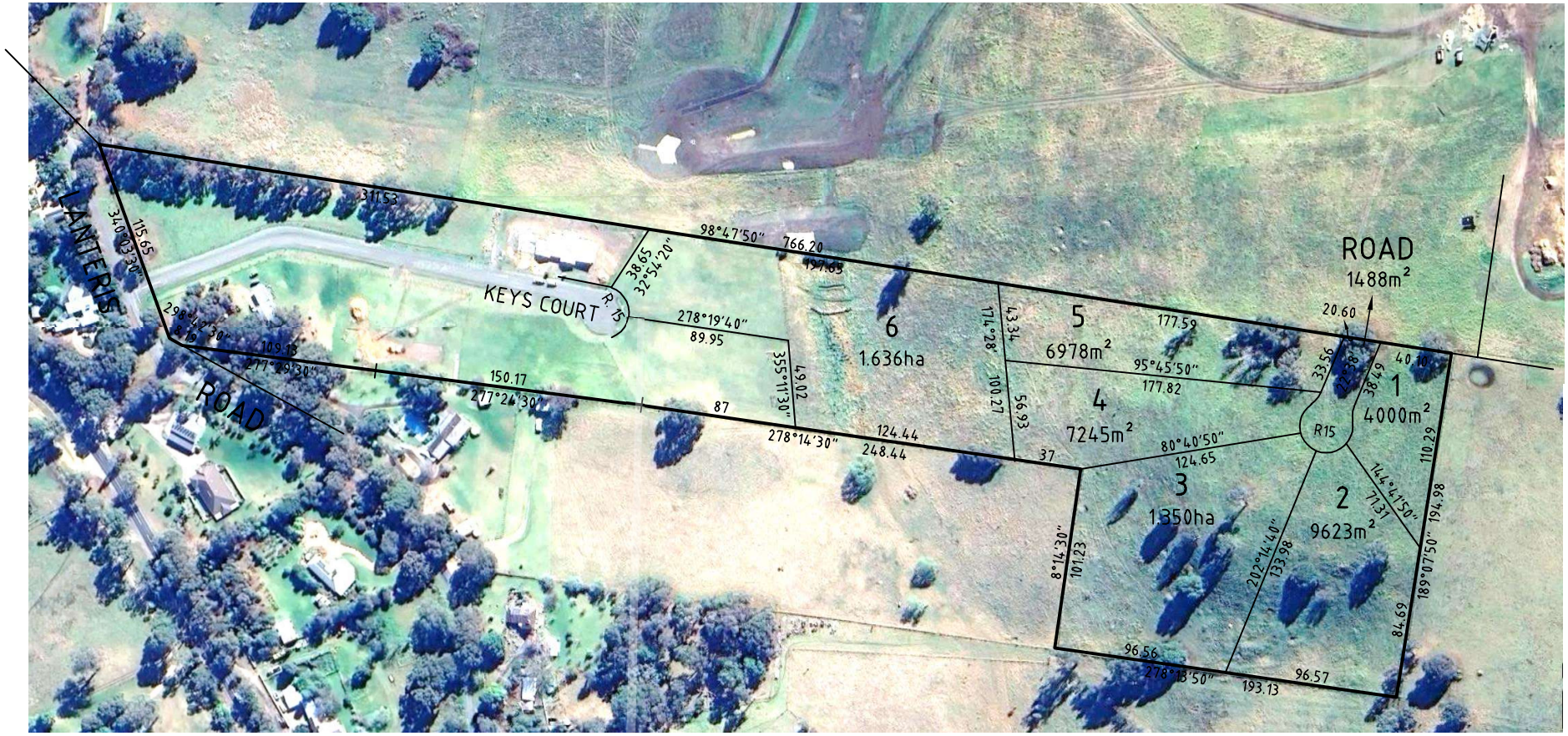
Pollutant:	Sources	Residual Load	% Reduction
Flow (ML/yr)	7.56	7.54	0.3%
Total Suspended Solids (kg/yr)	622.00	123.00	80.2%
Total Phosphorus (kg/yr)	1.95	1.02	47.7%
Total Nitrogen (kg/yr)	18.40	9.44	48.7%
Gross Pollutants (kg/yr)	90.80	0.00	100.0%

PARISH OF WY YUNG
CROWN ALLOTMENT 35[C1](PART)
LAST PLAN REF: PS 840690 (LOT 4) (PROPOSED)

TITLE REF:
ADDRESS: 64-66 LANTERIS ROAD, WY YUNG, VIC. 3875

PLAN OF PROPOSED SUBDIVISION

MGA 2020 ZONE 55



Beveridge Williams
development & environment consultants
Sale ph : 03 5144 3877
www.beveridgewilliams.com.au

SURVEYORS REFERENCE
1600534

SCALE: 1 : 2500

25 0 25 50 75 100
LENGTHS ARE IN METRES

ORIGINAL SHEET SIZE: A3

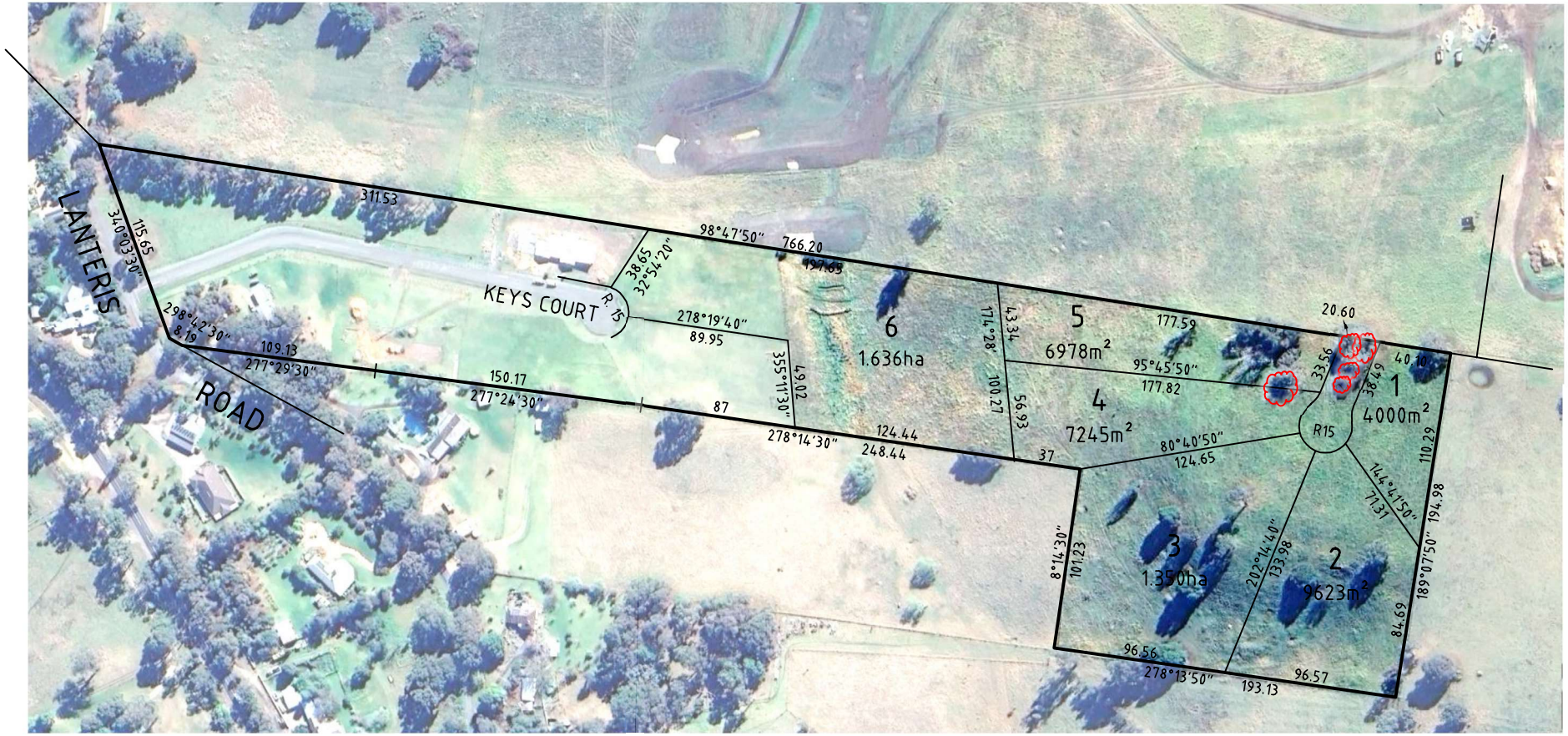
SHEET 1 OF 1

PARISH OF WY YUNG
CROWN ALLOTMENT 35^{C1}(PART)
LAST PLAN REF: PS 840690 (LOT 4) (PROPOSED)

TITLE REF:
ADDRESS: 64-66 LANTERIS ROAD, WY YUNG, VIC. 3875

PLAN OF PROPOSED SUBDIVISION & VEGETATION REMOVAL

N
MGA 2020
ZONE 55



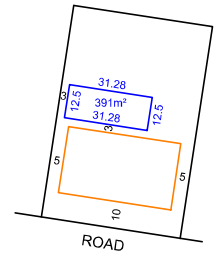
Beveridge Williams development & environment consultants Sale ph : 03 5144 3877 www.beveridgewilliams.com.au	SURVEYORS REFERENCE 1600534		SCALE: 1 : 2500	25 0 25 50 75 100 LENGTHS ARE IN METRES	ORIGINAL SHEET SIZE: A3 SHEET 1 OF 1
					TREE THAT IS PRESUMED LOST & BEING OFFSET:

PARISH OF WY YUNG
CROWN ALLOTMENT 35C1(PART)
LAST PLAN REF: PS 840690 (LOT 4) (PROPOSED)
TITLE REF:
ADDRESS: 64-66 LANTERIS ROAD, WY YUNG, VIC. 3875

PLAN OF PROPOSED SUBDIVISION

LEGEND
- Site boundary (approximate)
- Existing contours (1m interval)
- Easement
- Building Envelope
- Effluent envelope
- Indicative potential driveway location

TYPICAL OFFSETS
Unless noted otherwise the following offsets and effluent envelope dimensions apply



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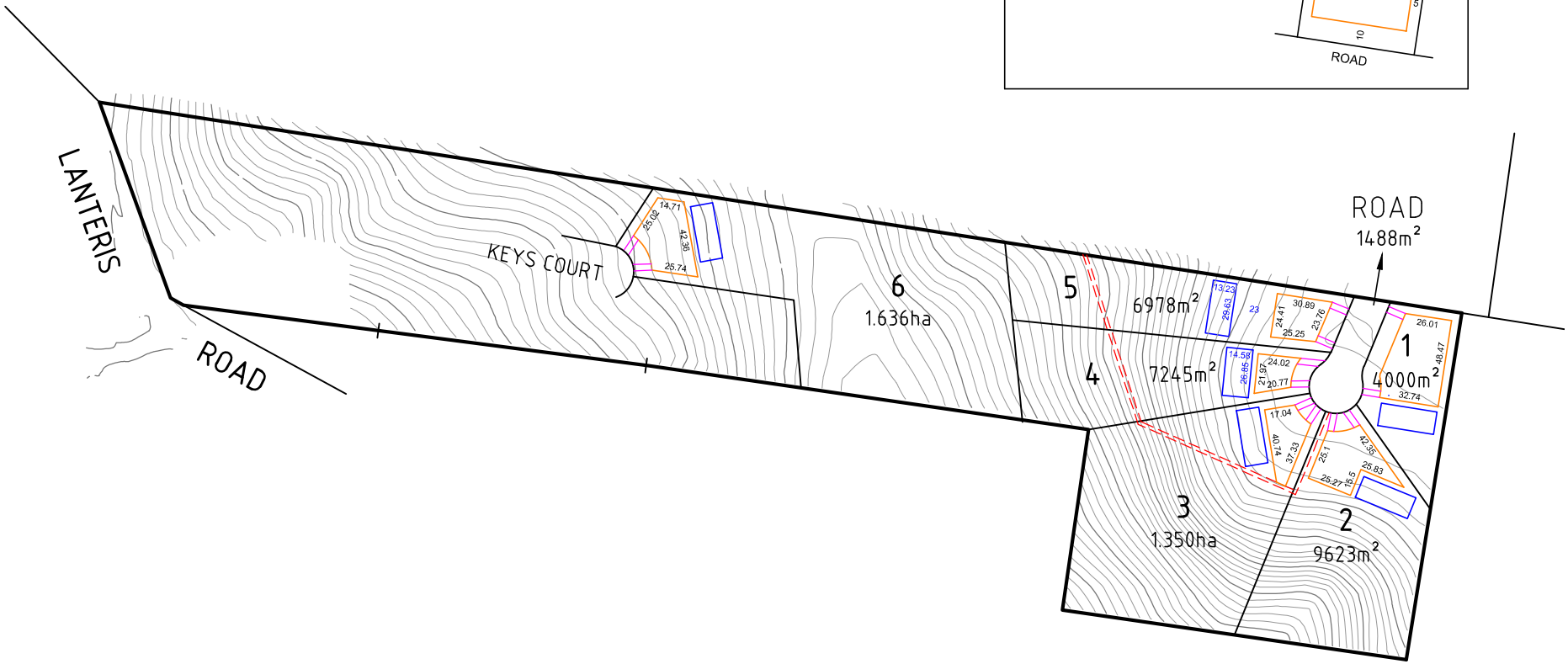
MGA 2020
ZONE 55



Beveridge Williams development & environment consultants Sale ph : 03 5144 3877 www.beveridgewilliams.com.au	SURVEYORS REFERENCE 1600534 V3A		SCALE 1 : 2500	25 0 25 50 75 100 LENGTHS ARE IN METRES	ORIGINAL SHEET SIZE: A3 / SHEET 1 OF 1