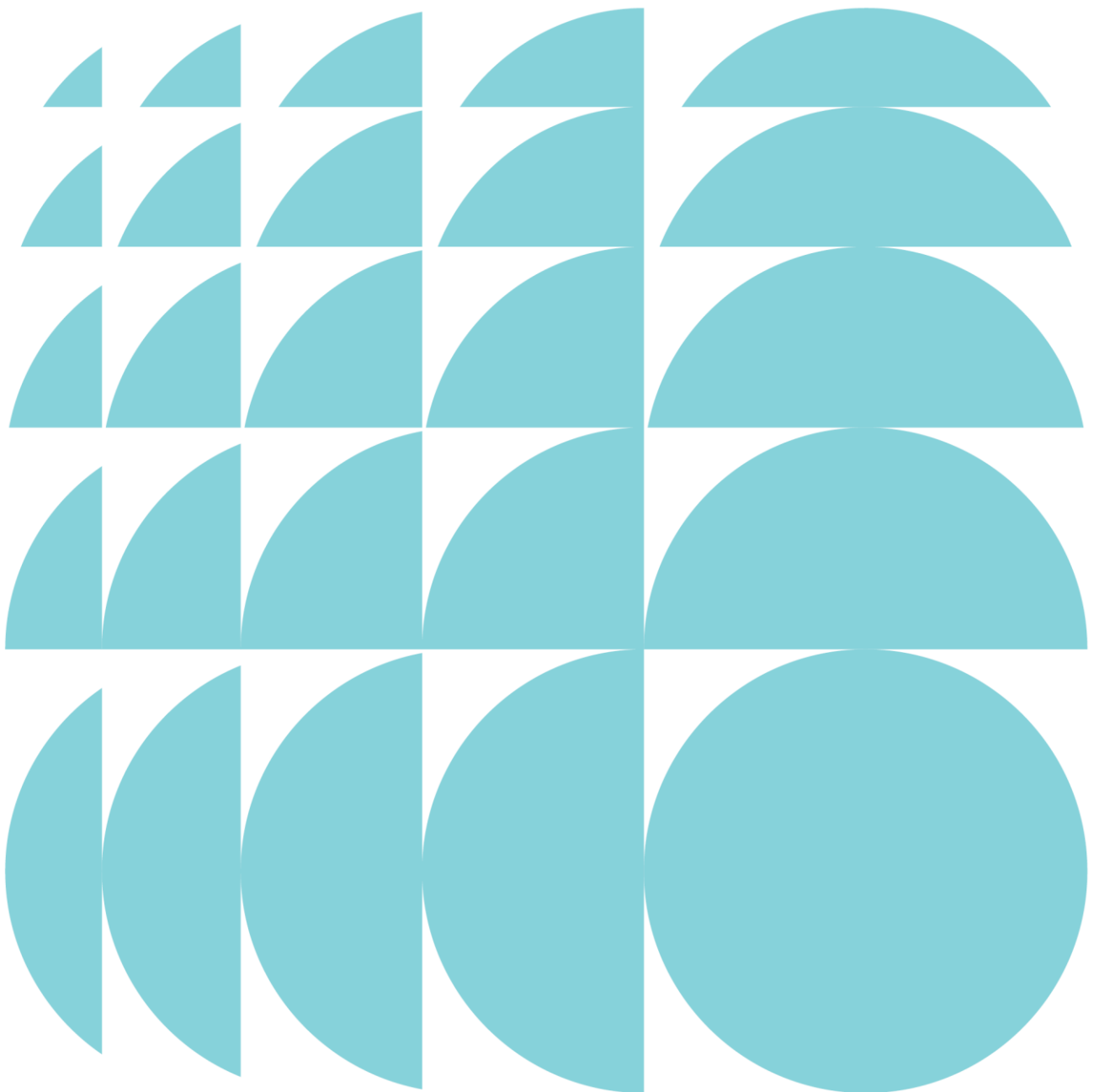


Planning Proposal

30-32 Telfer Road, Castle Hill
Amendment to The Hills LEP 2019

Submitted to The Hills Shire Council
On behalf of JS Architects

20 August 2021 | 2210089



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VERSION NO.

DATE OF ISSUE

REVISION BY

APPROVED BY

A

20/08/2021

JT

JM

Final

23/08/2021

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- A** Draft Plan of Subdivision
JS Architects
- B** Survey Plan
Summit
- C** Landslide Risk Assessment Report
Geotesta
- D** Draft LEP maps
Ethos Urban

Executive Summary

This report has been prepared by Ethos Urban on behalf of JS Architects, the landowners of the site at 30-32 Telfer Road, Castle Hill (the site) in support of a Planning Proposal to amend the Hills Local Environmental Plan 2019. Specifically, this Planning Proposal seeks to:

- Rezone the site from E4 Environmental Living to R2 Low Density Residential; and
- Reduce the minimum lot size control for the site from 200m² to 700m².

An indicative plan of subdivision for four (4) residential lots and one right of carriageway (ROW) has been prepared to demonstrate the site's capacity to accommodate residential dwellings in a manner which reflects the proposed amendments.

The Planning Proposal has been prepared in accordance with Section 3.33 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and the relevant guidelines prepared by the former NSW Department of Planning and Infrastructure including "A Guide to Preparing Local Environmental Plans" and "A Guide to Preparing Planning Proposals".

The Site

The site is located within an established residential area in Castle Hill which is located approximately 1km (15 min) walking distance from Castle Towers, a regionally significant shopping centre, and Castle Hill Station and bus interchange which provides high frequency transport to Parramatta, Norwest, Macquarie Park, Chatswood and the Sydney CBD beyond. The site is also close to a number of schools (including Castle Hill Public School and Castle Hill High School) and other active and passive public open space areas.

Further, with the exception of the site being identified as having landslide risk, the site is not burdened by any environmental constraints that would prevent or restrict development of the site.

Strategic Merit

At State level, the Greater Sydney Region Plan and the Central City District Plan are the central strategic policies against which the proposal's strategic merit is to be considered. The fundamental strategic vision of both documents is to create a '30-minute city' whereby residents live within 30 minutes travel of their place of work. The site is located within close to Castle Towers and Castle Hill Station providing residents with convenient retail offerings and high frequency public transport to strategic employment centres including Norwest, Parramatta and Macquarie Park. The Planning Proposal to facilitate appropriately scaled low density residential development at the site is entirely consistent with the State Government's strategic planning vision to create a '30-minute' city with integrated land use and transport connections consistent with objectives 10, 11 and 14 of the Greater Sydney Region Plan.

The site is located in an appropriate and accessible location for additional low density residential dwellings, the proposal is also consistent with Planning Priority C5 in the Central City District Plan "provide housing supply, choice and affordability, with access to jobs, services and public transport".

The Hills Local Strategic Planning Statement represents Council's strategic framework to guide the delivery of its nominated housing supply targets and objectives. Council seeks additional and diverse types of housing supply in accessible and appropriate locations which also protect and enhance the natural environment. The Planning Proposal seeks the rezoning of land to accommodate a modest increase of low density housing, is in an appropriate location and will assist Council in reaching its dwelling target of 38,500 new dwellings by 2036.

Site Specific Merit

The indicative plan of subdivision submitted with the Planning Proposal is compatible with the existing subdivision pattern in the immediate surrounding area. The Planning Proposal seeks the same development standards as neighbouring R2 zoned land to the south and east which will result in development with a consistent residential character in the locality. This Planning Proposal seeks to provide a suite of low intensity residential land uses which better reflect the existing characteristics of the site.

The site is not known to contain remnant vegetation or biodiversity values with the existing site containing a large residential dwelling, trees on or near the site boundary and a significant portion of the site containing groundcovers. The geotechnical assessment concludes that landslip risk management processes and risk treatments will protect future development.

The site is located close to neighbouring schools, parks and shops and the site is located near frequent Metro and bus connections to Parramatta, Macquarie Park, Norwest and the Sydney CBD beyond. The utilities assessment indicates that the proposal has sufficient connections to accommodate the proposed increase in residential density.

This Planning Proposal demonstrates both strategic merit and site-specific merit.

Planning Process and Next Stages

It is requested that Council consider the proposed amendments to *The Hills Local Environmental Plan 2019* contained in this Planning Proposal and, if Council forms the view that there is strategic merit in proceeding with the recommended amendments, refer the proposal to the NSW Department of Planning, Industry and Environment's Gateway Determination Panel.

1.0 Introduction

This report has been prepared by Ethos Urban on behalf of JS Architects in support of a Planning Proposal (Planning Proposal) to amend the Hills Local Environmental Plan 2019 (THLEP 2019) as it relates to 30-32 Telfer Road, Castle Hill (the site).

The objective of this Planning Proposal is to amend the THLEP 2019 to achieve a modest increase in density on the site in a manner consistent with neighbouring residential land. Therefore, this Planning Proposal seeks the following amendments:

- Rezone the site from E4 Environmental Living to R2 Low Density Residential; and
- Reduce the minimum lot size control from 2000m² to 700m².

This Planning Proposal will amend these controls to facilitate the provision of four (4) lots for residential dwellings and one right of carriageway (ROW) within an established residential area. The controls sought are entirely consistent with the controls adopted for R2 zoned land to the immediate south and east of the site and the broader Hills Local Government Area (LGA). Therefore, the built form impacts resulting from this Planning Proposal will be the same as that in R2 zoned land. In addition, the site is within walking distance (1km) from Castle Towers, an established shopping centre, and the Castle Hill Station and bus interchange which links the site with regional and employment centres such as Rouse Hill, Norwest Business Park, Macquarie Park and the Parramatta and Sydney CBD beyond.

This Planning Proposal has been prepared in accordance with Section 3.33 of the *Environmental Planning & Assessment Act 1979* (EP&A Act), and 'A Guide to Preparing Planning Proposals' prepared by the NSW Department of Planning and Environment. **Section 5.0** of this report sets out the strategic justification for the Planning Proposal and provides an assessment of the relevant strategic plans, state environmental planning policies, ministerial directions and the environmental, social and economic impacts of the proposed amendment. This report should be read in conjunction with the following expert consultant reports appended:

- Draft Plan of Subdivision prepared by JS Architects (**Appendix A**)
- Survey Plan prepared by Summit (**Appendix B**)
- Landslide Risk Assessment Report prepared by Geotesta (**Appendix C**)
- Draft LEP maps prepared by Ethos Urban (**Appendix D**)

1.1 Pre-lodgement Consultation

The Applicant has met with the Council's Duty Planner to discuss the Planning Proposal on 11 June 2019 and 28 January 2021. No formal feedback was provided.

2.0 The Site

2.1 Site Location and Context

The site is located approximately 1km to the south-east of the Castle Hill Town Centre in the Hills LGA and is approximately 10km to the north of Parramatta CBD and 23km to the north west of the Sydney CBD. The site is located away from the hill ridge on Castle Hill Road and The Northern Road to the north and east and land in the locality generally slopes from the north to south and east.

The Castle Hill Town Centre contains numerous shopping and retail stores in its commercial area including two shopping centres (Castle Towers and Castle Mall), the Castle Hill metro station and the Castle Hill bus interchange. Metro and bus services link Castle Hill with high frequency transport to local and regional employment centres including Norwest, Macquarie Park, Parramatta, Chatswood and the Sydney CBD. The site is located within 350m of a bus stop on the southern frontage of the Old Northern Road and within 400m of a bus stop on the northern frontage of the Old Northern Road which provide services throughout the Hills District and to Parramatta, Epping and Hornsby.

The site is located within a low density, established residential area of Castle Hill. Vegetation and bushland is located approximately 200m to the north east of the site between Castle Hill Road and Glen Street. There is no discernible difference in residential character between the site and E4 Environmental Living zoned land to the north, R3 zoned land to the west and R2 Low Density Residential zoned land to the south and east.

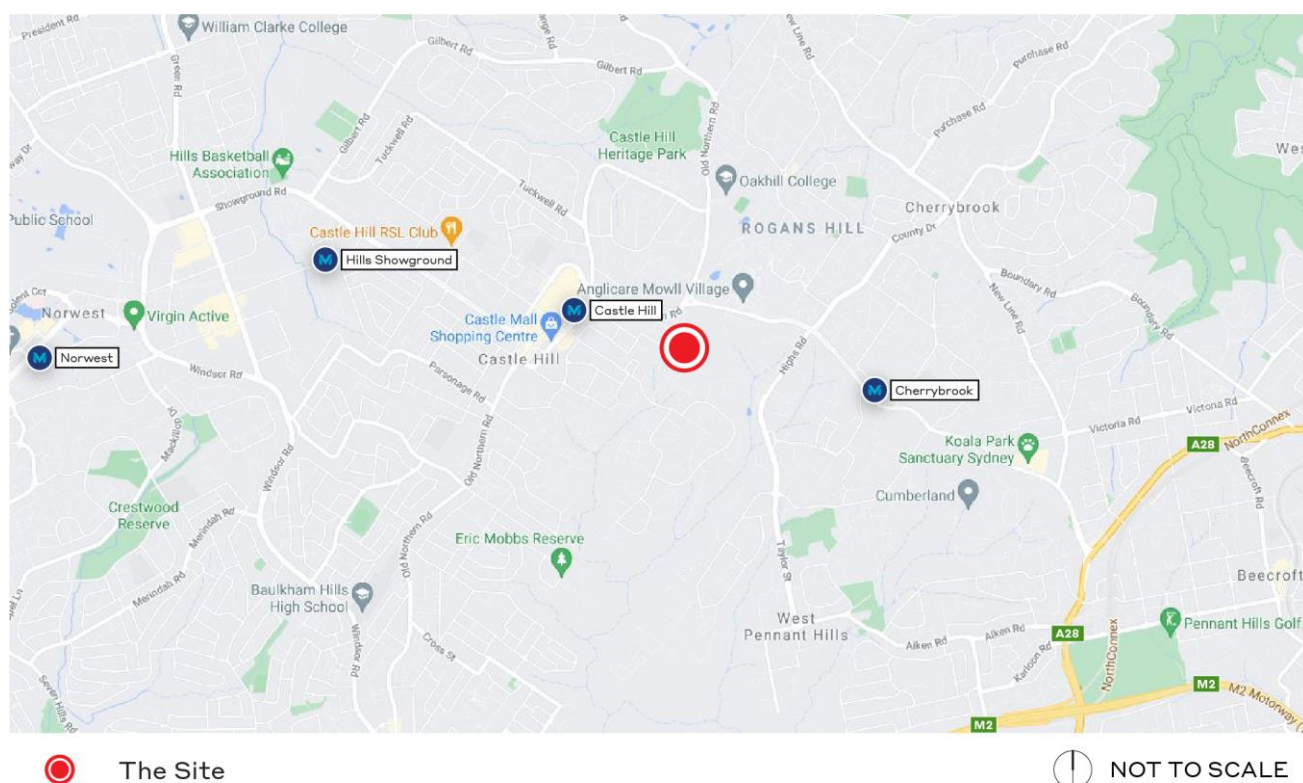


Figure 1 Context Map

Source: Google Maps & Ethos Urban

The surrounding area contains a number of community facilities, public transport, recreational facilities and other land uses that support the strategic merit of the Planning Proposal and more specifically, the future use of residents. Key locations and their distance from the site are outlined in **Table 1**.

Table 1 Key locations in the surrounding area

Location	Travel distance from the site
Castlewood Park	900m
Castle Hill Station	1km
Castle Towers	1km
Castle Hill Public School	1.5km
Greenup Park	1.5km
Castle Hill Heritage Park	2.2km
Castle Hill High School	2.3km

2.2 Site Description

The site is legally described as Lot A DP 358163. The site has an area of approximately 4,293m² and has a frontage of approximately 40m to Telfer Road and is rectangular in shape. A Survey Plan is located at **Appendix B**.

The site currently contains one residential dwelling with two driveways to Telfer Road, with the dwelling located to the north of the site near the street frontage. The site slopes 10m from north west to south east. Grass and groundcovers are largely located behind the dwelling, with other vegetation concentrated to the southern and eastern portions of the site. The Survey Plan indicates that 15 trees are located on the site.

The site (along with land to the west and the north) is identified as landslide risk under THLEP 2019. However, the site is not burdened by the following environmental constraints:

- Heritage and conservation;
- Critical habitats;
- Road widening, realignment or Council land acquisition;
- Bushfire;
- Acid Sulfate Soil; and
- Flooding or overland flow.

An aerial photo of the site is shown at **Figure 2** below.



Figure 2 Aerial Map
Source: Nearmap & Ethos Urban



Figure 3 **The Site as viewed from Telfer Road**

Source: Ethos Urban

2.3 Surrounding Development

Low density residential uses predominate the surrounding area, with detached dwelling houses being the primary development typology in the vicinity. The character of surrounding development is shown in **Figures 4 – 8** below.



Figure 4 Residential development to the north of the site at Telfer Road

Source: Ethos Urban



Figure 5 Residential development to the south of the site at Ilyarie Place

Source: Ethos Urban



Figure 6 Residential development to the south of the site at Telfer Road

Source: Ethos Urban



Figure 7 Residential development to the east of the site at Telfer Way

Source: Ethos Urban



Figure 8 Residential development to the west of the site at Telfer Road

Source: Ethos Urban

2.4 Current Planning Controls

2.4.1 The Hills Local Environmental Plan 2019

The key planning controls that currently apply to the site under the Hills LEP are outlined in **Table 2** below.

Table 2 Current controls under THLEP 2019

Control	Comment
Land Use Zoning	The site is zoned E4 Environmental Living which permits the following residential uses: Bed and breakfast accommodation; Building identification signs; Business identification signs; Community facilities; Dual occupancies (attached); Dwelling houses; Emergency services facilities; Environmental protection works; Home-based child care; Home businesses; Oyster aquaculture; Pond-based aquaculture; Roads; Secondary dwellings; Tank-based aquaculture
Minimum Lot Size	The site has a minimum lot size control of 2000m ² .
Building Height	The site has a maximum building height control of 9m.
Floor Space Ratio	No Floor Space Ratio control applies to the site.
Landslide Risk	Clause 7.6 of THLEP 2019 relates to landslide risk and applies to the site. The object of this clause is to ensure that development is commensurate to the underlying geotechnical conditions and to restrict development on unsuitable land.

3.0 Proposed Subdivision and Planning Proposal

3.1 Overview

This planning proposal aims to facilitate the subdivision of the site into four (4) lots with each approximately 700m² in area and one ROW as depicted below in **Figure 9**. This will enable residential dwellings to be developed on the site.

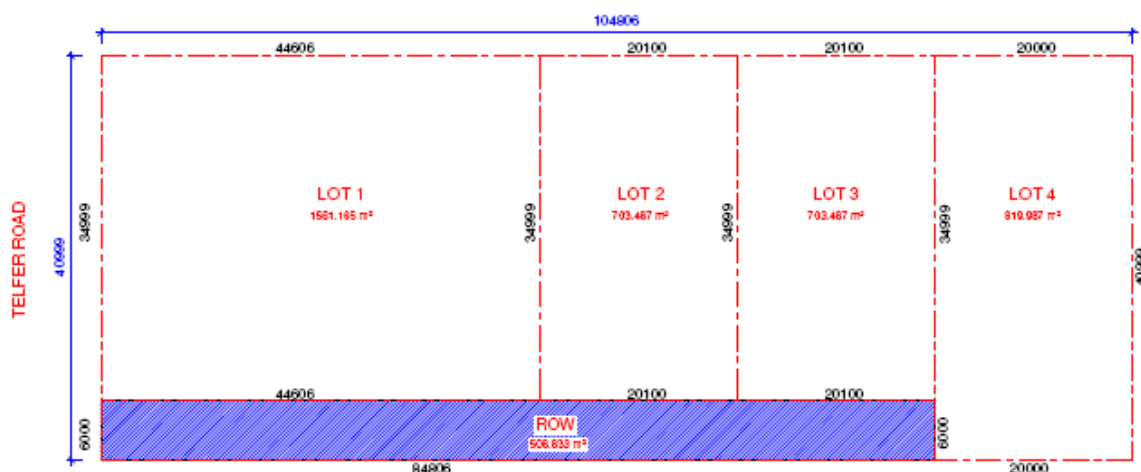


Figure 9 Plan of Subdivision

Source: JS Architects

A site specific DCP is not proposed. Future development will be designed with reference to the relevant sections of the Hills Development Control Plan 2012 or be developed under a Complying Development Certificate under Part 3 Housing Code of the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008.

3.2 Proposed Amendments to The Hills Local Environmental Plan 2019

The Planning Proposal seeks to amend the THLEP 2019 to facilitate a residential subdivision generally consistent with the indicative subdivision plan in **Appendix A** and extracted above in **Figure 9**. The proposed LEP controls are detailed below.

- Land Use Zoning - the land use zone of the site on the Land Zoning Map is to be amended from E4 Environmental Living to R2 Low Density Residential which permits dwelling houses on the site.
- Minimum Lot Size - the minimum lot size control of the site on the Lot Size Map is to be amended from a V1 designation (permitting a minimum lot size of 2,000m²) to a Q designation (permitting a minimum lot size of 700m²).

It is noted that the existing maximum height of buildings control of 9m which applies to the site is not proposed to be amended. No Floor Space Ratio (FSR) control applies to the site and this Planning Proposal does not seek to change this.

4.0 Strategic Justification

The following section considers the Planning Proposal against the Department of Planning and Environment's Strategic Merit and Site-Specific Merit Tests for Planning Proposals.

4.1 Strategic Merit Test

A Guide to Preparing Planning Proposals sets out that in order to answer this question, a planning proposal needs to justify that it meets the Strategic Merit Test. The consistency of this Planning Proposal with the mandated assessment criteria is set out below.

Is the proposal consistent with the relevant regional plan outside of the Greater Sydney Region, the relevant district plan within the Greater Sydney Region, or corridor/precinct plans applying to the site, including any draft regional, district or corridor/precinct plans released for public comment?

Greater Sydney Region Plan

'A Metropolis of Three Cities – The Greater Sydney Region Plan' was released by the Greater Sydney Commission in March 2018. This outlines actions to achieve the State Government's vision for Sydney to 'enhance its status as one of the most liveable global cities'. It sets out the 40 year vision objectives, strategies and actions for developing a three city metropolis model for greater Sydney comprising the Western Parkland City (near the future Western Sydney Airport), the Central River City (Parramatta) and the Eastern Harbour City (Sydney).

The Plan's Vision for 2056 promotes the '30 minute city' concept across greater metropolitan Sydney, allowing people to live, work and access amenities and services in a highly accessible manner. The Plan also advocates for more housing in the specific locations and encourages urban renewal of particular sites which benefit from existing and proposed infrastructure. The Plan identifies emphasises the importance of aligning population growth with infrastructure investment to create liveable and well serviced cities.

The plan includes 40 separate objectives to achieve this vision across the following themes:

- Infrastructure and collaboration;
- Liveability;
- Productivity; and
- Sustainability.

The Planning Proposal aligns with the objectives of the Greater Sydney Region Plan by amending the existing planning framework to allow for additional residential capacity and improving housing choice in an accessible and appropriate location near the Strategic Centre of Castle Hill. This improves the level of housing supply in an area close to shops and public transport and improves the diversity of new housing in the area. Therefore, this aligns with the objectives of the plan. Further comment is provided in **Table 3** below.

Table 3 Consistency with the Metropolis of Three Cities – Greater Sydney Region Plan

Objective	Planning Proposal
Objective 10. Greater housing supply	The Planning Proposal meets this objective by amending the existing planning controls to enable a four (4) lot residential subdivision for dwellings in an established residential neighbourhood. This represents the orderly and economic development of land and results in greater housing supply for the residential suburb of Castle Hill.
Objective 11. Housing is more diverse and affordable	The Planning Proposal seeks to increase the number of new dwellings in the suburb of Castle Hill, where most new housing is in the form of apartments and other higher density typologies near the town centre. This improves the diversity of new housing in the locality and improves affordability by increasing supply.
Objective 14. A Metropolis of Three Cities – integrated land use and transport creates walkable and 30-minute cities	The Planning Proposal meets this objective by:

Objective	Planning Proposal
	• Creating an opportunity for additional dwellings within a short distance of the Castle Hill town centre; • Supports the delivery of existing transport infrastructure including Sydney Metro and bus by ensuring additional residential capacity is located in an accessible location; • Will contribute additional monetary contributions towards the provision of community infrastructure to service the growing city.
Objective 27. Biodiversity is protected, urban bushland and remnant vegetation is enhanced	The proposal does not remove any ecological habitat and the site is not identified to contain bushland, remnant vegetation or biodiversity values as the site is used for residential purposes.
Objective 30. Urban tree canopy cover is increased	The urban tree canopy can be preserved as part of any future development of the site for the purposes of dwellings.

Central City District Plan

The Greater Sydney Commission's overarching vision for the Central City is to provide a 30-minute city in a manner consistent with the Greater Sydney Region Plan. This means that residents in the Central City District will have quicker and easier access to a wider range of jobs, housing types and activities. The Central City District Plan sets out 20 strategic Planning Priorities to achieve the vision.

The Planning Proposal is consistent with Planning Priority C5 – "Providing housing supply, choice and affordability with access to jobs, services and public transport". The Planning Proposal is consistent with Planning Priority C5 for the following reasons:

- The Planning Proposal will boost housing supply within the established residential neighbourhood of Castle Hill a short distance from established retail, community facilities and high frequency public transport, in a manner consistent with the District Plan and will also enable the existing community to remain in place.
- The site is accessible and represents a large landholding in Castle Hill. The delivery of additional housing is to be prioritised to meet the changing needs of the local community.
- The site is within walking distance of the Castle Towers shopping centre and within 30 minutes travel time on public transport to Parramatta CBD, Macquarie Park and Norwest. Therefore, it is in a strategically appropriate location to deliver the '30-minute City' by taking advantage of the amenity, services and employment opportunities provided by the surrounding strategic centres which include a full range of office, government, retail, cultural, entertainment and recreational activities.

Is the Planning Proposal consistent with a Council's local strategy or other local strategic plan?

The Hills Local Strategic Planning Statement

Hills Future 2036, The Hills Shire Council's Local Strategic Planning Statement (LSPS), links the State's regional planning framework with Council's local planning framework and sets out Council's short-, medium- and long-term priorities on infrastructure, liveability, productivity and sustainability to a 20 year horizon. The LSPS was endorsed by Council on 22 October 2019.

The LSPS presents 23 Planning Priorities which seek to shape the growth of the LGA. Applicable Planning Priorities relating to housing and the environment are reproduced below. In summary, the Planning Proposal is consistent with the outcomes of the Hills LSPS.

Table 4 Consistency with Hills LSPS

Planning Priority	Comment
Planning Priority 6: Plan for new housing to support Greater Sydney's growing population	The Planning Proposal seeks to amend the existing suite of planning controls to provide four (4) new dwellings within an area with an established residential character and serviced by existing utilities. This will assist Council to reach its new dwelling target of 38,500 dwellings by 2036. The site is not industrial, employment or rural land.

Planning Priority	Comment
Planning Priority 7: Plan for new housing in the right locations	The site is within walking distance of the Castle Hill station precinct which provides transport, employment and services which are easily accessible to future residents.
Planning Priority 8: Plan for a diversity of housing	The provision of new dwelling house stock in Castle Hill as sought by this Planning Proposal seeks to balance new housing in this location with higher density apartment style housing stock closer to the Castle Hill metro station. This provides a diversity of new housing which may be constructed in the suburb of Castle Hill.
Planning Priority 17: Protect areas of high environmental value and significance	Although the site is zoned E4 Environmental Living, the site currently contains one dwelling house and groundcovers to the rear with little environmental significance and ecological value. The site is largely reflective of its neighbouring residential zoned character and this Planning Proposal seeks to rezone the site to better reflect its own existing characteristics which do not significantly reflect environmental values.
Planning Priority 20: Prepare residents for environmental and urban risks and hazards	The site has a landslide risk overlay in the THLEP 2019. The geotechnical site investigation carried out by Geotesta in Appendix C concludes that the risks of shallow slump failure and deep seated failure are respectively unlikely and rare likelihood. A number of landslide risk management strategies are recommended in the report including the design of slope stabilisation mechanisms, drainage, footing designs and cut and fill which are to be adopted by any future DA for dwellings on the site.

Hills Draft Local Housing Strategy

The Hills Draft Local Housing Strategy (LHS) was prepared to outline the strategic direction to manage the residential population growth anticipated between 2016 and 2036 which is envisioned to be between 162,500 people to 290,900 people, or approximately 80% of the existing population. The draft LHS has been prepared to reflect the planning priorities of the Hills LSPS, specifically the following:

- plan for new housing to support Greater Sydney's growing population;
- plan for new housing in the right locations;
- plan for a diversity of housing;
- renew and create great places; and
- provide social infrastructure and retail services to meet residents' needs.

Although the draft LHS has not yet been endorsed by DPIE, the Planning Proposal is consistent with these planning priorities for the following reasons:

- The Planning Proposal seeks to increase the supply of housing in an accessible location close to schools, public transport, retail and other services close to an existing town centre;
- The Planning Proposal seeks to broaden the residential uses permissible on the site and proposes built form controls which are entirely consistent with neighbouring R2 zoned land which will result in acceptable built form impacts; and
- There is sufficient public infrastructure and utility services which can accommodate the minor increase in residential density.

Therefore, the proposal is consistent with the provisions of the Hills draft LHS.

4.2 Site Specific Merit Test

Does the proposal have site-specific merit?

Table 5 below considers the planning proposal against the Department's site-specific merit test.

Table 5 Strategic Merit Test

Site Specific Merit	Comment
the natural environment (including known significant environmental values, resources or hazards) and	The site does not contain any remnant vegetation or bushland and the existing dwelling and groundcovers are located on much of the site. The site is not known to accommodate endangered natural habitats. The site is located within a significant area of existing urban development and has been substantially cleared and developed in the past. Therefore, the Planning Proposal to facilitate a minor increase in density on the site is acceptable on environmental grounds.
the existing uses, approved uses, and likely future uses of land in the vicinity of the proposal and	The Planning Proposal seeks to amend the existing suite of planning controls for the site to be entirely consistent with controls on the neighbouring R2 zoned land.
the services and infrastructure that are or will be available to meet the demands arising from the proposal and any proposed financial arrangements for infrastructure provision.	The Planning Proposal will not create any significant demands on the existing services and infrastructure.

Therefore, based on the above conclusions, the Planning Proposal demonstrates both site specific and strategic merit.

5.0 State Legislation and Planning Policies

5.1 Environmental Planning and Assessment Act 1979

The Environmental Planning and Assessment Act 1979 (the EP&A Act) and the Environmental Planning and Assessment Regulation 2000 (EPA Reg.) set out amongst other things the:

- requirements for rezoning land;
- requirements regarding the preparation of a local environmental study as part of the rezoning process;
- matters for consideration when determining a development application; and
- approval permits and/or licences required from other authorities under other legislation.

This Planning Proposal has been prepared in accordance with the requirements set out in Section 3.33 of the EP&A Act in that it explains the intended outcomes of the proposed instrument. It also provides justification and an environmental analysis of the proposal.

5.2 Consistency with State Environmental Planning Policies

An assessment of the Planning Proposal against relevant State Environmental Planning Policies (SEPPs) is set out in **Table 6** below.

Table 6 Consistency with State Environmental Planning Policies

SEPP	Consistency		N/A	Comment
	Yes	No		
SEPP No. 1 Development Standards			✓	SEPP 1 does not apply to The Hills Shire Council
SEPP (State and Regional Development) 2011			✓	Not relevant to proposed LEP amendment
SEPP (Affordable Rental Housing)			✓	Not relevant to proposed LEP amendment
SEPP (Exempt and Complying Development Codes)			✓	Not relevant to proposed LEP amendment. May apply to future development on the sites.
SEPP (Infrastructure)			✓	Not relevant to proposed LEP amendment. The proposed subdivision is not of a size that triggers provisions relating to traffic generating development.
SEPP No. 55 Remediation of Land			✓	The site has historically been used for residential purposes and no issues relating to land contamination have been previously raised.
SREP Sydney Harbour Catchment	✓			The site is located in the Sydney Harbour Catchment area however is not located in the close proximity of watercourses or to the Sydney Harbour foreshore area. Measures will be undertaken to future development to ensure that stormwater runoff does not adversely affect the harbour catchment.

5.3 Consistency with Applicable Ministerial Directions (s.9.1 directions)

An assessment of the Planning Proposal against applicable section 9.1 Directions is set out in **Table 7** below.

Table 7 Consistency with section 9.1 direction

Direction	Consistency		N/A	Comment
	Yes	No		
1. Employment and Resources				
1.1 Business and Industrial Zones			✓	The site is not located in a business or industrial zone.
1.2 Rural Zones			✓	The site is not located in a rural zone.
1.3 Mining, Petroleum Production and Extractive Industries			✓	Not applicable
1.4 Oyster Aquaculture			✓	Not applicable
1.5 Rural Lands			✓	Not applicable
2 Environment and Heritage				
2.1 Environmental Protection Zones			✓	Not applicable
2.2 Coastal Protection			✓	Not applicable. The site is not within the coastal zone.
2.3 Heritage Conservation			✓	Not applicable
2.4 Recreational Vehicle Area			✓	Not applicable
3. Housing, Infrastructure and Urban Development				
3.1 Residential Zones	✓			The proposal seeks to amend the existing land use zone from E4 Environmental Living to R2 Low Density Residential as well as reduce the minimum lot size from 2,000m² to 700m². This seeks to broaden the choice of building types permissible on the site and increase the density of development. The site is already connected with existing utilities and services and is not located on the urban fringe.
3.2 Caravan Parks and Manufactured Home Estates			✓	Not applicable
3.3 Home Occupations			✓	No change is proposed to the current permissibility of home occupations.
3.4 Integrating Land Use and Transport	✓			This Direction applies due to this Planning Proposal relating to a new residential zone for the site. The Direction states that a Planning Proposal must be consistent with the aims, objectives and principles of: Improving Transport Choice – Guidelines for planning and development (DUAP 2001), and The Right Place for Business and Services – Planning Policy (DUAP 2001). The Planning Proposal is broadly consistent with the aims, objectives and principles of the above documents in that it will provide residential accommodation in an area well serviced by public transport. The site is within walking distance of Sydney Metro and bus services to the Hills District and Parramatta.

Direction	Consistency		N/A	Comment
3.5 Development Near Licensed Aerodromes			✓	Not applicable
3.6 Shooting Ranges			✓	Not applicable
4. Hazard and Risk				
4.1 Acid Sulfate Soil			✓	Not applicable
4.2 Mine Subsidence and Unstable Land	✓			The site is not identified as being on land at risk of mine subsidence. The site however is identified as landslide risk in THLEP 2019. The geotechnical assessment concludes that the Planning Proposal has a low likelihood of landslide risk with further detail provided in Appendix C .
4.3 Flood Prone Land			✓	Not applicable
4.4 Planning for Bushfire Protection			✓	Not applicable
5. Regional Planning			✓	Not applicable
6. Local Plan Making				
6.1 Approval and Referral Requirements	✓			This Planning Proposal is consistent with this Direction in that it does not introduce any provisions that require any additional concurrence, consultation or referral.
6.2 Reserving Land for Public Purposes	✓			This Planning Proposal is consistent with this Direction in that it does not create, alter or reduce existing zonings or reservations of land for public purposes.
6.3 Site Specific Provision			✓	Not applicable. No site specific DCP controls are proposed.
7. Metropolitan Planning				
7.1 Implementation of A Plan for Growing Sydney	✓			Not applicable

5.4 The Hills Local Environmental Plan 2019

The Hills LEP 2019 is the key environmental planning instrument that applies to the site. Table 8 – 10 demonstrate that the Planning Proposal is consistent with the overall aims and relevant objectives of the Hills LEP.

Table 8 Consistency with Aims of THLEP 2019

Aim	Comment
(aa) to protect and promote the use and development of land for arts and cultural activity, including music and other performance arts,	The Planning Proposal does not preclude the ability for the Hills Shire to protect and promote the arts and cultural activity.
(a) to guide the orderly and sustainable development of The Hills, balancing its economic, environmental and social needs,	The Planning Proposal seeks the orderly and sustainable development of Castle Hill as it seeks to provide additional residential dwellings in a manner which is consistent with neighbouring residential land and manages environmental impacts.
(b) to provide strategic direction and urban and rural land use management for the benefit of the community,	The Planning Proposal is consistent with the strategic direction for urban land in the Hills Shire.
(c) to provide for the development of communities that are liveable, vibrant and safe and that have services and facilities that meet their needs,	The Planning Proposal seeks to allow residential development that are liveable, vibrant and safe for future residents in an accessible area close to retail, services, facilities and public transport.

Aim	Comment
(d) to provide for balanced urban growth through efficient and safe transport infrastructure, a range of housing options, and a built environment that is compatible with the cultural and natural heritage of The Hills,	The Planning Proposal seeks to provide balanced urban growth to provide residential dwellings in a manner entirely consistent and compatible with neighbouring R2 zoned land.
(e) to preserve and protect the natural environment of The Hills and to identify environmentally significant land for the benefit of future generations,	The site is not located on ecologically or biodiversity sensitive land and future development on the site will have the opportunity to increase the existing tree canopy which will preserve and protect the natural environment of the locality.
(f) to contribute to the development of a modern local economy through the identification and management of land to promote employment opportunities and tourism.	The Planning Proposal seeks to increase the number of dwellings available on the site which will provide housing to support the local economy.

Table 9 Consistency with R2 Low Density Residential zone objectives

Zone Objective	Comment
To provide for the housing needs of the community within a low density residential environment.	The Planning Proposal seeks to enable dwellings to be built on the site and meet the housing needs of future Castle Hill residents.
To enable other land uses that provide facilities or services to meet the day to day needs of residents.	The Planning Proposal seeks to provide the same land uses permissible under the existing R2 zone for the site.
To maintain the existing low density residential character of the area.	The Planning Proposal seeks to maintain the existing low density residential character of neighbouring R2 zoned land in incorporating the neighbouring minimum lot size of 700m ² on the site which seeks to provide a low density residential environment for the site similar in nature to neighbouring R2 zoned land.

Table 10 Consistency with Minimum Lot Size objectives

Standard objective	Comment
to provide for the proper and orderly development of land,	The Planning Proposal allows for the proper and orderly development of land as it allows for the subdivision of the site into four (4) lots in an established residential area with existing connections to utilities. The proposal seeks development of a similar character to that of neighbouring R2 zoned land.
to prevent fragmentation or isolation of land,	The site is rectangular in shape, is of a sufficient size to accommodate the subdivision and the proposed plan of subdivision does not fragment or isolate any land within or neighbouring the site.
to ensure that the prevailing character of the surrounding area is maintained.	The Planning Proposal seeks the same controls as that for neighbouring R2 zoned land which will ensure that the prevailing character of the site and its surrounds is maintained.

For the reasons outlined above, it is clear that the Planning Proposal will result in a development that is consistent with the relevant THLEP 2019 objectives.

6.0 Environmental Impacts

This section provides an environmental assessment of development available under the planning controls sought by this Planning Proposal and the indicative development these controls are capable of accommodating. As aforementioned, the site is capable of accommodating 4 new residential lots within a minimum size of 700m² as part of a new plan of subdivision for the site. As the site is proposed to be zoned R2 Low Density Residential, dwelling houses and dual occupancies with a maximum height of 9m are the most intensive form of development permissible with consent under the proposed suite of controls. The following section seeks to identify environmental impacts to neighbouring dwellings and surrounds as a result of the proposal.

6.1 Impacts to Neighbouring Dwellings

6.1.1 Privacy

This Planning Proposal seeks to adopt the relevant provisions relating to privacy and setbacks from the Hills DCP 2012. These controls provide an appropriate level of amenity for residential development and ensure that the visual and acoustic privacy for neighbouring residents is maintained. Controls relating to privacy and setbacks for single dwellings are contained in Part 2.14 in Part B Section 2 and Part 2.3 in Part B Section 3 for dual occupancies.

6.1.2 Overshadowing

This Planning Proposal seeks to adopt the relevant provisions relating to solar access which are contained in Part 2.14.10 in Part B Section 2 for dwelling houses and Part 2.10 in Part B Section 3 for dual occupancies. These controls ensure that solar access is maximised to internal living spaces and private open spaces of both proposed dwellings and neighbouring dwellings. The site maintains a pleasant outlook and orientation to the north east and the proposed plan of subdivision is capable of providing dwellings which maximises solar access to proposed dwellings.

6.1.3 Traffic and Parking

The Planning Proposal seeks to enable four (4) new residential allotments. It is anticipated that parking will be accommodated on site and the minimal increase in dwellings will have a negligible impact on the operation of the surrounding road network.

6.1.4 Landslip

The site has a landslide risk overlay in the THLEP 2019. The geotechnical site investigation carried out by Geotesta in **Appendix C** concludes that the risks of shallow slump failure and deep seated failure are respectively unlikely and rare likelihood. A number of landslide risk management strategies are recommended in the report including the design of slope stabilisation mechanisms, drainage, footing designs and cut and fill which are to be adopted by any future DA for dwellings on the site which seem to minimise landslide related impacts to the site and its surrounds.

7.0 NSW Department of Planning, Industry and Environment Guidelines

This Planning Proposal has been prepared in accordance with Section 3.33 of the EP&A Act and 'A Guide to Preparing Planning Proposals' prepared by the NSW Department of Planning and Environment, which requires the following matters to be addressed:

- objectives and intended outcomes of the amendment to the LEP;
- explanation of provisions;
- justification;
- relationship to strategic planning frameworks;
- environmental, social and economic impact;
- State and Commonwealth interests; and
- community consultation.

The following Section outlines the objectives and intended outcomes and provides an explanation of provisions in order to achieve those outcomes, including relevant mapping. The justification and evaluation of impacts is set out in **Section 6.0** of this report.

7.1 The Intended Outcome

The objective of this Planning Proposal is to amend the existing THLEP 2019 controls for the site in relation to land use zoning and minimum lot size to better enable residential development on the site. These proposed amendments are consistent with the residential character of the site and surrounds and seek the same set of controls as applied to R2 zoned land to the west and south of the site to ensure environmental impacts are managed.

A summary of the key objectives of the Planning Proposal is provided below:

- Allow for the residential subdivision on the site for the purpose of low density dwellings in a suitable location: the Planning Proposal will provide four (4) new homes in a location close to schools, parks, transport and shops. The site is within walking distance to high frequency Metro and bus connections to Parramatta, Macquarie Park, Norwest and the Sydney CBD;
- Zone land in a manner consistent with the existing land use zoning of neighbouring R2 Low Density Residential land: the resulting built form will be consistent in character with surrounding dwellings in the immediate locality to the east, south and west; and
- Increase housing supply within an established residential neighbourhood in an appropriate manner: the Planning Proposal will deliver dwellings that will meet the changing needs of the local population.

7.2 Explanation of Provisions

The Planning Proposal seeks to amend the THLEP 2019 to facilitate a residential subdivision generally consistent with the indicative subdivision plan in **Appendix A**. The existing and proposed LEP controls are detailed below:

- Land Use Zoning - the land use zone of the site on the Land Zoning Map is to be amended from E4 Environmental Living to R2 Low Density Residential which permits dwelling houses on the site.
- Minimum Lot Size - the minimum lot size control of the site on the Lot Size Map is to be amended from a V1 designation (permitting a minimum lot size of 2,000m²) to a Q designation (permitting a minimum lot size of 700m²).

The Planning Proposal does not seek to amend the existing height or FSR development standards that currently apply to the site.

7.3 Mapping

This Planning Proposal seeks to amend the Land Zoning Map and the Lot Size Map of the THLEP 2019. The proposed maps are included at **Appendix D**.

8.0 Strategic Justification

8.1 The Need for a Planning Proposal

Q1 – Is the Planning Proposal a result of any strategic study or report?

The Planning Proposal is not the result of any specific strategic study or report. The Planning Proposal will enable the delivery of four (4) new dwellings through subdivision of the site in appropriate location in a manner consistent with Council's Local Housing Strategy and LSPS.

Q2 – Is the Planning Proposal the best means of achieving the intended outcome?

The Planning Proposal is the best means of achieving the intended outcome as the current land use zoning and minimum lot size controls under the existing planning framework prohibit the proposed redevelopment of the site in this manner.

Q3 – Is the Planning Proposal consistent with the objectives and actions of the applicable regional, sub-regional or district plan or strategy (including any exhibited draft plans or strategies)?

Yes – refer to **Section 4.1**.

Q4 - Is the planning proposal consistent with a council's local strategy or other local strategic plan?

The Planning Proposal is consistent with the Hills LSPS. The Planning Proposal is also consistent with Hills draft Local Housing Strategy, however we note this has not yet been endorsed by DPIE (refer to **Section 4.1**).

Q5 - Is the planning proposal consistent with applicable State Environmental Planning Policies?

Yes – refer to **Section 5.2**.

Q6 - Is the planning proposal consistent with applicable Ministerial Directions (s.9.1 directions)?

Yes – refer to **Section 0**.

8.2 Environmental, Social and Economic Impacts

Q7 – Is there any likelihood that critical habitat or threatened species, populations or ecological communities, or their habitats, will be adversely affected as a result of the proposal?

The site is not located on ecologically or biodiversity sensitive land and existing development of a residential nature is located on the site. Future development on the site will have the opportunity to increase the existing tree canopy which will preserve and protect the natural environment of the locality.

Q8 – Are there any other likely environmental effects as a result of the Planning Proposal and how are they proposed to be managed?

An assessment of the environmental impacts of the Planning Proposal is provided in **Section 6.0**. No unacceptable impacts will result from the achievement of the intended outcome.

Q9 – Has the Planning Proposal adequately addressed any social and economic impacts?

The Planning Proposal will have a positive social impact and will provide additional dwellings close to established retail and commercial offerings in Castle Hill and public transport connections to surrounding employment centres.

8.3 State and Commonwealth Interests

Q10 – Is there adequate public infrastructure for the Planning Proposal?

The Planning Proposal seeks to facilitate a minimal increase in dwellings. The existing public infrastructure is adequate.

Q11 – What are the views of State or Commonwealth public authorities consulted in accordance with the Gateway determination?

The views of State and Commonwealth public authorities will be known once consultation has occurred in accordance with the Gateway determination of the Planning Proposal.

8.4 Community Consultation

Community consultation will be conducted in accordance with section 3.34 and Schedule 1 of EP&A Act and A *Guide to Preparing Planning Proposals*.

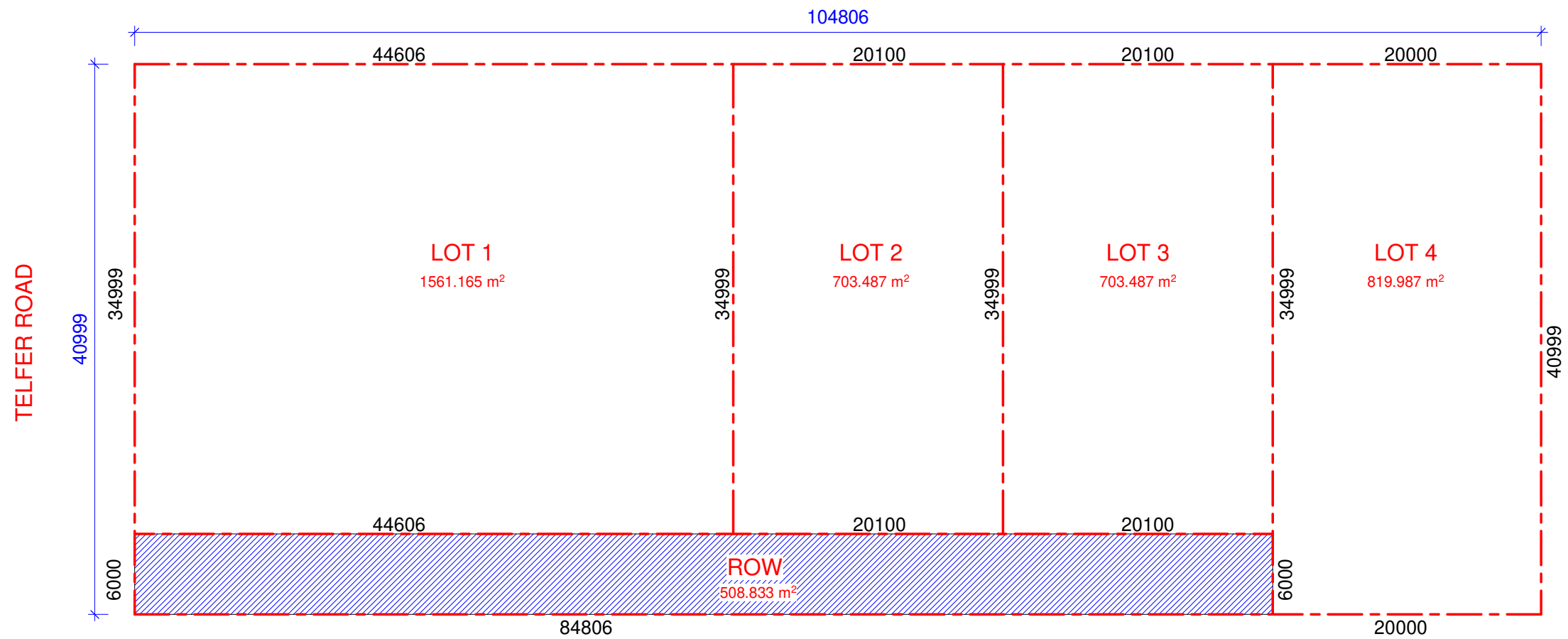
9.0 Conclusion

This Planning Proposal seeks an amendment to land use zoning and minimum lot size development standards relating to 30-32 Telfer Road, Castle Hill in the Hills Local Environmental Plan 2019 and seeks to enable a modest increase in low density residential development on the site within walking distance of local retail and frequent public transport services.

This Planning Proposal is justified for the following reasons:

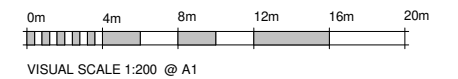
- The proposal is consistent with the objects of the EP&A Act, in that it promotes the orderly and economic use and development of land;
- The proposal is consistent with the strategic planning framework for the site;
- The development concept which the Planning Proposal aims to facilitate:
 - Allow for the residential subdivision on the site for the purpose of low density dwellings in a suitable location;
 - The rezoning of land in a manner consistent with the existing land use zoning of neighbouring R2 Low Density Residential land which will result in built form consistent in character with surrounding dwellings; and
 - Increase housing supply within an established residential neighbourhood in an appropriate manner.
- The proposal is consistent with the applicable SEPPs and Ministerial Directions.

Therefore, considering the strategic nature of the site and justification provided in addressing planning issues, we believe that the Planning Proposal has strategic merit and would have no hesitation in recommending that the Planning Proposal proceed through the Gateway to public exhibition.



1 SUBDIVISION PLAN

1 : 200



REVISION SCHEDULE			
ISSUE	DESCRIPTION	ISSUED BY	DATE
A	AREA OF LOT 2 AND LOT 3 REVISED	SO	25-10-2019

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CONSULTANTS

PM

NORTH POINT



THIS DRAWING ISSUE HAS BEEN REVIEWED BY
DIRECTOR - SO

CLIENT

MARK MINA

DRAWING TITLE
SUBDIVISION PLAN

DATE
25-10-2019

SCALE @ A1
1 : 200

PROJECT NUMBER
037 / 17-18

DRAWING No.
A101

ISSUE
A

PROJECT

PROPOSED SENIORS LIVING DEVELOPMENT
30-32 TELFER ROAD, CASTLE HILL

JS Architects Pty Ltd
Suite 4.04, Level 4, No: 5 Celebration Drive
BELLA VISTA ~ NSW 2153 Australia
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M : 61 412 06 06 04
E : info@jsarchitects.com.au
W : www.jsarchitects.com.au
ABN 70 119 946 575
Nominated Architect: Szymon Ochudzawa (RAIA 6865)



DIAGRAM
SCALE 1:500

ADJOINS BELOW L.H.S.

LEGEND:

TR/5/0.5/15 = TREE 5m Radius Spread / 0.5m Dia Trunk / 15m High
WT= WINDOW TOP
WS= WINDOW SILL
RL= REDUCED LEVEL
FLR= FLOOR LEVEL
AWN= AWNING
LP= LAMP POLE
SV= STOP VALVE
WM= WATER METER
ELP= ELECTRICITY LIGHT POLE
GAS= GAS METER
GASV= GAS VALVE
GUT= TOP OF GUTTER
PARA= PARAPET
HYD= HYDRANT
SLH= SEWER LAMP HOLE
SMH= SEWER MANHOLE
GPIT= GRATED PIT
TPIT= TELECOMMUNICATION PIT
SVENT= SERVICE VENT
BRET= BOTTOM OF RETAINING WALL
TRET= TOP OF RETAINING WALL

--- APPROXIMATE BOUNDARY POSITION ONLY.

NOTES:

* THIS PLAN HAS BEEN PREPARED FOR MARK MINA FROM A COMBINATION OF FIELD SURVEY AND EXISTING RECORDS FOR THE PURPOSE OF SHOWING THE PHYSICAL FEATURES OF THE LAND TO ASSIST IN DESIGNING FUTURE DEVELOPMENT, AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE.
* THE TITLE BOUNDARIES SHOWN HEREON WERE NOT VERIFIED OR MARKED AT THE TIME OF SURVEY BUT WERE DETERMINED BY EXISTING TITLE DIMENSIONS AND OCCUPATION (WHERE AVAILABLE), NOT BY FIELD MEASUREMENT. AS SUCH, THESE DIMENSIONS COULD BE OUT OF DATE AND INCORRECT BY MODERN STANDARDS. THIS PLAN SHOULD NOT BE USED FOR BUILDING TO BOUNDARY, OR TO PRESCRIBED SET-BACKS WITHOUT FURTHER BOUNDARY SURVEY.
* LOT AREA SHOWN AS PER TITLE DIAGRAM UNLESS OTHERWISE STATED. CALCULATED AREA FROM BEARINGS AND DISTANCES SHOWN MAY DIFFER.
* CURRENT TITLE SEARCH SHOULD BE PERFORMED PRIOR TO ANY PLANNING OR WORKS BEING UNDERTAKEN TO CONFIRM EXISTENCE OR OTHERWISE OF EASEMENTS, RESTRICTIONS, COVENANTS OR ANY OTHER NOTIFICATIONS ON THE TITLE. DO NOT SCALE OFF THIS PLAN - RELATIONSHIP OF IMPROVEMENTS AND DETAIL TO BOUNDARIES IS DIAGRAMMATIC AND IF CRITICAL SHOULD BE CONFIRMED BY A FURTHER BOUNDARY SURVEY.
* CONTOURS IF SHOWN ARE AN INDICATION OF THE TOPOGRAPHY AND SHOULD ONLY BE USED FOR PLANNING PURPOSES. IF DETAILED DESIGN IS TO BE UNDERTAKEN, SPOT LEVELS SHOULD BE USED.
* NO SERVICE SEARCH HAS BEEN UNDERTAKEN. SERVICES SHOWN ARE BASED ON SURFACE INDICATORS EVIDENT AT THE DATE OF SURVEY DURING FIELD SURVEY & CHARTED AS A GUIDE TO THE POSITION & NATURE OF THE SERVICE.
* BEFORE STARTING ANY DEMOLITION, EXCAVATION OR CONSTRUCTION ON THE SITE, THE RELEVANT PERSON SHOULD MAKE AN INDEPENDENT AND UPDATED ENQUIRY OF 'DIAL BEFORE YOU DIG' (PH.100) AND ANY RELEVANT SERVICE PROVIDERS TO ASCERTAIN THE EXISTANCE OF FURTHER SERVICES (IF ANY) AND THE ACCURATE LOCATION OF THOSE NOT ABLE TO HAVE BEEN SURVEYED AT THE TIME OF PREPARING THIS PLAN (OR DATA).
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* THE SPREAD AND HEIGHT OF EACH TREE IS INDICATIVE ONLY.
* ORIENTATION IS ON MAP GRID OF AUSTRALIA (M.G.A.)
* AUSTRALIAN HEIGHT DATUM (AHD) HAS BEEN OBTAINED FROM GPS OBSERVATIONS UTILISING CORSNET-NSW. IF AHD HEIGHT IS CRITICAL ADDITIONAL SURVEY CONNECTION TO LOCAL CO-ORDINATED MARKS SHOULD BE MADE.
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ROAD

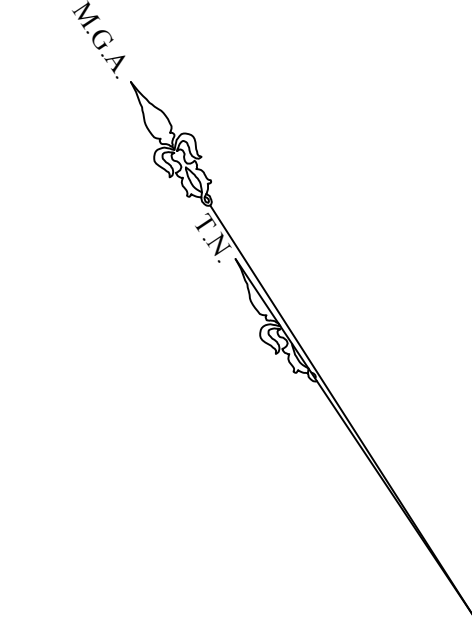
TELFER

ILLYARIE PL.

3
DP 771641

A
DP 358163
4293m²

4
DP 771641



Scale: 1:200 @ A1
Scale: 1:400 @ A3
0 1m 2.5m 5m 10m 15m 20m

Revisions:				LOT A	SECTION: -	SURVEYOR:	DRWN BY:	CHKD BY:
ISSUE	DATE	AMENDMENT	BY	DP 358163		P.N.	S.S.	P.N.
A	01/12/2011	Preliminary Drawing Issued	P.N.	TITLE: A/358163		DATE OF SURVEY: 29/11/2011		
B	07/12/2011	Revised Drawing Issued	P.N.	L.G.A.: THE HILLS SHIRE		LEVEL DATUM: AHD	ORIGIN: -	
C				PARISH: FIELD OF MARS		ORIGIN RL: -	SOURCE: SCIMS -	
D				COUNTY: CUMBERLAND		CONTOUR INTERVAL: 0.5m		

PLAN OF DETAIL AND LEVELS
Lot A in DP 358163
No's. 30 - 32 Telfer Road, Castle Hill, NSW 2154

ORIENTATION: M.G.A. (see note) SCALE: 1:200 @A1 SCALE: 1:400 @A3

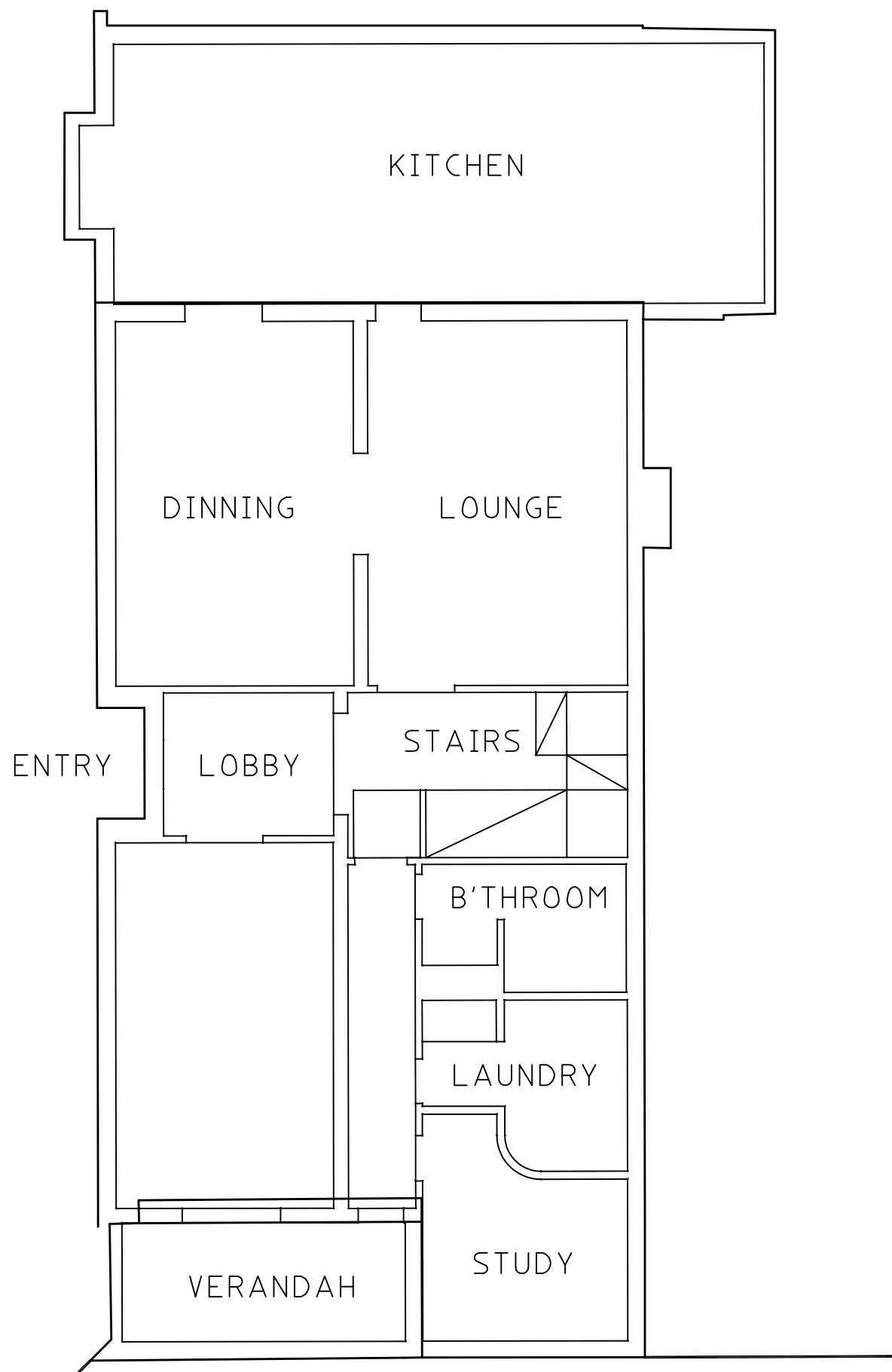


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http://www.summitgeo.com.au

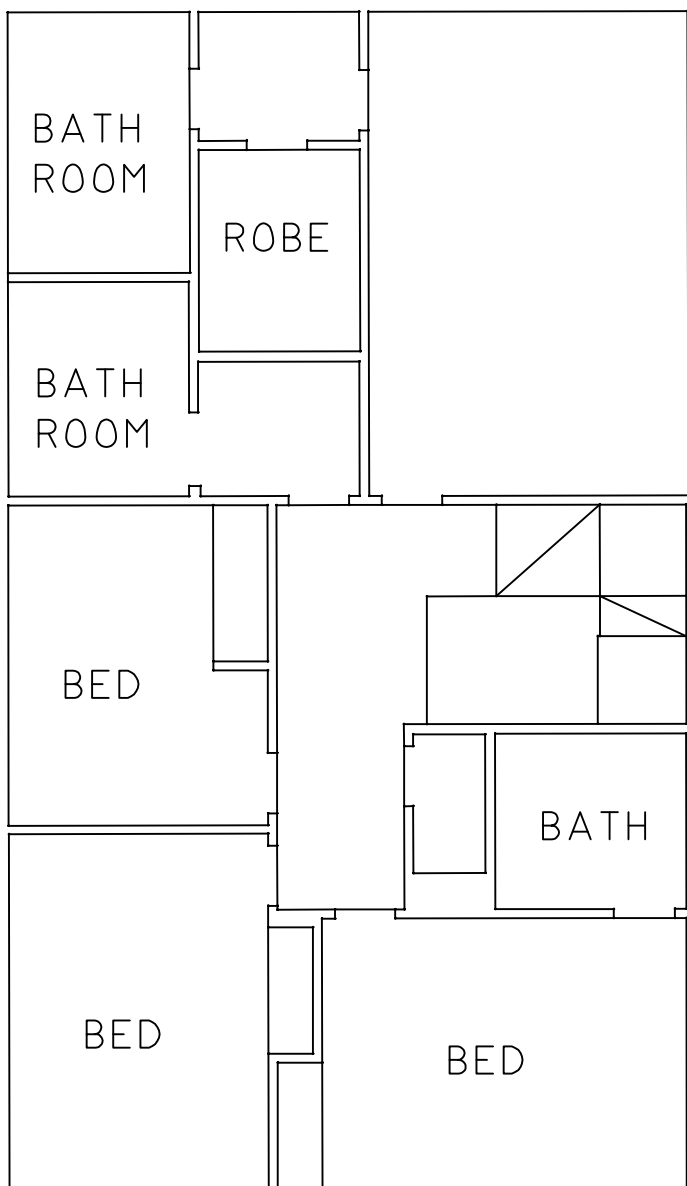
JOB REF: 3655
REV No: B
SHEET 1 OF 2

A1

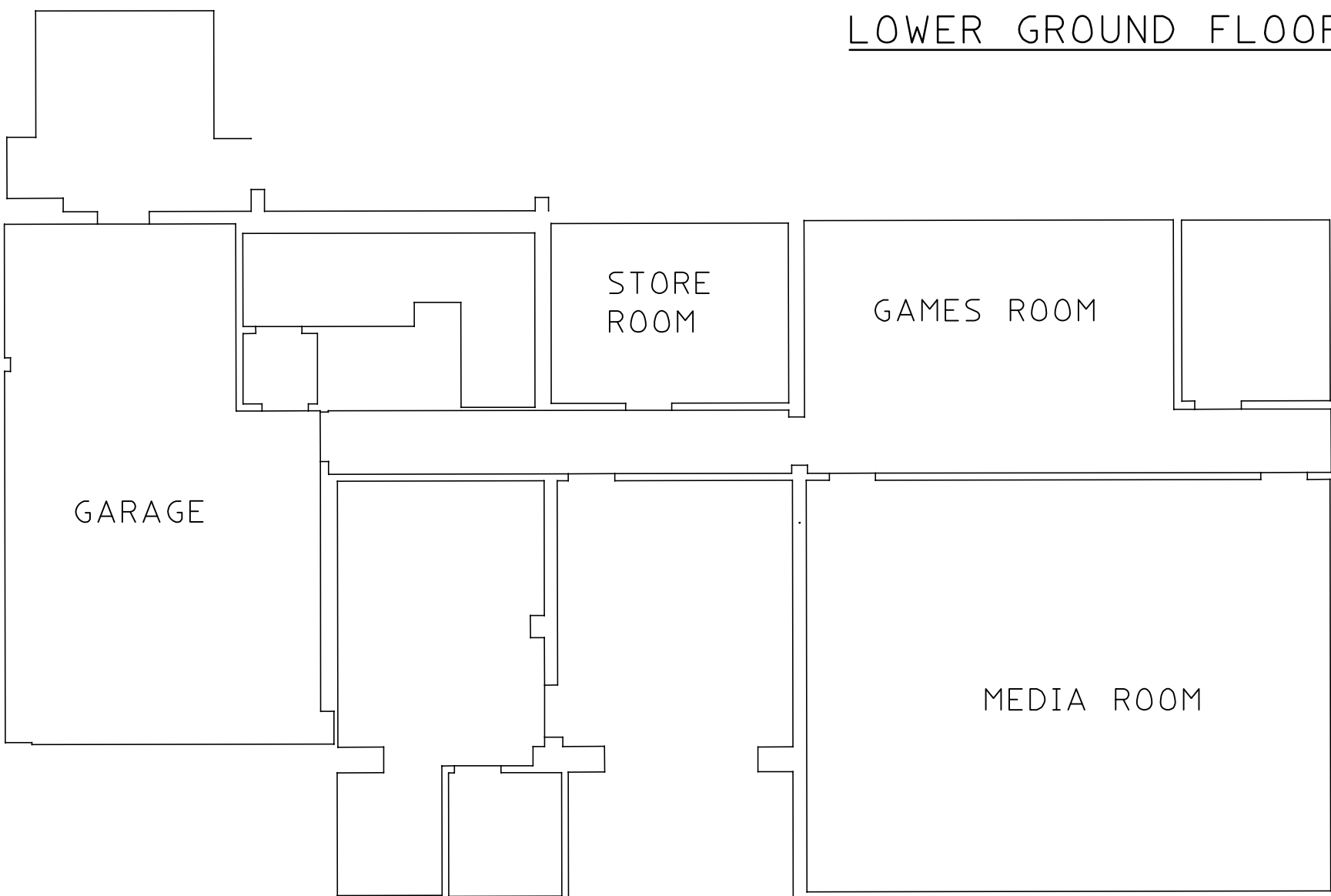
GROUND FLOOR



FIRST FLOOR

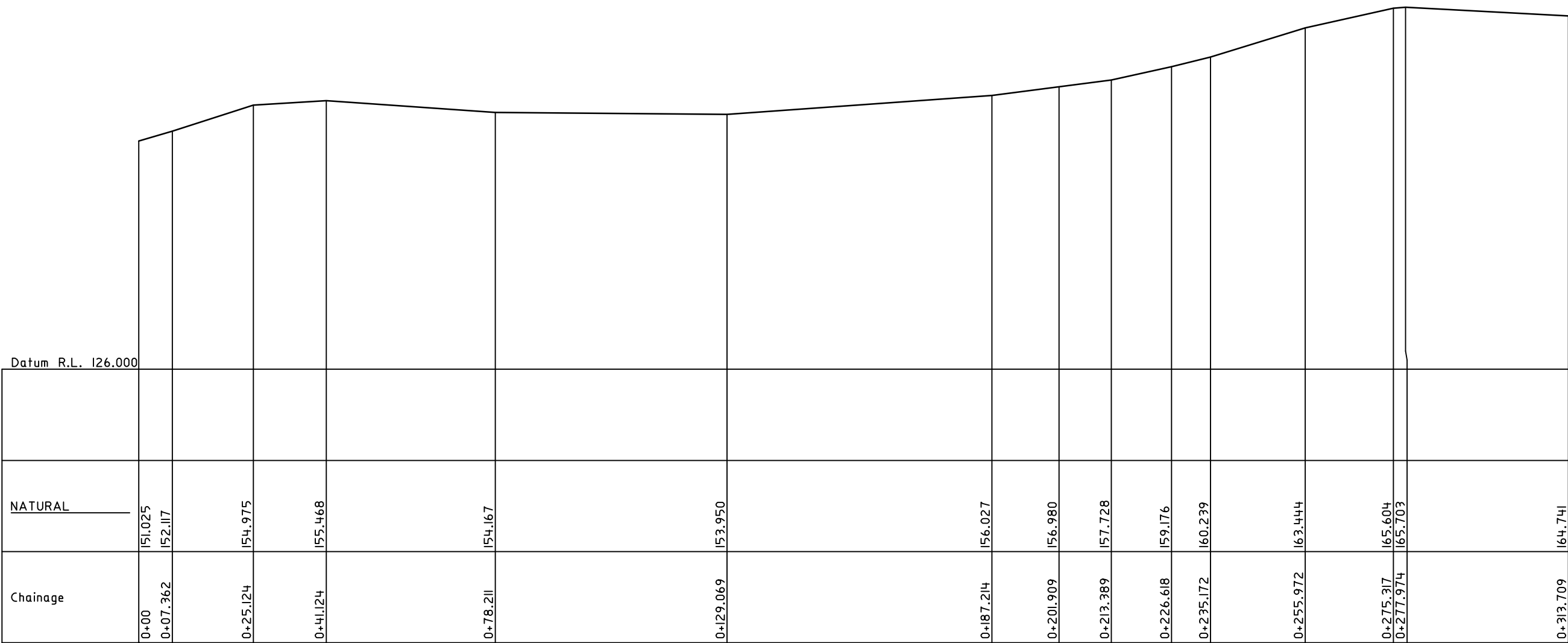
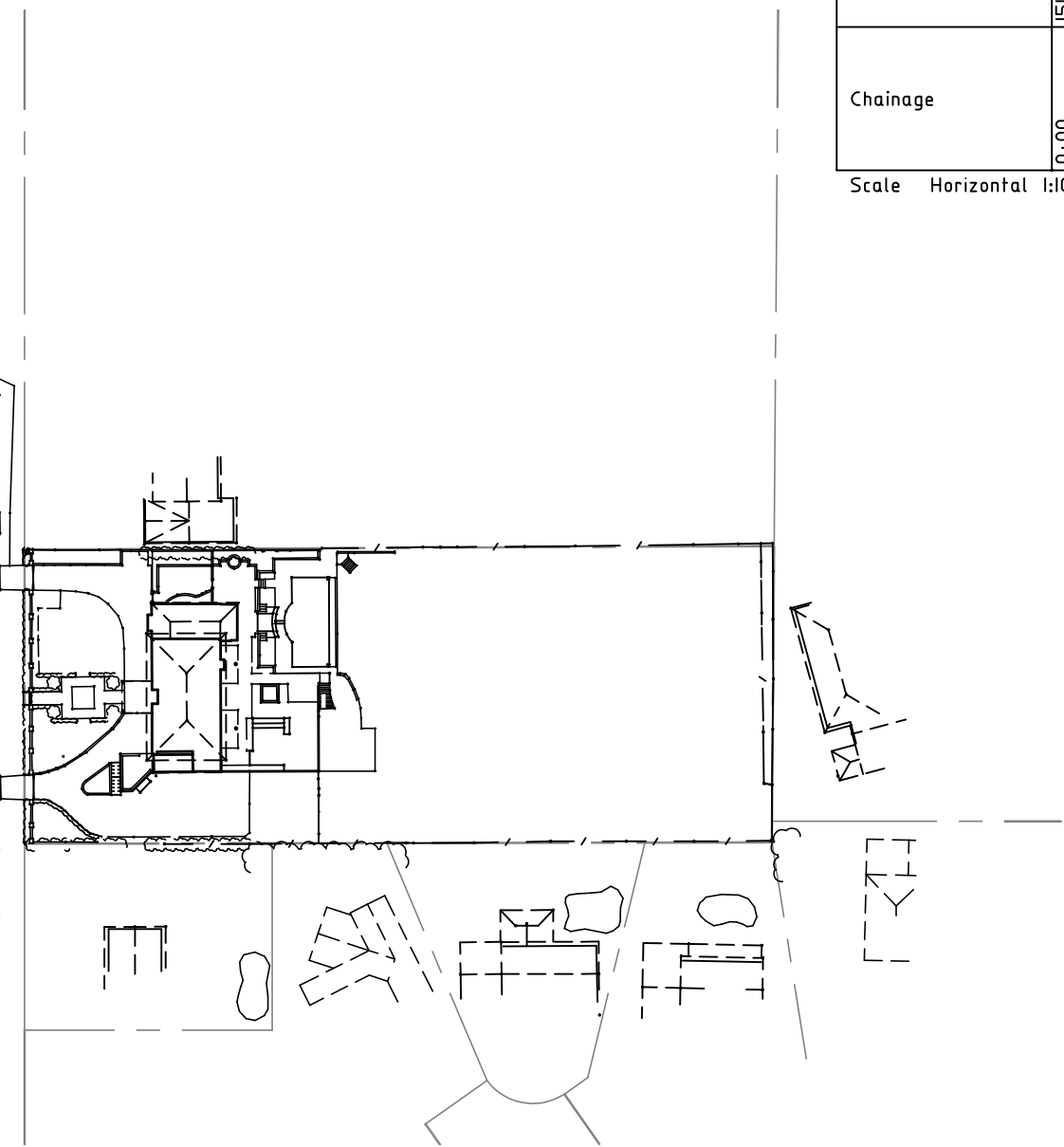


LOWER GROUND FLOOR



OLD NORTHERN ROAD
BUS STOP

T E L F E R R O A D



CROSS SECTION - ACCESS TO BUS STOP



LANDSLIDE RISK ASSESSMENT REPORT



PROJECT: 30-32 Telfer Road, Castle Hill, NSW
2154

CLIENT: Mark Mina

DATE: 26 September 2019

REPORT NO: NE568



GEOTESTA

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Appendix A: Site Photographs

Appendix B: Examples of good Hill Side Practice

Appendix C: Proposed Subdivision Plan

Appendix D: Existing drawings and previous Preliminary Geotech Report

1. INTRODUCTION

This report presents our result of risk assessment for a proposed new dwelling development at 30-32 Telfer Road Castle Hill NSW 2154. The purpose of the investigation was to assess the existing slope conditions, consider the implications of the construction of proposed structures and advise appropriate measures to minimise potential instability and erosion at the site.

Our scope of works included undertaking a site inspection, assessing the site conditions and preparing this report. The report presents the results of the landslip risk assessment and recommendations for risk mitigation strategies relevant to the proposed dwelling development. The site inspection was carried out on 25 September 2019.

Please note that this report is not intended as a replacement to engineering design. The results of this investigation should not be used for any other purpose than that for which it is specifically intended. We recommend that our advice be sought prior to any third party using or relying on the field data or the interpreted results. There may be significant variations from the conditions presented in this report that could affect the total project cost or its construction.

2. SITE CONDITIONS

2.1 Site details and location

The site under investigation is situated in 30-32 Telfer Road Castle Hill, NSW 2154 (DP 358163) on the eastern side of Telfer Road and, approximately 30 km (by road) northwest of Sydney CBD. The site location and features are shown in Figure 1. The proposed site being a residential property is occupied by a two/three-story residential building, a swimming pool and garage located on the western side of the site. The site is roughly rectangular shape with an area of approximately 4293m². The property has a width of 41.35m along Telfer Road and a length of 104.5m. The area is covered with short grass and a few scatter trees exist around the boundaries and in the middle of site. Steel fencing runs along the border of the site.

The site is actually backyard of an existing property that is proposed to be subdivided in two or three lots.



Figure 1. Site location and features

2.2 Site Geology

The geological origin of the soil profile was identified from our geotechnical experience, and reference to geological maps of the area. The geological map of the area indicates that the site is underlain by shale, carbonaceous, claystone, claystone laminate, fine to medium

grained lithic sandstone, rare coal and tuff of the Wianamatta Group (1:100,000 Geological Sheet, 9035). The geology map of the site is presented in Figure 2.

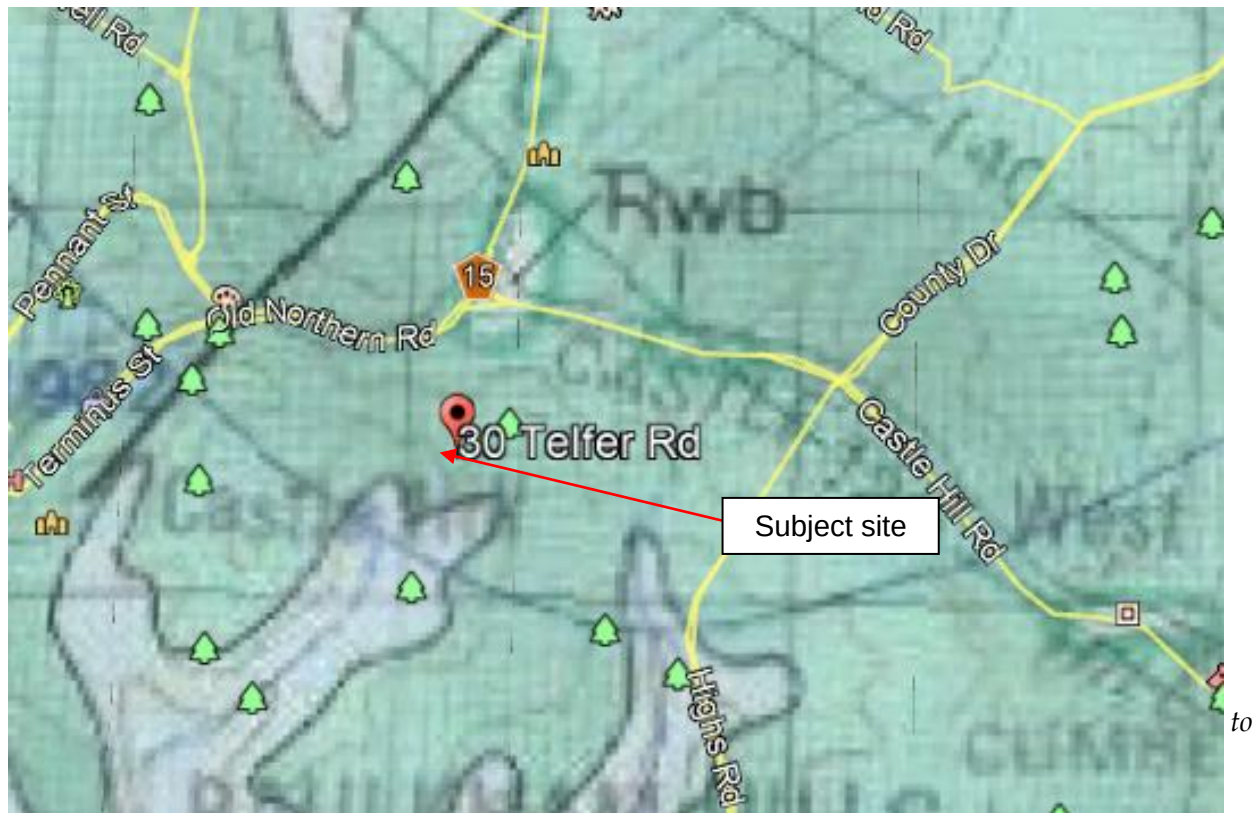


Figure 2. Geology map of the site and surrounding area

2.3 Surface Conditions and Topography

The property is located on the side of an undulating to moderately steep hill on the south-eastern side of Telfer Road. The natural slope angle of the site is about 10° , generally dipping to the south east. The elevation contour map of the site is presented in Figure 3. The site lies at an elevation of approximately 141m-150m above sea level (ASL) referenced to Australian Height Datum (AHD) (<http://en-au.topographic-map.com>). The site is within the Hills Shire City Council.

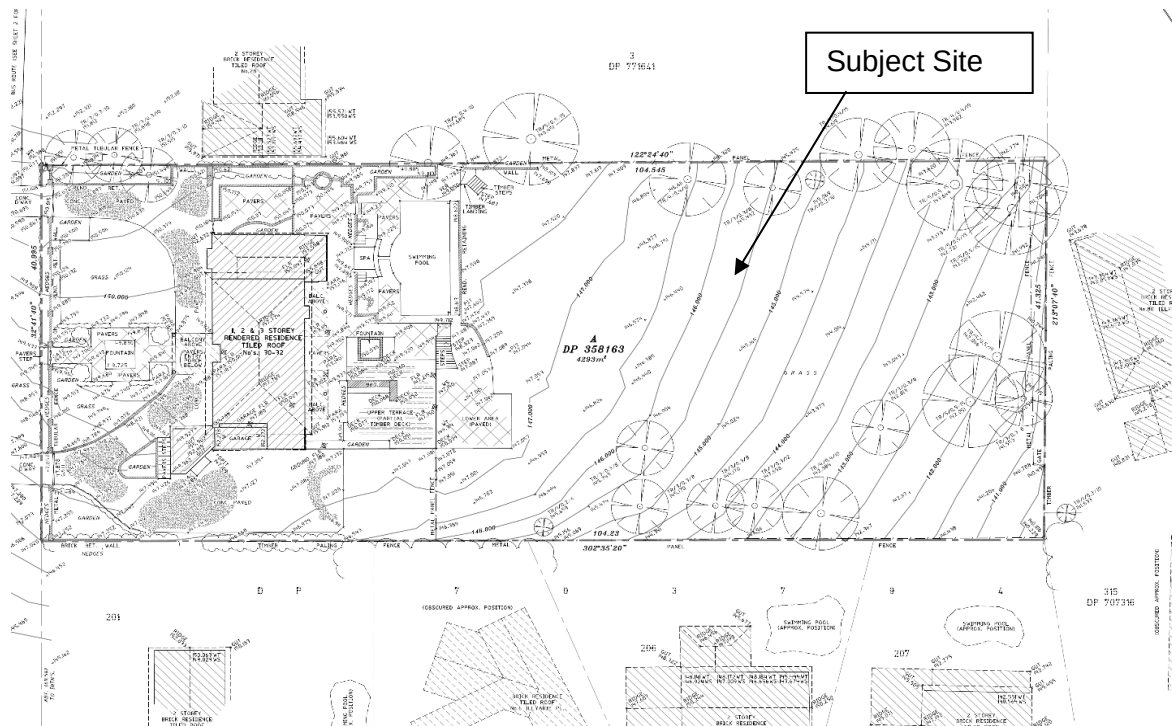


Figure 3. Contour Map of the Site

3. PREVIOUS GEOTECHNICAL SITE INVESTIGATION

A preliminary Geotechnical Site Investigation (soil testing) was undertaken on 21 January 2010 by Geotechnique Pty Ltd involved drilling of four test pits (TP1, TP2, TP3 and TP4) using a small tracked excavator.

The investigation revealed that the soil profile at test pits comprised 0.35m thick topsoil overlying medium to high plasticity residual Clay with some ironstone gravels and Shale fragments to 1.5-2.9m depth underlain by very low to high strength bedrock Shale.

Fill material was encountered within TP3 to a depth of 0.6m overlain by topsoil to 300mm depth. The result of DCP tests indicated clayey soil to have a consistency of stiff to very stiff and hard at depth.

Ground water was not encountered in the test pits for the short time they remained open. It should be noted that fluctuations in the levels of groundwater might occur due to variations in rainfall and/or other factors. Based on the swell-shrink index results carried out in the investigation undertaken by Geotechnique Pty Ltd, the site may be classified as Class H (Highly reactive clay sites, which may experience high ground movement from moisture changes) in accordance with AS2870-1996 "Residential Slabs and Footings. Potential free surface movement was calculated to be in the range of 40-60mm.

Based on the observations, the stability of the site was classified LOW risk according to Walker et al, 1985 for the Australian Geomechanics Society. Good engineering practice suitable for hillside construction required and risk after development is usually acceptable.

The site was recommended to be suitable for the proposed residential development, provided the recommendations given below:

- Foundation loads may be supported on ground bearing slabs, pads or bored piers. Bored piers, if constructed, should be socketed a minimum of 300 millimetres (mm) into the shale bedrock and may be designed for an allowable end bearing pressure of 600kPa. It should be noted that some high strength ironstone bands and gravels are present which may hinder pier drilling.
- Foundation loadings should be supported on the same bearing stratum to minimise the effect of differential settlements.

4. POTENTIAL MODES OF INSTABILITY

4.1 Proposed Site Development

It is proposed to construct new dwellings on this site by sub-dividing the property into four (4) lots. According to Subdivision plan (See Figure 4), Lot 1 will include the exiting dwelling with a lot size of 1561.16m², Lots 2 and 3 each will include 703.48m² and Lot 4 locating in the eastern side of the site will have a size of 819.98m². The cross section of the proposed subdivision plan is shown in Figure 5.

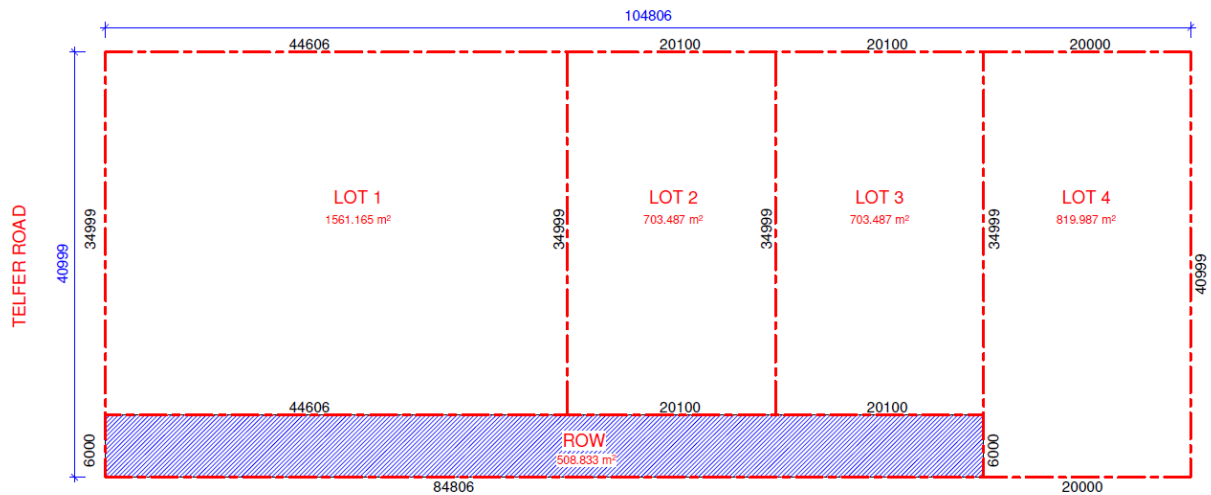


Figure 4. Proposed Subdivision Plan

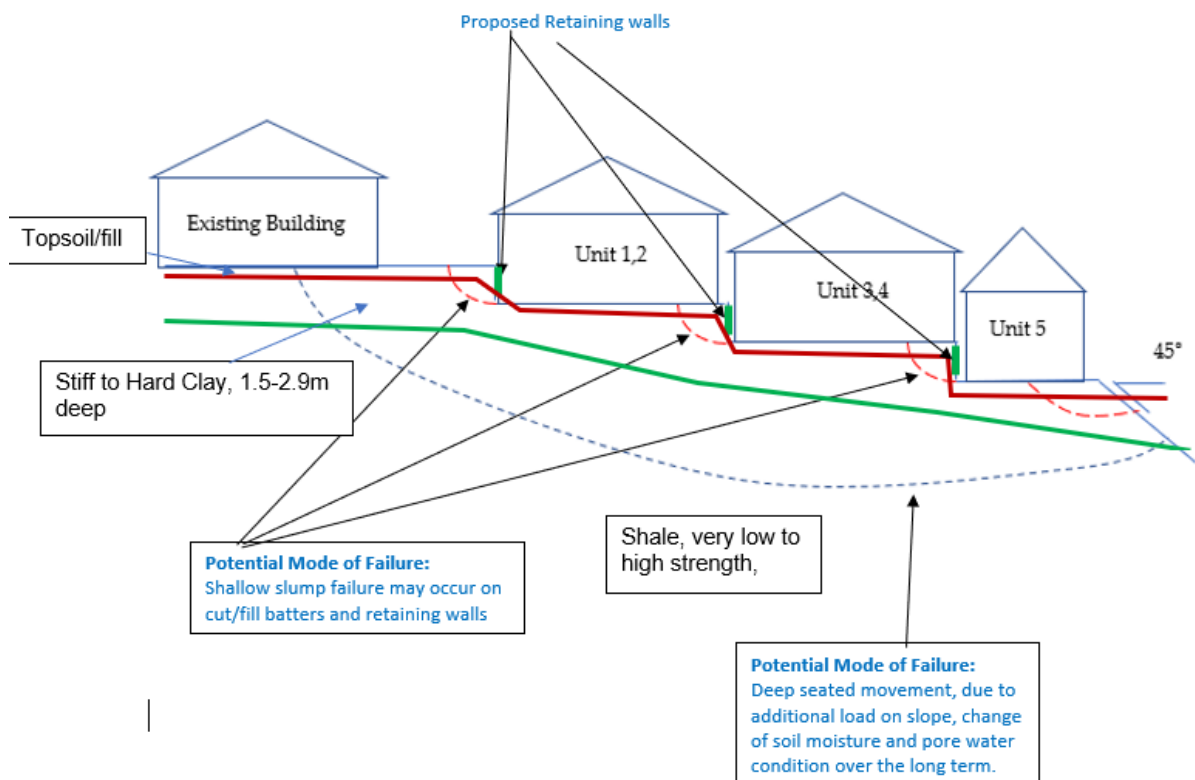


Figure 5. Cross Sections of the proposed subdivision plan and Potential Mode of Failure (not to scale)

Based on the proposed work, some of the construction activities related to the slope conditions are:

- Construction of the proposed dwelling and effect of live loading from machinery and materials during construction activities;
- Modifying the surface and subsurface drainage.
- Construction of retaining walls for associated cut/fill.

4.2 Potential Modes of Instability

There are two main classes of failure hazards differentiated on the basis of material type and scale of failure due to the proposed works:

Mode 1: A shallow slump (earth slide or earth flow) involving the natural slope, cuts and man-made fill. This mode of failure may occur in the area surcharged with uncontrolled fill or subject to additional loading from the new constructions or steep cut batters;

Mode 2: Deep seated failure (rotational or translational landslide) that involves the underlying fill, natural soil and rock in steep slope. The area subject to this failure could be identified from the presence of steep slopes combined with additional load on the slope.

The sketch of the slope cross section illustrating the potential modes of instability is shown in Figure 5.

5. GEOTECHNICAL RISK ASSESSMENT FOR PROPERTY LOSS

5.1 Risk Assessment Methodology

The risk assessment process is a qualitative process designed to enable ranking of the sites identified as hazardous. This ranking is important to allow prioritisation of sites for either nomination to a hazard monitoring program or for hazard treatment. In this qualitative process, risk has been assessed as the product of likelihood and consequence criteria, determined by a matrix method in line with accepted risk management principles. The likelihood rating is applied to the table '*Qualitative Measures of Likelihood*' to derive a likelihood level, A to F. Qualitative Measures of Likelihood is presented in Table 1.

Table 1. Qualitative Measures of Likelihood-Property Loss

Indicative Value	Implied Indicative Landslip Recurrence	Descriptor	Definition	Level
10^{-1}	10 years	ALMOST CERTAIN	The event is expected to occur over the design life	A
10^{-2}	100 years	LIKELY	The event will probably occur under adverse conditions over the design life	B
10^{-3}	1000 years	POSSIBLE	The event could occur under adverse conditions over the design life	C
10^{-4}	10,000 years	UNLIKELY	The event might occur under very adverse circumstances over the design life	D
10^{-5}	100,000 years	RARE	The event is conceivable but only under exceptional circumstances over the design life	E
10^{-6}	1,000,000 years	BARELY CREDIBLE	The event is inconceivable or fanciful over the design life	F

The consequence rating is applied to the table '*Qualitative Measures of Vulnerability and Consequence*' to derive a consequence level, 1 to 5. Qualitative Measures of Consequence is detailed in Table 2.

Table 2. Qualitative Measures of Consequence to Property

Approx. Cost of damage Indicative Value	Definition	Descriptor	Level
200%	Structure(s) completely destroyed and/or large-scale damage requiring major engineering works for stabilisation. Could cause at least one adjacent property major consequence damage	CATASTROP HIC	1
60%	Extensive damage to most of structure, and/or extending beyond site boundaries requiring significant stabilisation works. Could cause at least one adjacent property medium consequence damage	MAJOR	2
20%	Moderate damage to some of structure, and/or significant part of site requiring large stabilisation works. Could cause at least one adjacent property minor consequence damage	MEDIUM	3
5%	Limited damage to part of structure, and/or part of site requiring some reinstatement stabilisation works	MINOR	4
0.5%	Little damage. (Note for high probability event (Almost Certain), this category may be subdivided at a national boundary of 0.1%. See risk Matrix)	INSIGNIFICA NT	5

The Approximate Cost of Damage is expressed as a percentage of market value, being the cost of the improved value of the unaffected property which includes the land plus the unaffected structures. It is an estimate of the direct cost of the damage, such as the cost of reinstatement of the damaged portion of the property (land plus structures), stabilisation work required to render the site to tolerable risk level for the landslip which has occurred and professional design fees, and consequential costs such as legal fees, temporary accommodation. It does not include additional stabilisation works to address other landslips which may affect the property.

A qualitative risk rating is derived by using both the likelihood level (Table 1) and the consequence level (Table 2) in a standard form of risk analysis matrix. Table 3 outlines the *Qualitative Risk Analysis matrix*. This matrix assigns a four-fold risk level ranging from VH (very high), H (high), M (moderate) to L (low).

Table 3. Qualitative Risk Analysis Matrix – Level of Risk to Property

Likelihood	Indicative value of Approximate Annual Probability	Consequences to Property				
		1. Catastrophic 200%	2. Major 60%	3. Medium 20%	4. Minor 5%	5. Insignificant 0.5%
Almost Certain (A)	10 ⁻¹	VH	VH	VH	H	M or L
Likely (B)	10 ⁻²	VH	VH	H	M	L
Possible (C)	10 ⁻³	VH	H	M	M	VL
Unlikely (D)	10 ⁻⁴	H	M	L	L	VL
Rare (E)	10 ⁻⁵	M	L	L	VL	VL
Barely Credible (F)	10 ⁻⁶	L	VL	VL	VL	VL

A table of 'Risk Level Implications' is shown in Table 4 below. These implications are only given as a general guide as the implications for a particular site are often very site specific.

Table 4. Risk Level Implications

Risk Level	Implications
VH - Very High	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	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	May be tolerated in certain circumstances (subjected 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

Risk Level	Implications
L – Low	Usually acceptable to regulators. Where treatment has been required to reduce the risk to this level, ongoing maintenance is required
VL – Very Low	Acceptable. Manage by normal slope maintenance procedures

We have undertaken the risk assessment of the site with reference to the guidelines set out by the Australian Geomechanics Society (AGS) in “Landslide Risk Management Concepts and Guidelines” as published in the Australian Geomechanics Journal, Vol. 42 No. 1, March 2007c.

5.2 Likelihood of Failure Event

The estimation of the probability that a slope failure event will occur has been based on inspection of the site and any indications of current or past events.

The following observations were important in estimating the indicative annual probability of a slope instability event:

- The soil properties;
- Review of geotechnical data;
- The site topography;
- The surface run-off and groundwater conditions;

These observations can enable an estimation of indicative annual probability for both small volume shallow slumps and deep-seated failure.

5.2.1 Shallow Slump Failure Mode

Likelihood

The major factors which govern the likelihood of a shallow slump are the presence of:

- Unretained and over steepened man-made fill or cut;
- Alteration of soil moisture condition due to removal of vegetation cover and installation of new surface and subsurface drainage;
- Additional pressure on the slope from the proposed dwelling and construction machinery.

The likelihood of a shallow failure is considered “Possible” on any proposed cut or fill batters and retaining walls.

A design that incorporated a good surface and subsurface drainage system, limited the number and extent of fill, incorporated placement of engineered fill and engineer designed earth retaining structures would reduce the likelihood of a shallow slump failure occurring to “Unlikely”.

Although it is acknowledged that the client cannot control development beyond the boundaries of their site, good maintenance of the drain in the adjacent properties will also be important to prevent over saturation of the slope.

If drainage of the site is not managed well, it could lead to saturation of the soil profile and reducing the soil shear strength. The likelihood of a shallow slump failure would therefore increase if the above factors eventuate. They can, of course, be offset by ensuring good drainage and placement of engineered fill. Some mitigation options against the slope instability are presented in section 8 of this report.

Consequences

The element at risk on this site is the proposed dwellings. A small slump failure may cause “Minor” damage to the structures.

5.2.2 Deep Seated Failure Mode

Likelihood

A deeper failure involving deeper soil profile is heavily dependent on the overall slope angle and in the engineering properties of the soil mass. The common triggers that initiate deep seated slope failure are excessive cutting or erosion and change in groundwater conditions including saturation in the uppermost soil profile due to poor surface drainage condition. A kinematic analysis and review of the geomorphology of this region indicates that the likelihood of failure through the soil mass occurring at the site is “Rare”.

If the engineering recommendations suggested in this report are adopted and the works do not involve excavation of any substantial cuttings or significant fill, as proposed, it is considered that the impact of the proposed development with regards to this mode of failure will be to further reduce its likelihood of occurring.

Consequences

The deep-seated failure occurring at the site may result in “Major” damage to the proposed dwelling. A construction strategy that improves the surface and subsurface drainage conditions and minimises or prohibits deep excavation that undercuts the slope should be adopted.

5.3 Results of Risk Level Estimation

The estimated risk levels are shown below in the following Table 5. This table also presents the implications of the estimated risk levels.

Table 5. Risk Levels after Risk Mitigation

Mode of Failure	Element at Risk	Likelihood of Occurrence	Consequence	Risk
Mode 1: Shallow Slump failure	New dwellings	Unlikely	Minor	L
Mode 2: Deep Seated failure	New dwellings	Rare	Major	L

Adopting an Important Level of Structure of 2 (Low rise structures) (NCC Volume 1, 2015), the suggested acceptable qualitative risk to property criteria is “Low (L)”. It should be noted that the above risk level has been estimated based on the assumption that all the risk mitigation recommendations given in this report are adopted.

6. GEOTECHNICAL RISK ASSESSMENT – QUANTITATIVE RISK TO LIFE

6.1 Method of Assessment

The risk of loss of life has been estimated using the methodology outlined by the AGS, 2007, Section 7.

For loss of life, the individual risk can be calculated from:

$$R(\text{LoL}) = P(H) \times P(S:H) \times P(T:S) \times V(D:T)$$

Where:

R(LoL) is the risk (annual probability of loss of life (death) of an individual);

P(H) is the annual probability of the landslide;

P(S:H) is the probability of spatial impact of the landslide impacting a building (location) taking into account the travel distance and travel direction given the event.

The shallow slump failure may occur at any cut/fill and retaining walls that would be required for the proposed dwelling. This failure is estimated to hit a part of the proposed structures. P(S:H) for shallow slump failure is estimated as 0.2. The deep-seated failure may also impact a part of the proposed dwelling. Hence, the P(S:H) for deep-seated failure is estimated as 0.5.

P(T:S) is the temporal spatial probability (e.g. of the building or location being occupied by the individual) given the spatial impact and allowing for the possibility of evacuation given there is warning of the landslide occurrence; in this case it is assumed that the proposed dwelling will be occupied by 2 persons on average 10 hours/day, 365 days per year, so $P(T:S)=0.83$.

V(D:T) is the vulnerability of the individual (probability of loss of life of the individual given the impact). Vulnerability value due to shallow slump failure occurring upslope/downslope of the proposed dwelling is 0.1. Vulnerability value due to deep seated failure is 0.5.

Vulnerability is generally based on the guidelines contained in Appendix F of AGS, 2007 and refers to the probability of survival given the type of failure and its spatial impact on the element at risk. Low value of vulnerability has been assigned to events that are unlikely to cause any significant effect on the structures due to spatial distance and /or low impact energy, such as a shallow slump.

6.2 Risk to Life

Based on the stated tolerable risks for loss of life of the AGS (2007) guidelines, a risk of 10^{-5} per annum for persons most at risk on new development is considered tolerable provided that risk treatment options will be employed to maintain or reduce the level of risk. Acceptable risks are usually considered to be one order of magnitude smaller than tolerable risks (10^{-6} per annum).

Risk estimate (Loss of life) calculation including individual risk is presented in Table 6. An evaluation of the estimated risk levels against the adopted criteria indicates the assessed risks for shallow slump failure and deep-seated failure are “Acceptable”.

Table 6. Risk Estimate – Loss of Life

Mode of Failure	Likelihood of Occurrence	Indicative Annual Probability	Probability of Spatial Impact	Temporal Factor	Vulnerability	Individual Risk
Mode 1: Shallow slump failure	Unlikely	10^{-4}	0.2	0.83	0.1	1.66×10^{-6}
Mode 2: Deep seated	Rare	10^{-5}	0.5	0.83	0.5	2.08×10^{-6}

7. LANDSLIP RISK MANAGEMENT

7.1 Risk Mitigation

Based on the landslip risk assessment detailed in the preceding sections, the following site-specific risk mitigation options have been considered in the preparation of this document.

7.2 Risk Treatments

Based on the qualitative and quantitative risk assessment, the following recommendations are made to reduce the risk to both property and individuals at this site.

7.2.1 Stabilisation of Slope

Additional control measures should be adopted to reduce the risk to an acceptable level. The work may involve the following scope of work (see Figure 6):

- Installation of engineer designed retaining walls for any cut or fill batter higher than 1m or create a minimum batter of 2H:1V in unretained cut or engineered fill. Review of existing surface stormwater drain. The surface runoff should be regulated to prevent flow onto the slopes.

7.2.2 Drainage

- It is important that drainage of the slope in the vicinity of the proposed dwellings/buildings is well managed. This may include ensuring that the surface stormwater drain is regularly maintained and diverted away from the slope. If stormwater is collected into a water storage tank, care must be taken to ensure the overflow is discharged into a legal outlet point via a sealed pipe. No excess water should discharge directly onto the slope.
- Surface water should be prevented from ponding anywhere on site. The collected water from the roof of the proposed dwelling should be discharged to an appropriate collection point specified by the Council.
- Any retaining wall structures should have adequate surface and subsurface drainage installed behind the crest and at the toe of the wall to collect water and direct it to an appropriate outlet point specified by Council. The subsurface drain aimed to prevent surface soil saturation in the area behind the wall.

7.2.3 Footing Designs

Based on site observations, subsurface investigations, the size and type of proposed development it is considered that the site be assigned a Class P classification (slope stability), in accordance with AS 2870-2011. The recommended Site Classification can be updated/reviewed after the final subdivision plans and cross sections.

A new geotechnical site investigation to be carried out to advice on the site classification, footing types, founding depths, bearing capacity of footings/piers and lateral earth pressure for design of retaining walls.

It is recommended that bored piers be used to support the proposed dwelling. At a minimum, the pier footings should be founded in the natural very stiff silty clay and penetrate through any fill material. The founding depth should be 2.0-2.5m or to a hard layer, whichever is shallower.

A suitably qualified geotechnical engineer should be engaged to confirm the appropriate founding depth during footing excavation stage. The founding depth may be deepened subject to the findings during the excavation.

7.2.4 Cut and Fill

The following guidelines should be adopted for any earthwork that may be required at the site:

- Any unrestrained fill on this site or during construction should be minimised to not greater than 1.0m in height above the original ground surface level. Fill should be placed in layers not exceeding 150mm loose thickness and compacted to achieve 95% standard compaction dry density as per AS 3798 - 2007 "Guidelines on earthworks for commercial and residential developments". It is recommended that the backfill be tested to ensure it meets the required minimum compaction criteria.
- The existing material derived in-situ is considered suitable for fill material, except for materials greater than 75mm, such as large cobbles or boulders.
- Key the fill into the natural slope. The vegetation and topsoil should be removed before placing fill.
- The unretained cut and fill slope should not be steeper than 2H:1V.
- Any retaining walls should be constructed with appropriate drainage that is incorporated into the overall site storm water management plan. Where possible, batters above retained cut batters should be revegetated.
- Any retaining structures higher than 1m should be designed by a qualified Engineer and should adopt the guidelines as recommended in AS4678-2002 (Earth Retaining Structures).

7.2.5 Site Revegetation

Emerson class testing to be carried out in the geotechnical investigation, to provide the erosion potential characteristics of the soil profile. Revegetation of bare patches resulting from any construction works is essential on steep slopes for limiting the effects of erosion. Revegetating is integral to maintain surface stability and the balance of water in the soils.

7.2.6 Erosion and Sediment Control

Erosion and Sediment control plan should be implemented before commencing any earthworks for the proposed development. Below are some general guidelines to be taken into considerations:

- Establish a single entry/exit point when construction work starts
- Minimize area to be cleared and provide as much as vegetation as possible
- Install sediment fences along the low side of the site before work begins
- Ensure the imported fill material/top soil within the sediment controlled plan
- Fill in and compact all trenches immediately after services have been laid
- Divert water around the work site and stabilized channels
- A silt trap to be installed around the site perimeter during construction.
- Provide temporary earth drain around the proposed site if possible, to prevent water logging within the site
- Stabilize exposed earth banks/embankment

7.2.7 Construction Supervision and Site Maintenance

- It is recommended that the detailed drainage and structural designs be reviewed by a Geotechnical Engineer.
- It is recommended that a suitably qualified engineer be engaged to design and oversee construction of retaining walls for the cutting and filling.
- The house owner should engage a Geotechnical Engineer that will provide a site inspection in the first year after the earthwork is completed. The inspection should include visual observation of the slope condition in the vicinity of the proposed development.

This assessment has been determined based on the assumption that recommendations contained in this report are adopted in their entirety for the final design and that the construction phase of the project is supervised by an appropriately qualified geotechnical engineer.

To ensure that the risk does not increase to unsatisfactory levels, it is strongly recommended that ongoing site maintenance be undertaken. Maintaining site drainage and monitoring the site for evidence of deterioration in slope stability are key components of any ongoing maintenance program for this site. Some guidelines for hillside construction published by AGS (Australian Geomechanics Society) are attached.

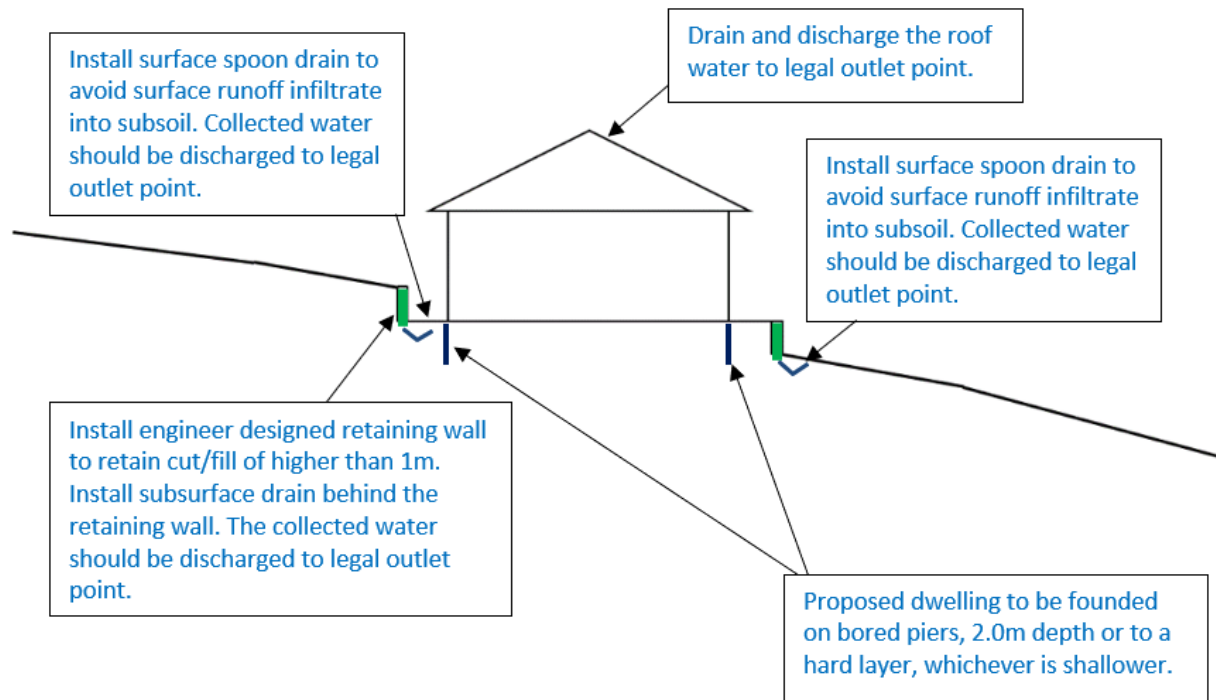


Figure 6. Proposed Engineering Measures

8. GENERAL RECOMMENDATIONS

- Good drainage is an important part of any footing design. The Builder should follow all of the drainage requirements in AS 2870 to prevent water accumulation near the building footings (even during construction). It is recommended that sufficient ground clearance be created to accommodate paving which slopes a minimum of 1:20 away from the building. This slope should be achieved by excavation and not by building-up loose fill around the footings.
- Any proposed footings which are close to an easement and/or other excavations, (including those in adjoining properties) should be founded below a line projected up at 30° to the horizontal (for Sand) and 40° to the horizontal (for firm/stiff Clay) and measured from the nearest base of the easement excavations.
- Avoid excavations close to footings since those founded on sandy soils can experience settlements while those founded in clayey soils can also move due to the shrinking and swelling of the clay. Plumbers and drainers should follow all the recommendations made in AS 2870 and other appropriate codes with respect to drainage works.
- It is also recommended that the Owners follow the requirements of AS 2870 and the C.S.I.R.O. BTF18 (www.csiro.au), which requires Owners to carry out regular maintenance of drainage and care for the soil moisture conditions.
- A new geotechnical site investigation to be carried out to advice on the site classification, footing types, founding depths, bearing capacity of footings/piers and lateral earth pressure for design of retaining walls.

9. CONDITIONS OF THE RECOMMENDATIONS

- This report is a geotechnical report only and the classification stated shall not be regarded as an engineering design nor shall it replace a design by engineering principles although it may contribute information for such designs. It shall be read in conjunction with AS 2870 and must be reproduced only in total.
- The advice given in this report is based on the assumption that the test results are representative of the overall subsurface conditions. However, it should be noted that actual conditions in some parts of the building site may differ from those found in our test holes. If excavations reveal soil conditions significantly different from those shown in our attached Borehole Log(s), Geotesta must be consulted and excavations stopped immediately.
- Any sketches in this report should be considered as only an approximate pictorial evidence of our work. Therefore, unless otherwise stated, any dimensions or slope information should not be used for any building cost calculations and/or positioning of the building.
- Whilst Geotesta has accepted the commission for the work reported herein, the ownership of the report and any liabilities associated with it, remain with Geotesta until all relevant accounts have been paid.

For and on behalf of
GEOTESTA PTY LTD

Dr. Mohammad Hossein Bazyar
B.Eng M.Eng Ph.D CPEng NER MIEAust
Senior Geotechnical Engineer

Appendix A

SITE PHOTOGRAPHS



View of the dwelling, looking west



View of the site, looking south-east

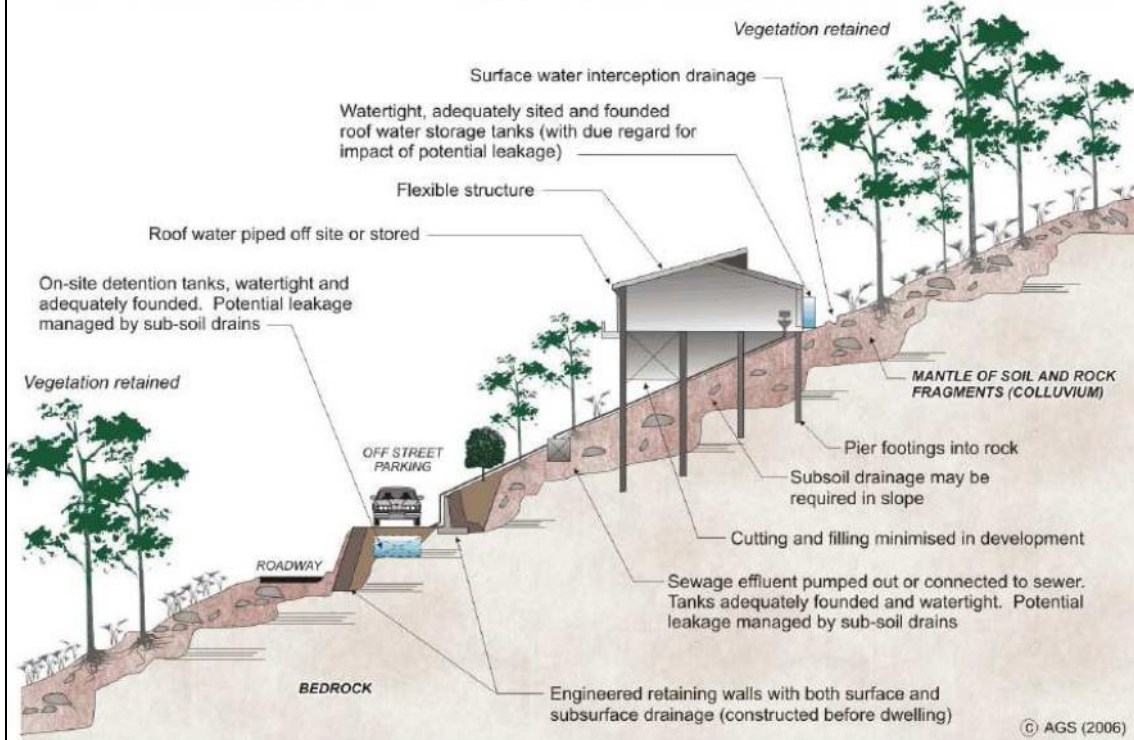


View of the dwelling, looking east

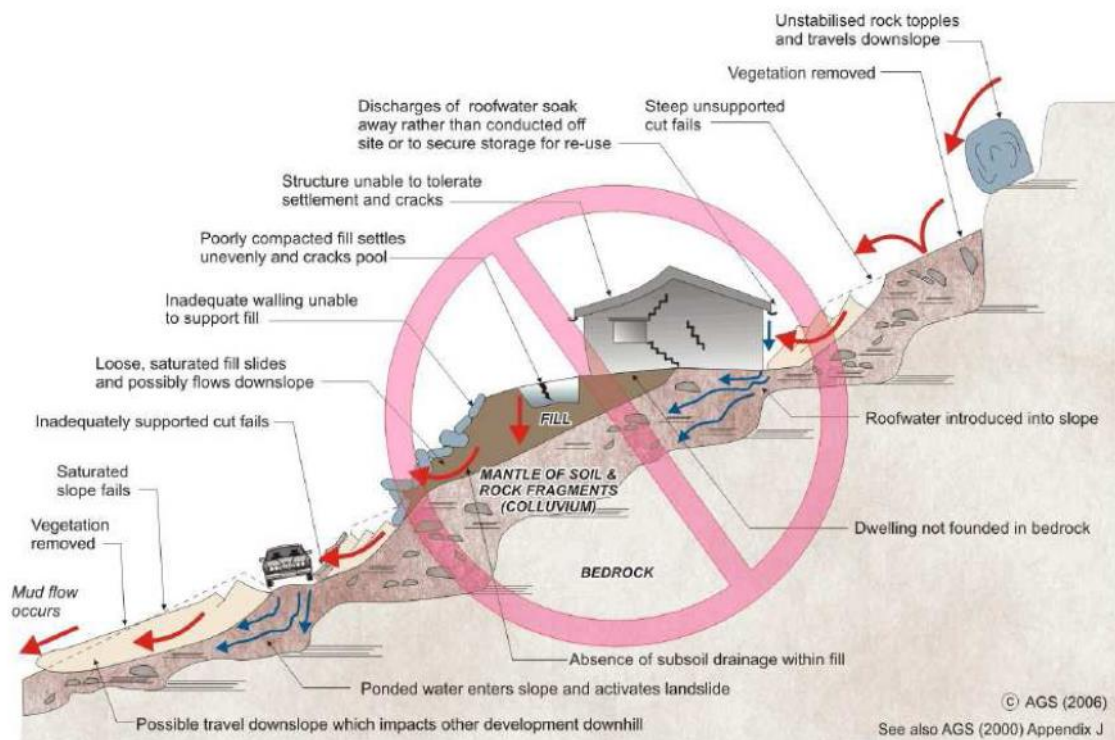
Appendix B

EXAMPLES OF GOOD HILLSIDE PRACTICE

EXAMPLES OF **GOOD** HILLSIDE PRACTICE

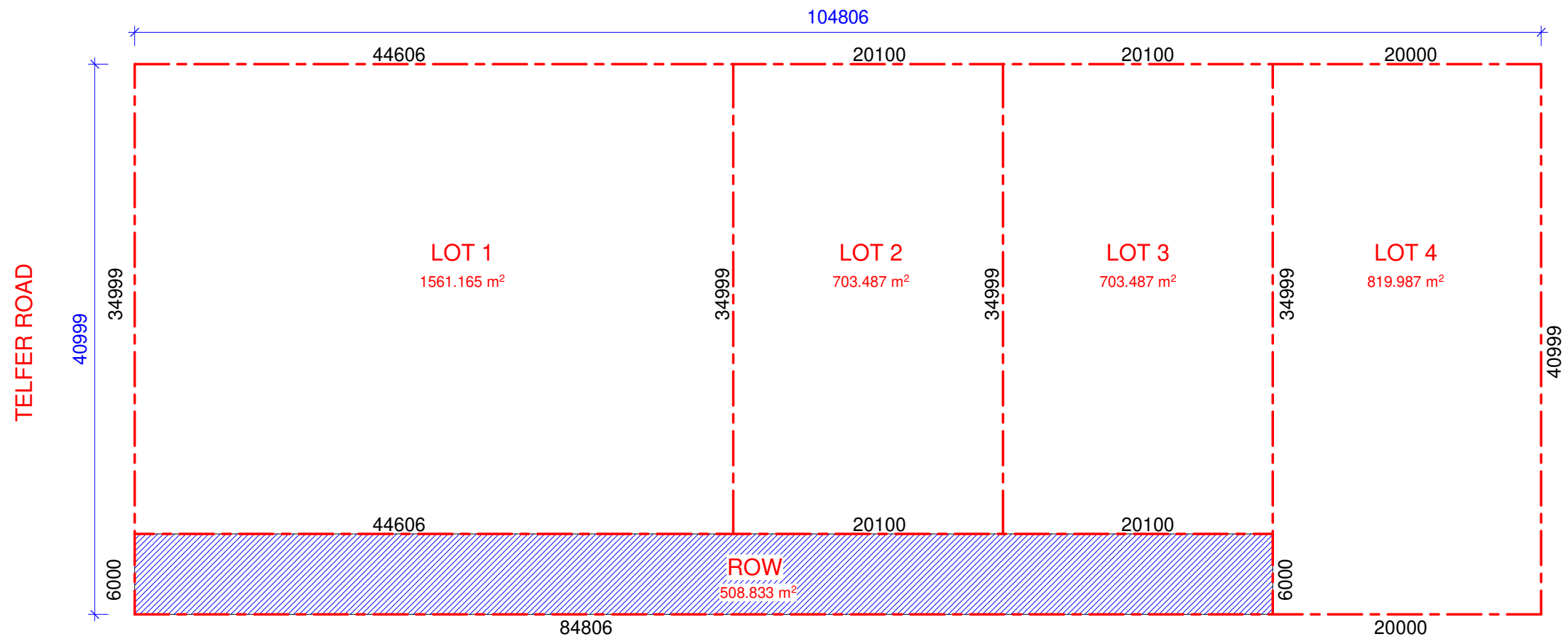


EXAMPLES OF **POOR** HILLSIDE PRACTICE

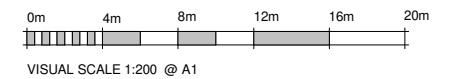


Appendix C

PROPOSED SUBDIVISION PLAN



1 SUBDIVISION PLAN
1 : 200



REVISION SCHEDULE			
ISSUE	DESCRIPTION	ISSUED BY	DATE
A	AREA OF LOT 2 AND LOT 3 REVISED	SO	25-10-2019

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CONSULTANTS

PM

NORTH POINT



THIS DRAWING ISSUE HAS BEEN REVIEWED BY
DIRECTOR - SO

CLIENT

MARK MINA

DRAWING TITLE
SUBDIVISION PLAN

DATE
25-10-2019

SCALE @ A1
1 : 200

PROJECT NUMBER
037 / 17-18

DRAWING No.
A101

ISSUE
A

PROJECT

PROPOSED SENIORS LIVING DEVELOPMENT
30-32 TELFER ROAD, CASTLE HILL

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ABN 70 119 946 575
Nominated Architect: Szymon Ochudzawa (RAIA 6865)



Appendix D

EXISTING DRAWINGS AND PREVIOUS PRELIMINARY GEOTECH REPORT

DIAGRAM
SCALE 1:500

ADJOINS BELOW L.H.S.

LEGEND:

TR/5/0.5/15 = TREE 5m Radius Spread / 0.5m Dia Trunk / 15m High
WT= WINDOW TOP
WS= WINDOW SILL
RL= REDUCED LEVEL
FLR= FLOOR LEVEL
AWN= AWNING
LP= LAMP POLE
SV= STOP VALVE
WM= WATER METER
ELP= ELECTRICITY LIGHT POLE
GAS= GAS METER
GASV= GAS VALVE
GUT= TOP OF GUTTER
PARA= PARAPET
HYD= HYDRANT
SLH= SEWER LAMP HOLE
SMH= SEWER MANHOLE
GPIT= GRATED PIT
TPIT= TELECOMMUNICATION PIT
SVENT= SERVICE VENT
BRET= BOTTOM OF RETAINING WALL
TRET= TOP OF RETAINING WALL

--- APPROXIMATE BOUNDARY POSITION ONLY.

NOTES:

* THIS PLAN HAS BEEN PREPARED FOR MARK MINA FROM A COMBINATION OF FIELD SURVEY AND EXISTING RECORDS FOR THE PURPOSE OF SHOWING THE PHYSICAL FEATURES OF THE LAND TO ASSIST IN DESIGNING FUTURE DEVELOPMENT, AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE.
* THE TITLE BOUNDARIES SHOWN HEREON WERE NOT VERIFIED OR MARKED AT THE TIME OF SURVEY BUT WERE DETERMINED BY EXISTING TITLE DIMENSIONS AND OCCUPATION (WHERE AVAILABLE), NOT BY FIELD MEASUREMENT. AS SUCH, THESE DIMENSIONS COULD BE OUT OF DATE AND INCORRECT BY MODERN STANDARDS. THIS PLAN SHOULD NOT BE USED FOR BUILDING TO BOUNDARY, OR TO PRESCRIBED SET-BACKS WITHOUT FURTHER BOUNDARY SURVEY.
* LOT AREA SHOWN AS PER TITLE DIAGRAM UNLESS OTHERWISE STATED. CALCULATED AREA FROM BEARINGS AND DISTANCES SHOWN MAY DIFFER.
* CURRENT TITLE SEARCH SHOULD BE PERFORMED PRIOR TO ANY PLANNING OR WORKS BEING UNDERTAKEN TO CONFIRM EXISTENCE OR OTHERWISE OF EASEMENTS, RESTRICTIONS, COVENANTS OR ANY OTHER NOTIFICATIONS ON THE TITLE. DO NOT SCALE OFF THIS PLAN - RELATIONSHIP OF IMPROVEMENTS AND DETAIL TO BOUNDARIES IS DIAGRAMMATIC AND IF CRITICAL SHOULD BE CONFIRMED BY A FURTHER BOUNDARY SURVEY.
* CONTOURS IF SHOWN ARE AN INDICATION OF THE TOPOGRAPHY AND SHOULD ONLY BE USED FOR PLANNING PURPOSES. IF DETAILED DESIGN IS TO BE UNDERTAKEN, SPOT LEVELS SHOULD BE USED.
* NO SERVICE SEARCH HAS BEEN UNDERTAKEN. SERVICES SHOWN ARE BASED ON SURFACE INDICATORS EVIDENT AT THE DATE OF SURVEY DURING FIELD SURVEY & CHARTED AS A GUIDE TO THE POSITION & NATURE OF THE SERVICE.
* BEFORE STARTING ANY DEMOLITION, EXCAVATION OR CONSTRUCTION ON THE SITE, THE RELEVANT PERSON SHOULD MAKE AN INDEPENDENT AND UPDATED ENQUIRY OF 'DIAL BEFORE YOU DIG' (PH.100) AND ANY RELEVANT SERVICE PROVIDERS TO ASCERTAIN THE EXISTANCE OF FURTHER SERVICES (IF ANY) AND THE ACCURATE LOCATION OF THOSE NOT ABLE TO HAVE BEEN SURVEYED AT THE TIME OF PREPARING THIS PLAN (OR DATA).
* NO RESPONSIBILITY CAN BE ACCEPTED BY SUMMIT GEOMATIC PTY LTD FOR ANY DAMAGE CAUSED TO ANY UNDERGROUND SERVICE OR ANY LOSS OR INJURY SO SUFFERED IF ENQUIRY AND VERIFICATION HAVE NOT BEEN COMPLETED IN ACCORDANCE WITH THIS NOTE.
* ONLY VISIBLE SERVICES AND FEATURES EVIDENT AT THE DATE OF SURVEY HAVE BEEN OBSERVED.
* FLOOR LEVEL HAS BEEN TAKEN AT ACCESSIBLE POINT INDICATED. (40 THRESHOLD) INTERNAL FLOOR LEVELS MAY DIFFER FROM INDICATED LEVEL AND SHOULD BE CONFIRMED IF CRITICAL.
* RIDGE, EAVE AND GUTTER HEIGHTS HAVE BEEN OBTAINED BY AN INDIRECT METHOD AND ARE ACCURATE FOR PLANNING PURPOSES ONLY.
* ADJOINING BUILDINGS AND DWELLINGS HAVE BEEN PLOTTED FOR DIAGRAMMATIC PURPOSES ONLY.
* THE SPREAD AND HEIGHT OF EACH TREE IS INDICATIVE ONLY.
* ORIENTATION IS ON MAP GRID OF AUSTRALIA (M.G.A.)
* AUSTRALIAN HEIGHT DATUM (AHD) HAS BEEN OBTAINED FROM GPS OBSERVATIONS UTILISING CORSNET-NSW. IF AHD HEIGHT IS CRITICAL ADDITIONAL SURVEY CONNECTION TO LOCAL CO-ORDINATED MARKS SHOULD BE MADE.
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ROAD

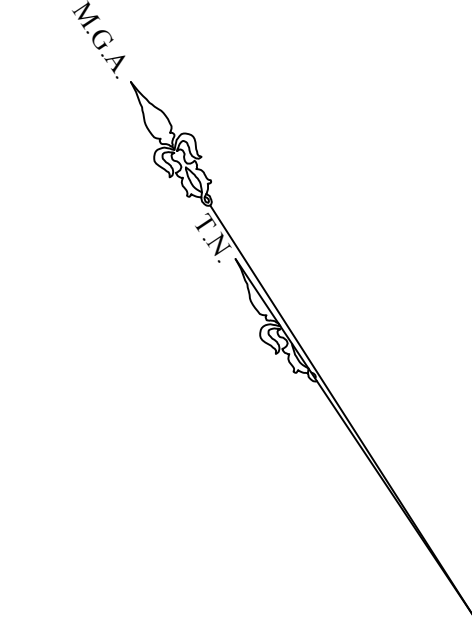
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ILLYARIE PL.

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DP 358163
4293m²

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DP 771641

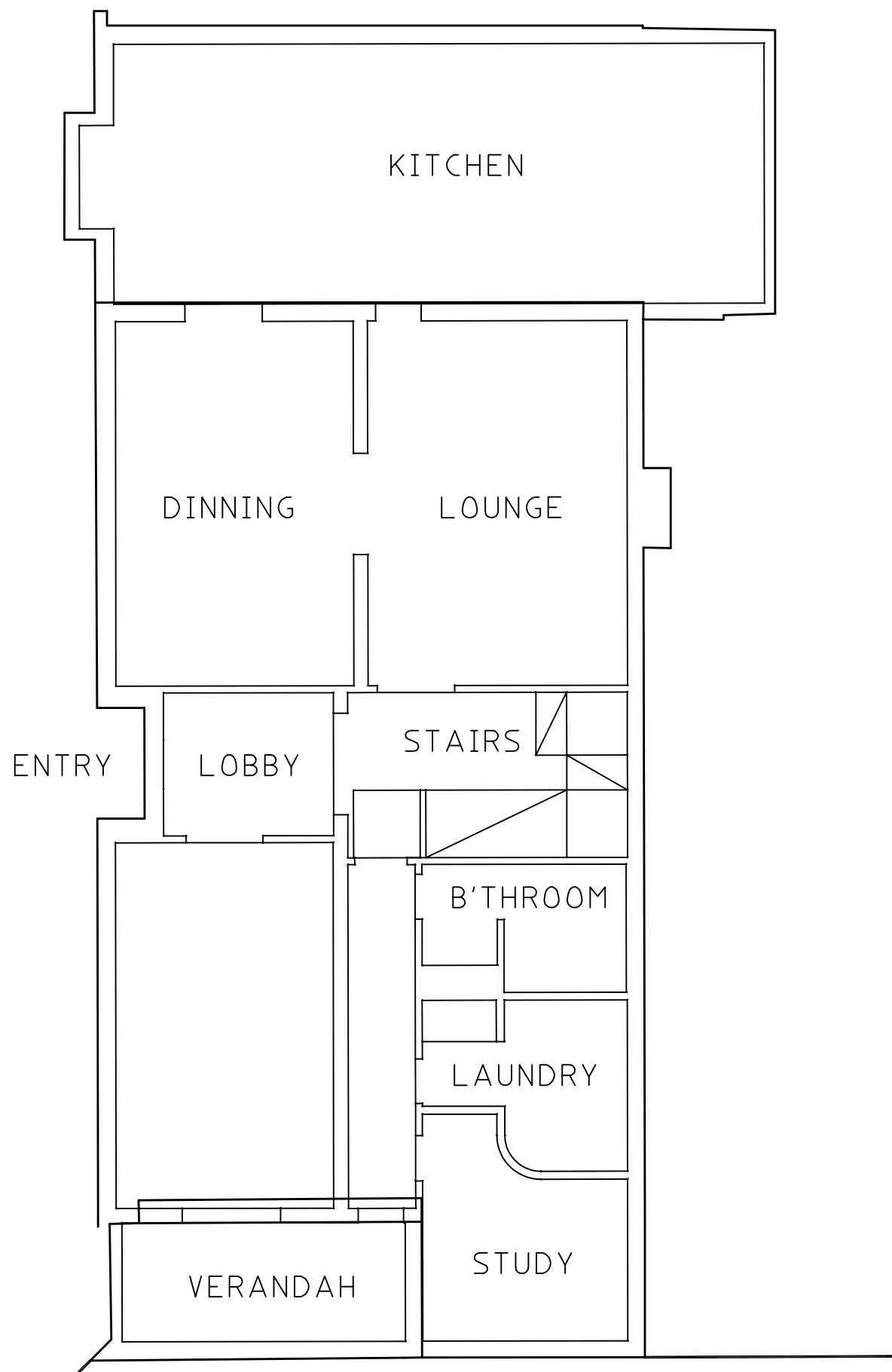


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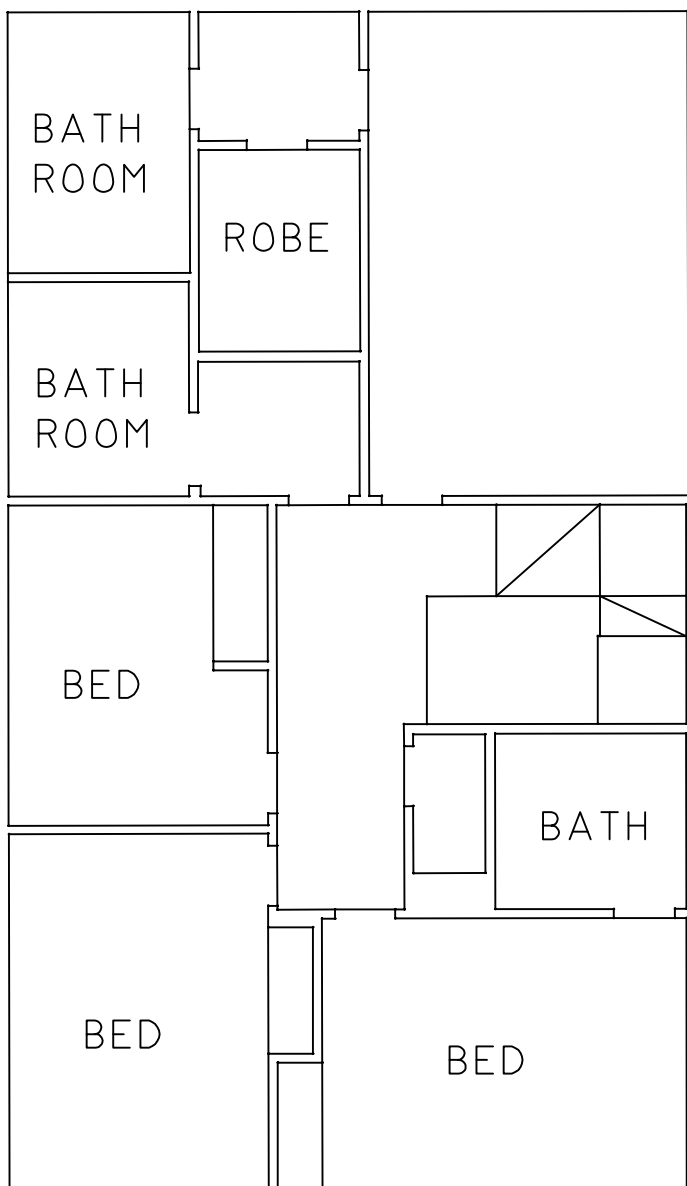
Revisions:				PLAN OF DETAIL AND LEVELS			summit GEOMATIC		
CLIENT:	ISSUE	DATE	AMENDMENT	BY	DP 358163	SECTION: -	SURVEYOR:	DRWN BY:	CHKD BY:
Mark Mina 85 Grose Street Parramatta NSW 2150	A	01/12/2011	Preliminary Drawing Issued	P.N.	TITLE: A/358163		P.N.	S.S.	P.N.
	B	07/12/2011	Revised Drawing Issued	P.N.	L.G.A.: THE HILLS SHIRE		DATE OF SURVEY: 29/11/2011		
	C				PARISH: FIELD OF MARS		LEVEL DATUM: AHD	ORIGIN: -	
	D				COUNTY: CUMBERLAND		ORIGIN RL: -	SOURCE: SCIMS -	
				ORIENTATION: M.G.A. (see note)			SCALE: 1:200 @A1		SCALE: 1:400 @A3
				SUMMIT GEOMATIC PTY LTD ABN: 71 092 947 601 PO BOX 7809, BAULKHAM HILLS B.C. NSW 2153 SUITE 101, 33 LEXINGTON DRIVE BELLA VISTA, N.S.W. 2153 Ph. (02) 9836 3155 Fax (02) 9836 3177 Email: survey@summitgeo.com.au http://www.summitgeo.com.au			JOB REF: 3655 REV No: B SHEET 1 OF 2		

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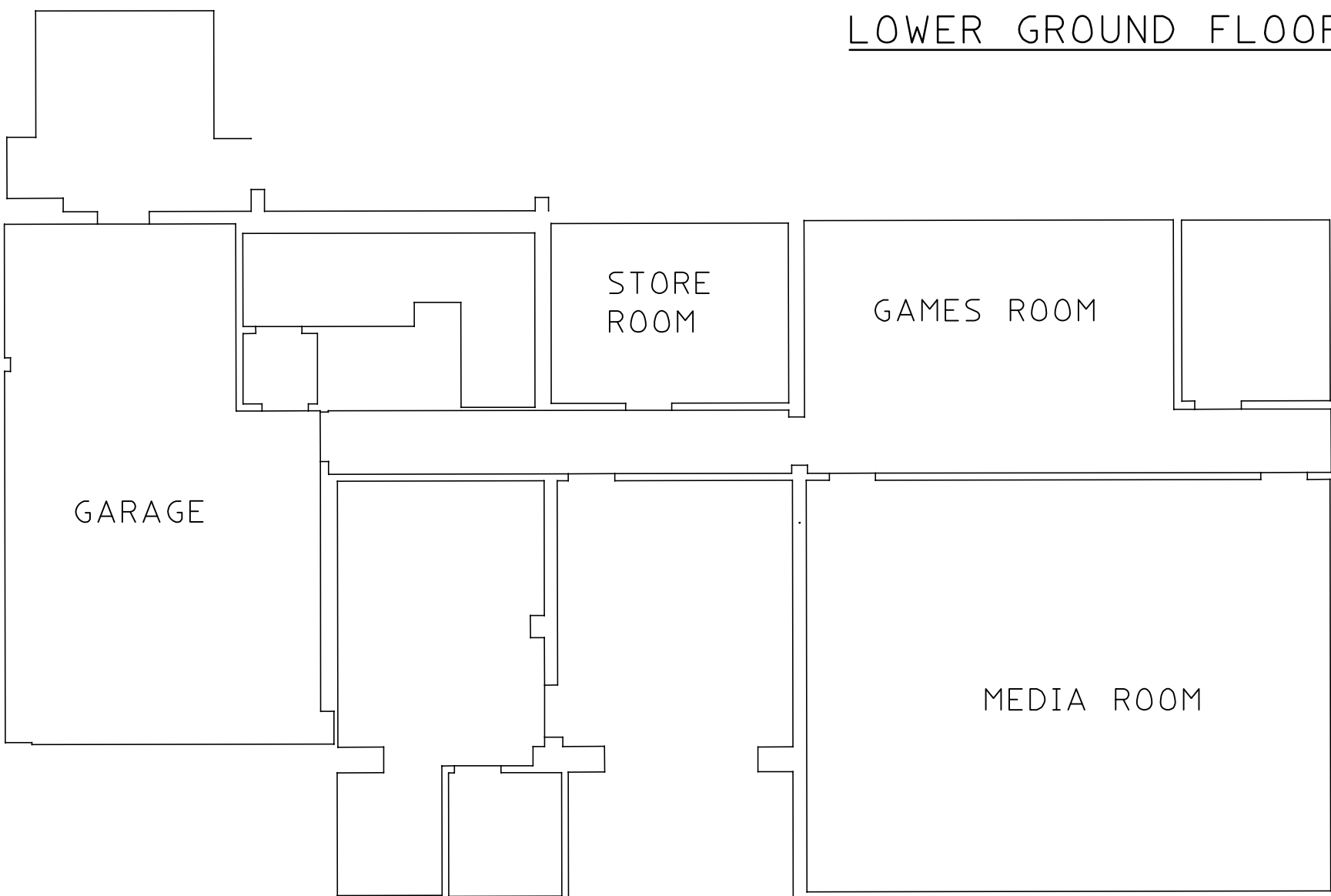
GROUND FLOOR



FIRST FLOOR

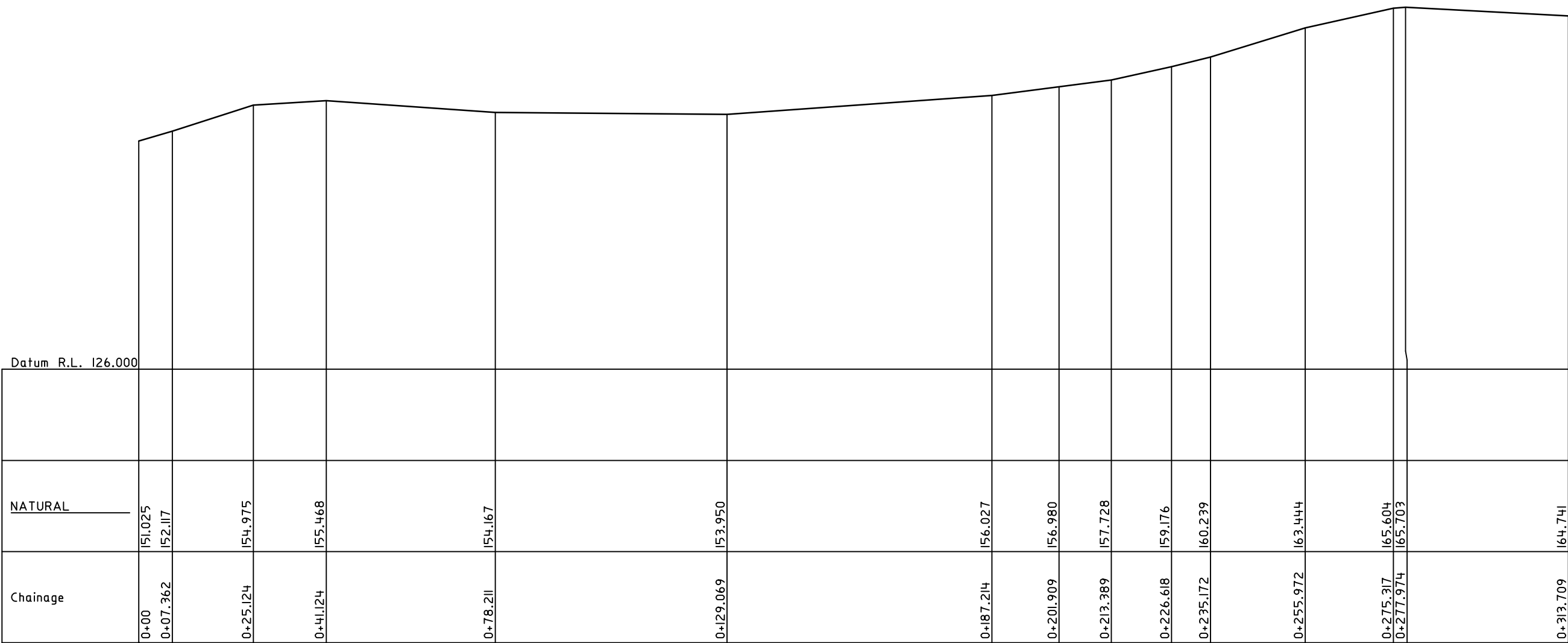
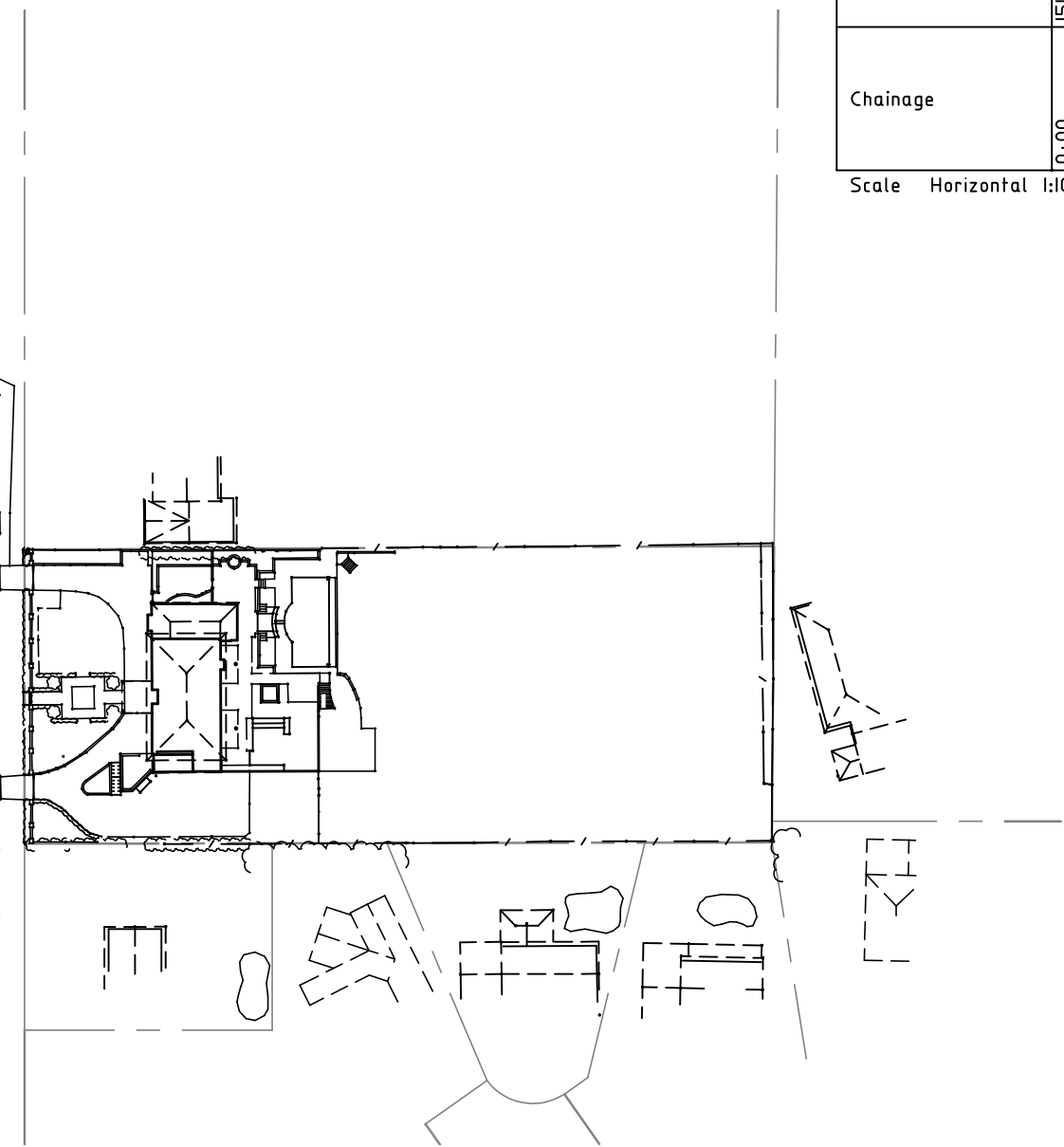


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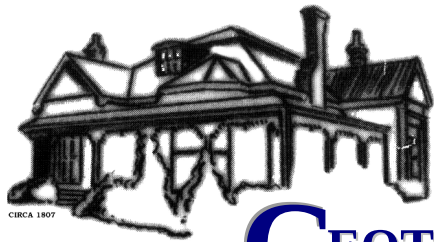


OLD NORTHERN ROAD
BUS STOP

TELFER ROAD



CROSS SECTION - ACCESS TO BUS STOP



GEOTECHNIQUE
PTY LTD

ABN 64 002 841 063



Email: geotech@pnc.com.au

Job No: 3034/1
Our Ref: 3034/1-AA

21 January 2010

Mr P Della Vedova
30 Telfer Road
CASTLE HILL NSW 2154

Dear Sir

re: **Proposed Development
30 Telfer Road, Castle Hill
Geotechnical Investigation**

This report presents the results of a geotechnical investigation carried out for the proposed redevelopment of the rear of the above site. It is understood that the proposed development will be of a residential nature, possibly of brick veneer construction. The investigation was commissioned by Mr P Della Vevoda, the owner of the above property.

The purpose of the investigation was:

- To provide information on surface and sub-surface conditions for site classification and the design and construction of floor slabs and footings.
- To assess the stability of existing slopes.

SITE DESCRIPTION

At the time of conducting the investigation, the site contained an existing rendered brick residence and swimming pool.

The property is located on the side of an undulating to moderately steep hill on the south-eastern side of Telfer Road and is rectangular in shape, measuring approximately 41 metres (m) by 104m. The area of investigation is immediately to the rear of the existing residence and covers an area approximately 60m by 35m. Slopes in this area fall approximately 7 to 8 degrees toward the south.

3034/1-AA
30 Telfer Road, Castle Hill

The area of investigation was well grassed, with juvenile trees planted throughout and scattered mature trees. Trees were noted to be predominantly vertical.

A 1.0m high timber retaining wall was present along the rear boundary of the site. The retaining wall was in poor condition. This retaining wall was inclined downslope and supported in places by props.

Ground surfaces in places were wet. This wetness was apparently due to recent rains and the presence of a rainwater soak-away trench on the up slope neighbouring property.

REGIONAL GEOLOGY

Reference to the Sydney 1:100,000 Geological Series Sheet 9130 (Edition 1) 1983 indicates that the site is underlain by Ashfield Shale of Triassic Age. This rock unit is described as comprising black to dark grey shale and laminite.

INVESTIGATION PROCEDURE

Field work for the investigation was carried out on 19th August 1999 and comprised the excavation of four (4) test pits (TP1 to TP4) at the locations indicated on the attached Drawing No 3034/1-1. The test pits were excavated using a small tracked excavator, to depths ranging from 1.6m to 2.9m below existing ground levels. Insitu testing utilising the Dynamic Cone Penetrometer (DCP) test was carried out adjacent to each test pit.

One undisturbed sample was recovered from TP3 for laboratory testing to provide shrink swell information for foundation design.

A member of our Engineering Staff, who was responsible for sampling and testing of the sub-surface materials and preparation of the engineering logs, supervised the field work.

SUB-SURFACE CONDITIONS

Details of the conditions encountered in the test pits are provided on the attached Engineering Excavation Logs, together with notes defining the descriptive terms used in the report. The sub-surface profile encountered is summarised below:

Topsoil	Silty clay, low to medium plasticity, dark brown, to depths of 0.3m to 0.35m, underlain by
Residual	Clays, medium to high plasticity, orange-grey and grey, with some ironstone gravel and shaley in parts, to depths of 1.5m to 2.9m, underlain by
Bedrock	Shale, very low to high strength, extremely to distinctly weathered, grey and brown with iron cementation in places.

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30 Telfer Road, Castle Hill

Fill material was encountered within TP3 to a depth of 0.6m overlain by topsoil to 300mm depth.

The results of the DCP tests indicate clays to be stiff to very stiff and hard at depth.

Groundwater was not encountered in the test pits for the short time they remained open. It should be noted that fluctuations in the levels of groundwater might occur due to variations in rainfall and/or other factors.

LABORATORY RESULTS

During the course of the investigation an undisturbed (U_{50}) sample of the naturally occurring clays was recovered for laboratory testing, aimed at determining the reactivity of the soils to seasonal moisture variations. The test conducted was Shrink/Swell Index Determination (I_{ss}), in accordance with Australian Standard AS1289 7.1.1-1992, and from the results obtained the potential free surface movement was calculated to be in the range of 40-50 millimetres (mm).

The laboratory test results certificates are attached.

COMMENTS AND RECOMMENDATIONS

Stability

The stability of a property is generally governed by site factors such as slope angles, depth of insitu soils, strength of sub-surface materials and concentrations of water. A property may generally be classified under five categories in terms of stability, as indicated by *Walker et al, 1985*, for the Australian Geomechanics Society.

Class	Implication
Very Low	Good engineering practice should be followed.
Low	Good engineering practices suitable for hillside construction required. Risk after development usually acceptable.
Medium	Development restrictions may be required. Engineering practices suitable to hillside construction necessary. Geotechnical investigation may be needed. Risk after development generally no higher than usually accepted.
High	Development restrictions and/or geotechnical works required. Geotechnical investigation necessary. Risk after development may be higher than usually accepted.
Very High	Unsuitable for development unless major geotechnical work can satisfactorily improve the stability. Extensive geotechnical investigation necessary. Risk after development may be higher than usually accepted.

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30 Telfer Road, Castle Hill

Based on the foregoing observations, the stability of the site may be classified as **LOW** risk. The log retaining wall along the rear boundary of the site should be reconstructed, following re-design in accordance with good engineering practice.

Site Classification

It is considered that the site may be classified as **Class "H"** (Highly Reactive) in accordance with AS2870-1996 "Residential Slabs and Footings".

General

It is considered that the site is suitable for the proposed residential development, provided the recommendations given below are followed.

- Foundation loads may be supported on ground bearing slabs, pads or bored piers. Bored piers, if constructed, should be socketed a minimum of 300 millimetres (mm) into the shale bedrock and may be designed for an allowable end bearing pressure of 600kPa. It should be noted that some high strength ironstone bands and gravels are present which may hinder pier drilling.
- Foundation loadings should be supported on the same bearing stratum to minimise the effect of differential settlements.
- If filling is required for ground bearing slabs, site works should be as follows:
 - Strip existing topsoil and vegetation to an average depth of about 300mm.
 - Excavate any fill material to natural clay subgrade levels.
 - Place fill material in 200mm maximum loose thickness layers and compact to a Dry Density Ratio of at least 98% Standard, at a moisture content within 2% of Optimum Moisture Content (OMC). The final layer should be compacted to a minimum Dry Density Ratio of at least 100%. Fill materials should preferably be of low plasticity clays, sandy clays and clayey sands, with a maximum particle size of 150mm.
 - Filled slopes or batters should be overfilled and cut to the required shape or batter to ensure compaction of the fill material.
 - Ground bearing slabs should not be constructed within two metres of the top of any filled batter slope.
- Slopes not steeper than 2.5 Horizontal : 1 Vertical, for filled slopes and insitu soils, are considered stable. All slope modification should be grassed, or suitably maintained, to reduce erosion. Steeper slopes may be used provided they are retained by engineer-designed retaining walls.

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30 Telfer Road, Castle Hill

- Retaining walls, if required, may be designed using the following parameters:
 - Unit weight of residual soils and compacted fill 18kN/m³
 - Unit weight of extremely weathered shale 20kN/m³
 - Coefficient of active pressure (Ka) in residual soils 0.3
 - Coefficient of active pressure (Ka) in weathered shale 0.2
 - Coefficient of passive pressure (Kp) in weathered shale 3.0
 - Coefficient of "at rest" pressure in residual soils and/or compacted fill 0.45
- For the case of fully suspended slabs, filling may be required for temporary support of concrete slabs in the first few weeks after casting. Fill material should be placed in layers not exceeding 300mm loose thickness and lightly compacted. Maximum particle size should not exceed 200mm.
- All roof catchment should be collected or piped away from the development.
- All surface run-off should be diverted away from slopes and batters.
- Development should generally be in accordance with the attached "Some Guidelines for Hillside Construction".

Should you have any questions relating to this report, please do not hesitate to contact the undersigned.

Yours faithfully
GEOTECHNIQUE PTY LTD

Reviewed by:



MATTHEW CUPITT
Engineering Geologist

EMGED RIZKALLA
Senior Geotechnical Engineer

Encl: Engineering Excavation Logs
Drawing No 3034/1-1 - Test Pit and Borehole Location Plan
Some guidelines for hill-side construction

29 June 2022

THE HILLS SHIRE COUNCIL

PO Box 7064

Norwest NSW 2153

Attention: Dragana Strbac

RE: Geotechnical Peer Review (Landslide Risk Management)
30-32 Telfer Road, Castle Hill NSW 2154
Planning Proposal (2/2022/PLP)
Report No. 2122025-R1

1. INTRODUCTION

At the request of The Hills Shire Council (Council), Willows Engineering Consultants Pty Ltd (Willows Engineering) undertook an Independent Peer Review of a Landslide Risk Assessment Report submitted on behalf of the Proponent in support of a planning proposal (ref: 2/2022/PLP) at 30-32 Telfer Road, Castle Hill (the subject site).

The peer review is based on the *"Practice Note Guidelines for Landslide Risk Management"*, by the Australian Geomechanics Society (AGS 2007).

The purpose of AGS 2007 is to provide guidance of a technical nature on the process and tasks undertaken by geotechnical practitioners who prepare landslide risk management reports. The guidelines provide guidance on the quality of assessment and reporting, including the outcomes to be achieved and how they are to be achieved.

The assessment was undertaken in accordance with the Council's Brief for Peer Review, with the following scope of work:

1. Consideration of the proposed development and supplied documents.
2. Walkover inspection of site conditions.
3. Interpretation of the site geological model, hazards, and landslide risk assessment.
4. Conclusions on whether the geotechnical report addresses AGS 2007 requirements.
5. Recommendations (if required) on additional information in the geotechnical report.

An online inception meeting was held on 10 June 2022 with Council officers Dragana Strbac (Town Planner), Janelle Atkins (Principal Planner) and Jessie Wiseman (Strategic Planning Coordinator). The walkover site inspection was undertaken on 14 June 2022 and was attended by David Willows (Willows Engineering), Dragana Strbac and Jessie Wiseman.

Commentary is provided on the geotechnical recommendations, landslide risk assessment criteria and test pit investigation data for the proposed subdivision and residential lot development, as described in the supplied documents.

In addition, the peer review provides commentary in relation to other potential development types which may be permitted for the site, based on rezoning the land from C4 Environmental Living (formerly E4 Environmental Living) to R2 Low Density Residential.

The geotechnical model for the site has been interpreted based on the geological setting, observations and information contained in the supplied geotechnical reports. No subsurface investigations, drawings, slope modelling or calculations were undertaken by Willows Engineering.

A summary table is attached with comments on the peer review and AGS 2007 reporting standards.

2. SUPPLIED DOCUMENTS

Council supplied the following documents for the peer review:

- Geotechnical Report: *"Landslide Risk Assessment Report"* by Geotesta Pty Ltd (ref: Report No. NE568) dated 29/09/2019.
- Survey Plan: *"Plan of Detail and Levels, Lot A in DP 358163, 30-32 Telfer Road, Castle Hill"*, by Summit Geomatic Pty Ltd (ref: 3655, Rev B) dated 7/12/2011.
- Subdivision Plan: *"Proposed Seniors Living Development"* by JS Architects Pty Ltd (ref: Project No. 037/17-18, Drawing No. A101, Issue B) dated 25/10/2019.
- Planning Proposal Report by Ethos Urban (ref: 2210089) dated 20/08/2021.
- Summary table and extracts from past Geotechnical reports near the site, provided on a confidential basis.

3. BACKGROUND

As background to the peer review, Council officers also supplied copies of historical geotechnical reports on the land instability issues for development in the region. The geotechnical reports indicate slope stability hazards for development, due to the geological setting and history of previous landslides in the region. The reports, borehole logs, slope inclinometers and groundwater monitoring records were provided on a confidential basis solely to inform these findings.

The landside history and risk mapping are discussed in Sections 3.1 and 3.2.

3.1. Landslide History

The historical geotechnical reports included borehole logs, slope inclinometers and groundwater monitoring records from investigations undertaken in Telfer Road, Dan Crescent and Old Northern Road, Castle Hill. The subsurface conditions described on the logs are consistent with the regional geology mapping (see Section 3.4).

Historical land instability issues in the area may be related to roadworks excavations for Telfer Road, stormwater drainage, underground services and residential housing development, which may have intercepted groundwater seepage, at the natural geological interfaces in the sloping land.

3.2. Landslide Risk Map

The site is identified on Council's landslide risk maps, as shown in the extract in Figure 1:

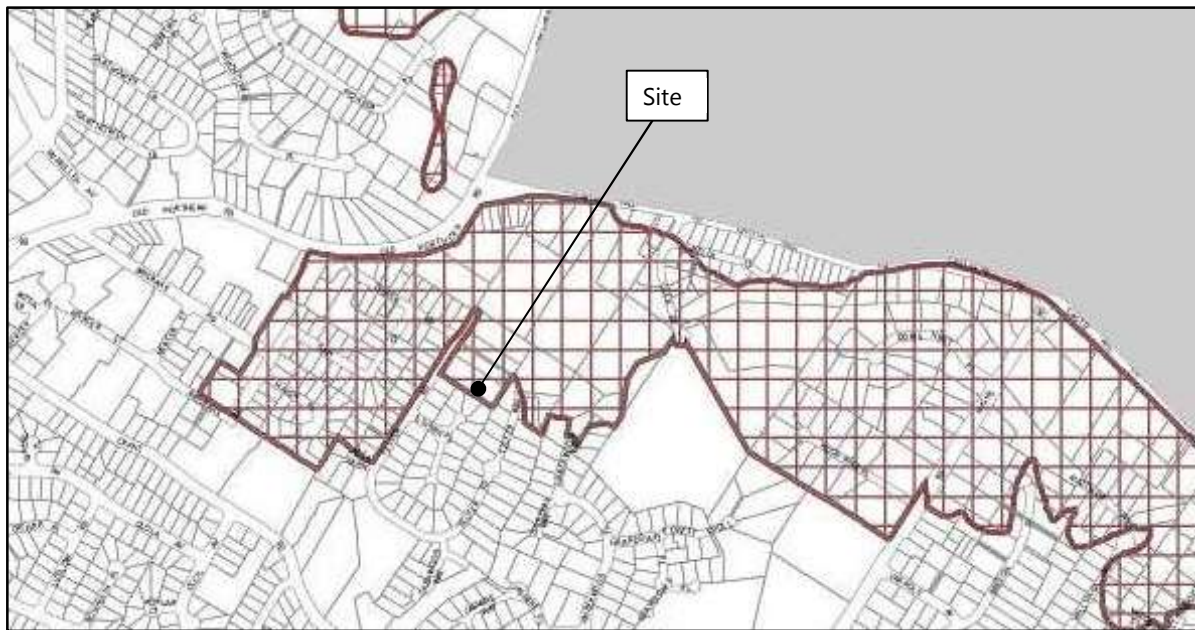


Figure 1 – Extract from Council's Landslide Risk Map
Source: The Hills Shire Council Local Environmental Plan 2019

3.3. Site Locality

An aerial photo of the site with the approximate property boundaries is shown in Figure 2:

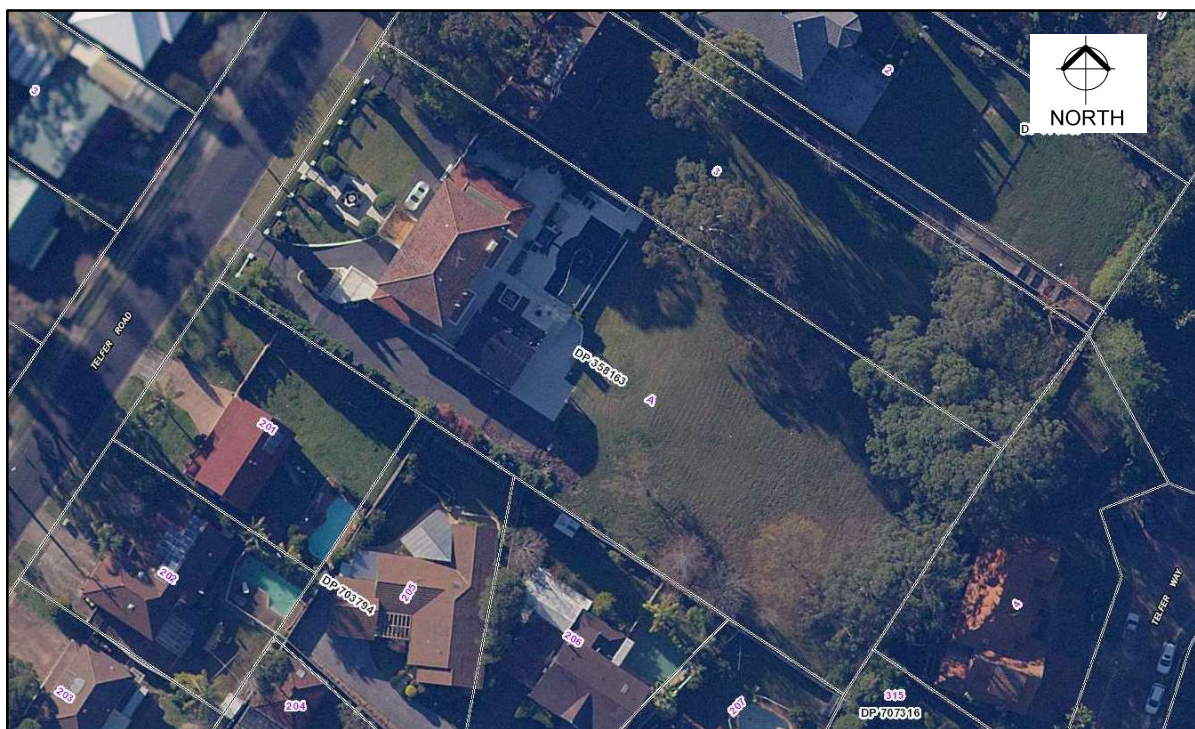


Figure 2 – Aerial photo of the site
Source: NSW SixMaps (<https://maps.six.nsw.gov.au/>)

3.4. Geological Setting

An extract from the 1:100,000 geological map of Sydney is shown in Figure 3:

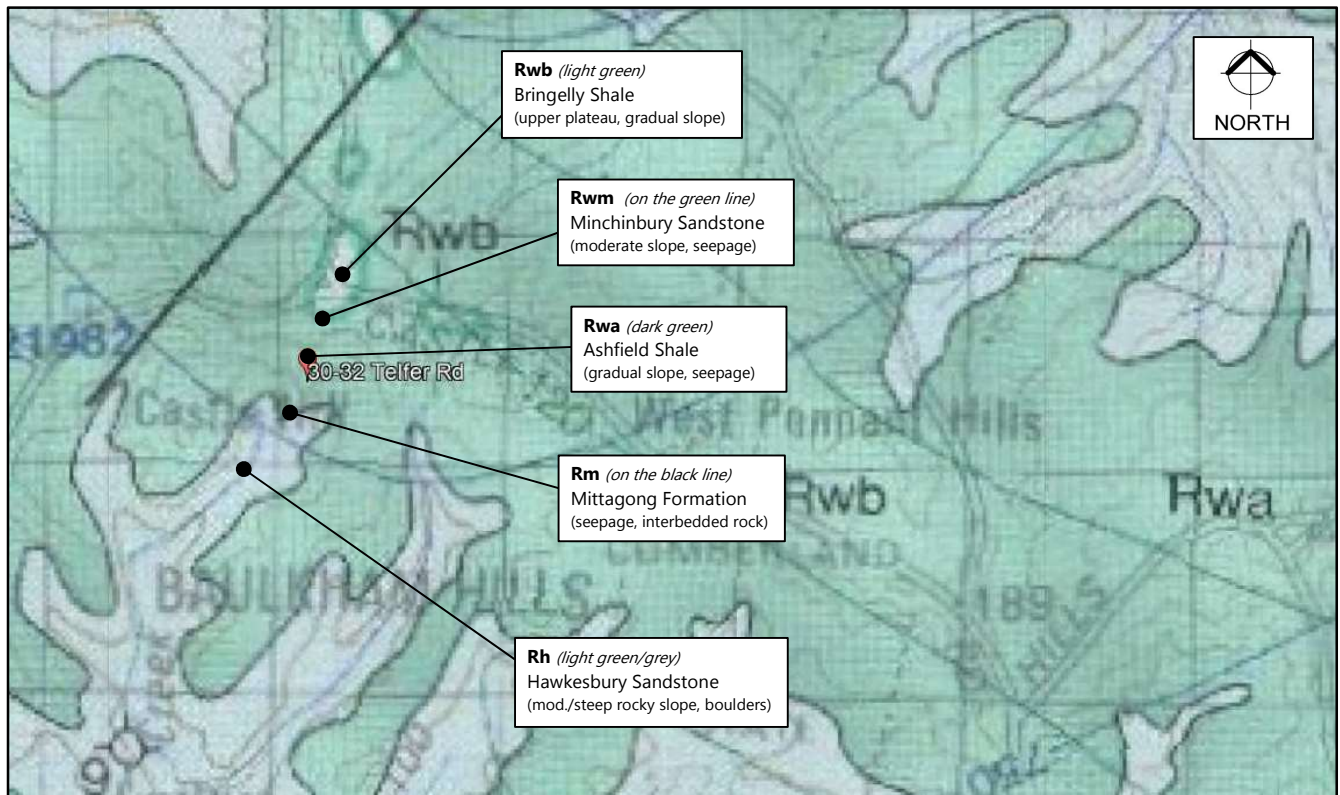


Figure 3 – Extract from 1:100,000 Sydney geology map

As annotated on Figure 6, the major geological units in the region include Bringelly Shale (Rwb), Ashfield Shale (Rwa) and Hawkesbury Sandstone (Rh). However, Minchinbury Sandstone (Rwm) occurs at the interface between the Bringelly Shale and Ashfield Shale. Also, the Mittagong Formation (Rm) occurs at the interface between the Ashfield Shale and the Hawkesbury Sandstone.

As a background, the letters in brackets are a short-hand reference used by geologists and geotechnical practitioners to categorise the different soil / bedrock units. The first, capital letter indicates the geological age ('R' is used for Triassic rocks). The second and third letters are used to further categorise the geological units (i.e. 'w' is short hand for the Wianamatta Group; 'a' means Ashfield, 'b' means Bringelly, 'h' means Hawkesbury). The term 'Rwm' is used for Minchinbury Sandstone because it is part of the Wianamatta Group. The term 'Rm' is used for Mittagong Formation because it at the geological interface of the Ashfield Shale and Hawkesbury Sandstone.

'Ironstone' bands are commonly present within the Bringelly Shale and Ashfield Shale, caused by long-term seepage over impermeable bedrock layers. The ironstone typically has higher strength than the surrounding shale or sandstone bedrock. The soil landscape has formed in an erosional environment as slopewash / colluvium, by rainfall and surface water.

Groundwater seepage is often present in the Minchinbury Sandstone and Mittagong Formation, which are variable interbedded bedrock units. The weathered bedrock and residual soil can cause 'slide planes' for rock wedge failures from excavations, or landslides on sloping land.

4. PLANNING PROPOSAL

The Ethos Urban report indicates the proposal is to rezone the site from 'C4 Environmental Living' to 'R2 Low Density Residential' and to reduce the minimum lot size from 2000 m² to 700 m².

The project background was described in the Council's brief as follows:

"A planning proposal has been lodged with council to rezone the land from C4 Environmental Living to R2 Low Density Residential and reduce the minimum lot size from 2,000m² to 700m². The proposal intends to facilitate a four (4) lot subdivision and a Right of Way to allow for the construction of low density residential dwellings (noting that it could theoretically facilitate a potential fifth residential lot under the proposed minimum lot size controls).

The site is rectangular in shape, has a total area of 4,293m² and slopes approximately 10m from north-west to south-east. A double storey dwelling house and swimming pool occupy the western portion of the site. The remainder of the site is undeveloped.

The site is identified as Landslide Risk Map under The Hills Local Environmental Plan 2019 (LEP 2019). The environmental zoning of the site is largely attributed to the landside risk and site topography."

4.1. Site Survey Plan

An extract from the site survey plan is presented in Figure 4:

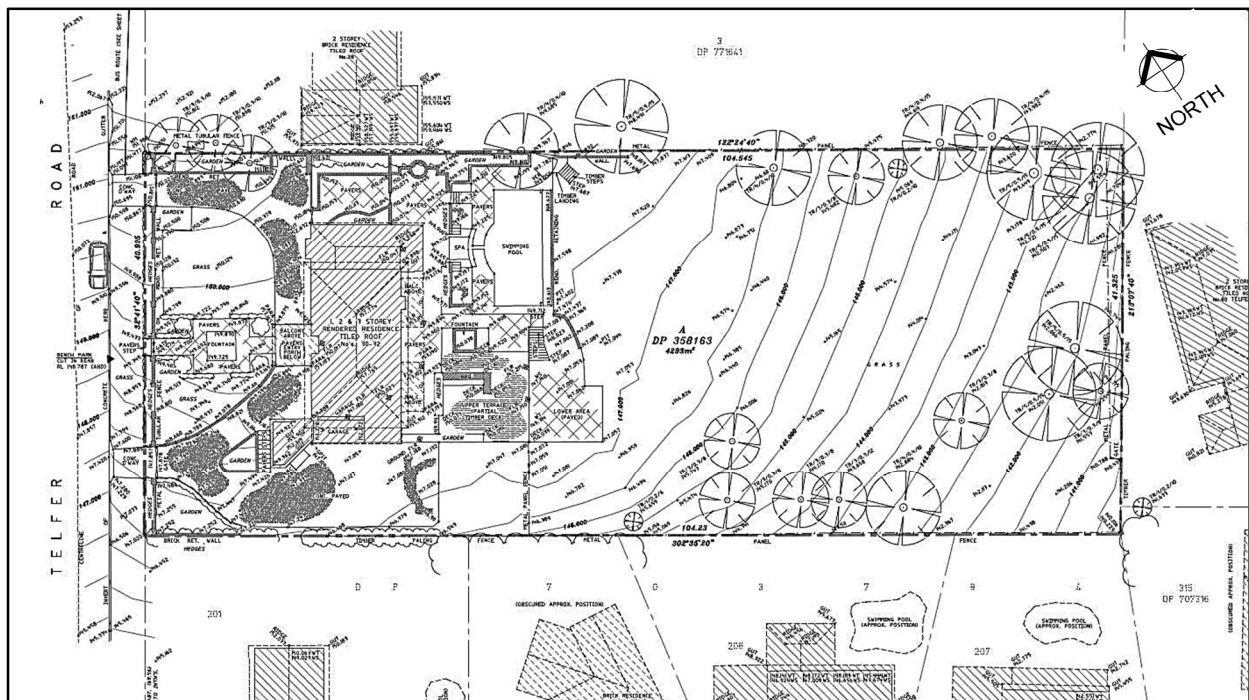


Figure 4 – Extract from site survey plan
Source: Summit Geomatic Pty Ltd (ref: 3655)

4.2. Proposed Development

The purpose of the rezoning is for a proposed residential subdivision development.

The Ethos Urban report refers to the JS Architects subdivision and driveway layout plan to *"...demonstrate the site's capacity to accommodate residential dwellings in a manner which reflects the proposed amendments."*

The landslide risk assessment report by Geotesta provides geotechnical recommendations for the residential subdivision and promotes the AGS 2007 guidelines for hillside construction practice.

Civil engineering design details, cross sections and long sections for the development are to be prepared at a later stage, with further geotechnical investigations and engineering review.

Peer review comments are provided in Section 6.

4.3. Indicative Subdivision Plan

An extract from the indicative subdivision plan is presented in Figure 5:

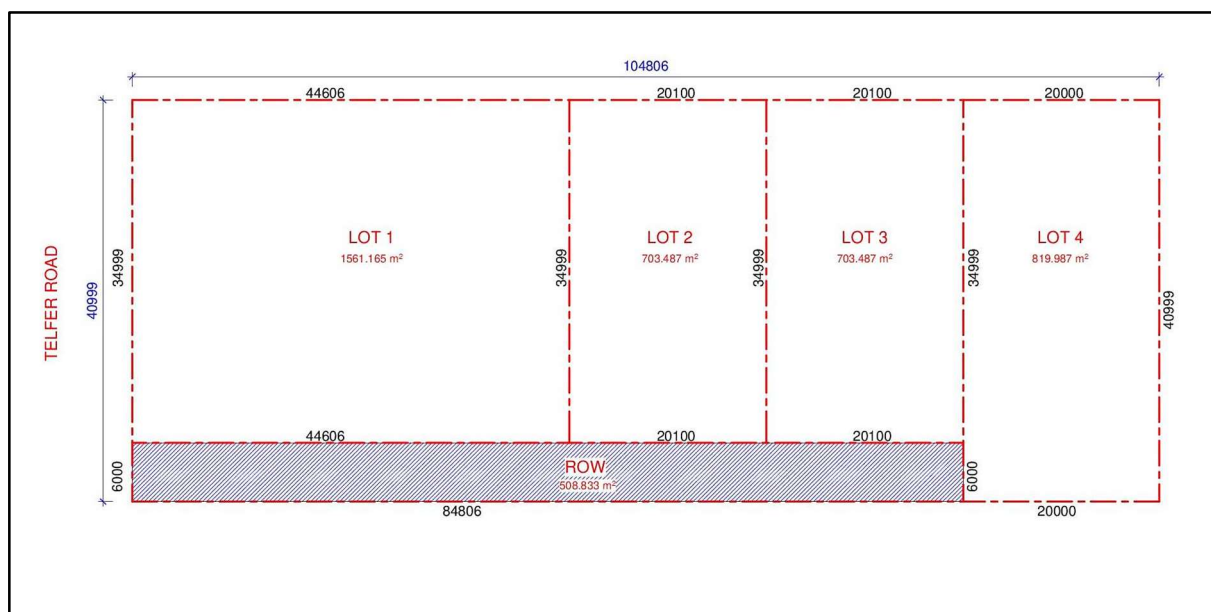


Figure 5 – Extract from indicative site subdivision plan

Source: JS Architects Pty Ltd (ref: 037/17-18, Drawing No. A101)

The JS Architects subdivision plan shows the existing house and three additional lots on the vacant land at the rear of the site. The plan shows a driveway to access the created lots, in the southern part of the land.

However, the subdivision plan does not indicate the proposed driveway levels, earthworks, retaining walls or drainage. No information is provided on construction of in the vicinity of underground services, anticipated layout and volumes of cut/fill, waste management and stockpiled material.

4.4. Council Land Zoning

The Land Zoning map extracted from Council's LEP 2019 is presented in Figure 6:

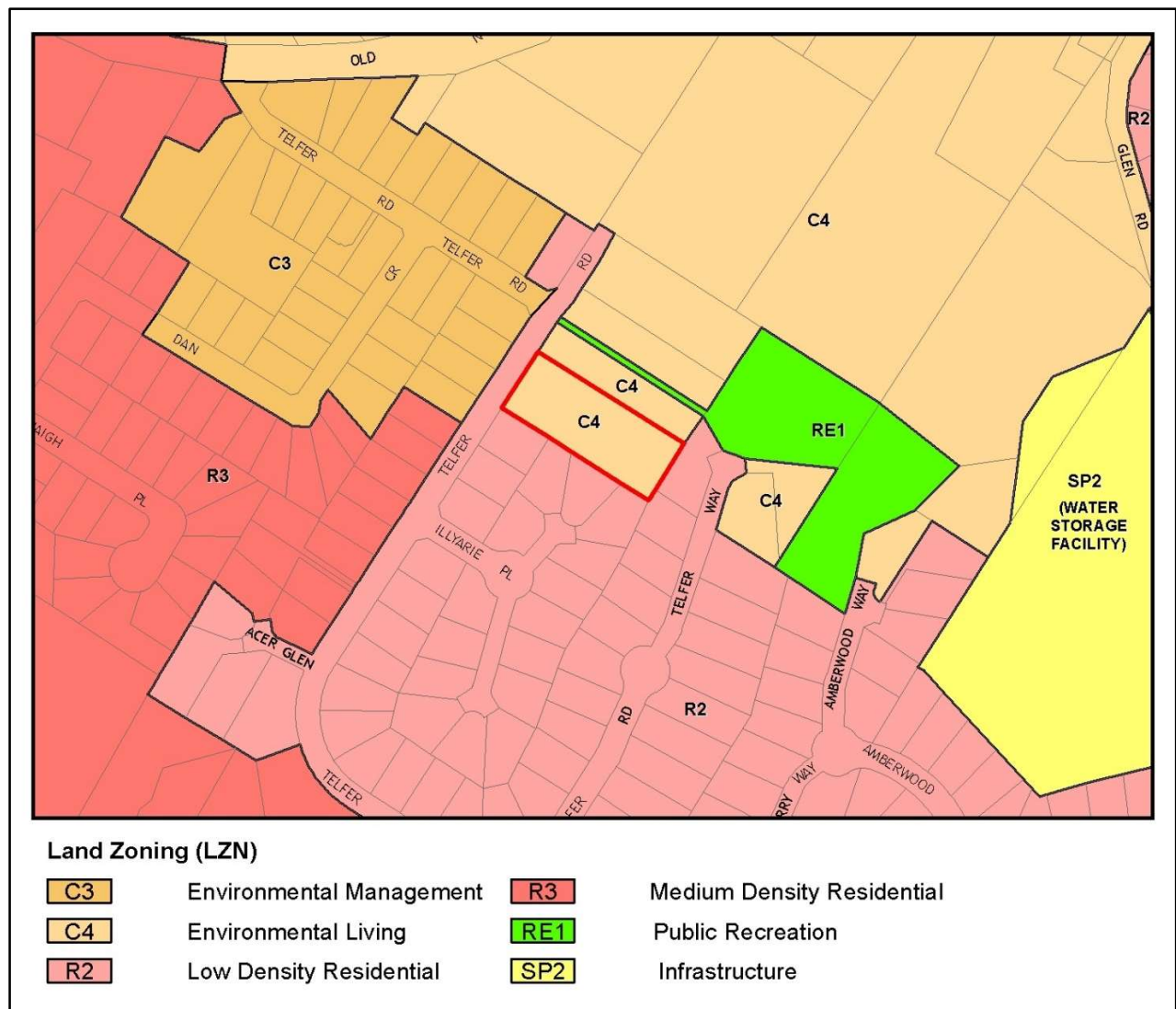


Figure 6 – Extract from the Land Zoning map

Source: Council's Local Environmental Plan 2019

As shown in Figure 6, the site and adjacent property to the north are C4. The adjacent properties to the south and east of the site are R2.

Council noted in the inception meeting that the site is designated C4 Environmental Living due to historical land instability in the region. The site is shown on the Council's landslide risk map.

Council advised that the R2 Low Density Residential designation may permit different land uses. As such, in addition to the proposed residential subdivision development, the other potential land uses for R2 are considered in the landslide risk assessment peer review.

Development applications are to be submitted to Council for approval, prior to construction of the subdivision or structures.

The permitted and prohibited land uses for R2 Low Density Residential and C4 Environmental Living zones are set out in Council's Local Environmental Plan 2019.

Extracts from LEP 2019 are provided in Figures 7 and 8.

Zone R2	Low Density Residential
1	Objectives of zone
	▪ To provide for the housing needs of the community within a low density residential environment. ▪ To enable other land uses that provide facilities or services to meet the day to day needs of residents. ▪ To maintain the existing low density residential character of the area.
2	Permitted without consent
	Home businesses; Home occupations
3	Permitted with consent
	Bed and breakfast accommodation; Building identification signs; Business identification signs; Centre-based child care facilities; Dual occupancies; Dwelling houses; Group homes; Health consulting rooms; Home-based child care; Oyster aquaculture; Pond-based aquaculture; Respite day care centres; Roads; Tank-based aquaculture; Any other development not specified in item 2 and 4
4	Prohibited
	Agriculture; Air transport facilities; Airstrips; Amusement centres; Animal boarding or training establishments; Boat building and repair facilities; Boat launching ramps; Boat sheds; Camping grounds; Car parks; Caravan parks; Cemeteries; Charter and tourism boating facilities; Commercial premises; Correctional centres; Crematoria; Depots; Eco-tourist facilities; Electricity generating works; Entertainment facilities; Environmental facilities; Extractive industries; Farm buildings; Forestry; Freight transport facilities; Function centres; Health services facilities; Heavy industrial storage establishments; Helipads; Highway service centres; Home occupations (sex services); Industrial retail outlets; Industrial training facilities; Industries; Information and education facilities; Jetties; Marinas; Mooring pens; Moorings; Mortuaries; Open cut mining; Passenger transport facilities; Port facilities; Public administration buildings; Recreation facilities (indoor); Recreation facilities (major); Recreation facilities (outdoor); Registered clubs; Research stations; Residential accommodation; Restricted premises; Rural industries; Service stations; Sewerage systems; Sex services premises; Signage; Storage premises; Tourist and visitor accommodation; Transport depots; Truck depots; Vehicle body repair workshops; Vehicle repair stations; Veterinary hospitals; Warehouse or distribution centres; Waste or resource management facilities; Water recreation structures; Water supply systems; Wharf or boating facilities; Wholesale supplies

Figure 7 – Zone R2 Extract from Local Environmental Plan 2019

Zone C4 Environmental Living	
1	Objectives of zone ▪ To provide for low-impact residential development in areas with special ecological, scientific or aesthetic values. ▪ To ensure that residential development does not have an adverse effect on those values.
2	Permitted without consent Home occupations
3	Permitted with consent Bed and breakfast accommodation; Building identification signs; Business identification signs; Community facilities; Dual occupancies (attached); Dwelling houses; Emergency services facilities; Environmental protection works; Home-based child care; Home businesses; Oyster aquaculture; Pond-based aquaculture; Roads; Secondary dwellings; Tank-based aquaculture
4	Prohibited Industries; Service stations; Warehouse or distribution centres; Any other development not specified in item 2 or 3

Figure 8 – Zone C4 Extract from Local Environmental Plan 2019

4.5. Development Types

Development 'permitted with consent' in the R2 Low Density Residential zone and prohibited in the C4 Environmental Living zone, include:

- 'Centre-based child care facilities'
- 'Dual occupancies (detached)'
- 'Exhibition homes'
- 'Exhibition villages'
- 'Flood mitigation works'
- 'Group homes'
- 'Health consulting rooms'
- 'Recreational areas'
- 'Respite day care centres'
- 'Places of public worship'
- 'School-based childcare facilities'

It is noted that various additional land uses are also permitted with consent in the R2 Low Density Residential zone under State environmental planning policies (that are prohibited in the C4 Environmental Living zone), including the following:

- 'Community health service facilities'
- 'Health consulting rooms'
- 'Patient transport facilities including helipads and ambulance'.

However, from a geotechnical perspective, the construction of any site development in the future will need to be subject to review by geotechnical engineers. Recommendations for landslide risk management are to be incorporated into the engineering design drawings and specifications.

Prior to construction (i.e. during the preliminary design, pre-DA or development consent stages), the project geotechnical engineer should review the civil and structural engineering details to confirm the 'risk to property' and 'risk to life' are Acceptable for the proposed construction stages.

This is typically undertaken as part of the development application assessment process, prior to consent for development. Further commentary is provided in Section 6.

5. SITE OBSERVATIONS

During the walkover inspection on 14 June 2022, the following observations were made:

- There is an existing 2-storey house with basement in the western area (front yard). There are structures for the existing house in the front yard, including concrete driveways, gate and fencing, retaining walls, decorative fountain, landscaped gardens and pathways.
- There is a swimming pool on the eastern side of the existing house (back yard).
- The land beyond the eastern side of the house and pool is undeveloped and grassed, with some trees. Measurements in the back yard indicated the natural slope angle is 9° to 10°.
- There are some uneven undulations in the ground surface, with apparent settled ground and signs of minor soil erosion. These features are consistent with 'soil creep' (slow movements) occurring within the surface soil layers.
- The ground surface near the pool appeared locally 'flat' and/or below the surrounding slope levels, suggesting excavations in the area (i.e. cut earthworks) for the development.
- The ground surface to the east of the swimming pool was noted to be 'wet'. By comparison, in the other areas of the site the ground surfaces were typically 'dry' to 'moist'.
- The trees on the site did not appear to be affected by ground movement.
- The lower part of the site is heavily vegetated with ground cover and small trees.
- Sewer, stormwater drainage and other services for the existing house are located toward the southern boundary, for discharge at the south-eastern corner of the site.

Selected photos from the site inspection are shown in Figures 9 and 10:



Figure 9 – Conditions observed during walkover inspection (14/06/2022)



Figure 10 – Conditions observed during walkover inspection (14/06/2022)

6. GEOTECHNICAL PEER REVIEW

6.1. Compliance with Reporting Standards (AGS 2007c)

Table 1 (attached) provides a summary of the peer review and 'reporting standards' listed in Section 10.2 of AGS 2007c. The Geotesta report does not include all items in the AGS 2007c reporting standards (e.g. landslide history, site mapping, test pit locations, logs, test results, etc.).

As set out in the peer review recommendations (Section 8), additional information should be submitted to address these items in the geotechnical report. It is considered that the information provided is sufficient for the planning proposal and generally can be applied for other potential land uses. However, the additional geotechnical investigation recommended by Geotesta should be carried out before any construction work is commenced. This can be managed at the development application stage by suitable conditions of consent and design / construction review hold points.

An extract from Section 10 of AGS 2007c is provided in Figure 11:

10 REPORTING STANDARDS	
10.1 The report on the risk assessment is to document the data gathered, the logic applied and conclusion reached in a defensible manner.	
The practitioner will gather relevant data, will assess the relevance of the data and will reach conclusions as to the appropriate geotechnical model and basic assessment of the slope forming processes and rates. Full documentation of these results provides evidence of completion, provides transparency in the light of uncertainty, enables the assessment to be re-examined or extended at a later date and enables the assessment to be defended against critical review. The process often identifies uncertainties or limitations of the assessment which also need to be documented and understood.	
10.2 The data to be presented includes:	
a.	List of data sources.
b.	Discussion of investigation methods used, and any limitations thereof.
c.	Site plan (to scale) with geomorphic mapping results.
d.	All factual data from investigations, such as borehole and test pit logs, laboratory test results, groundwater level observations, record photographs.
e.	Location of all subsurface investigations and/or outcrops/cuttings.
f.	Location of cross section(s).
g.	Cross section(s) (to scale) with interpreted subsurface model showing investigation locations.
h.	Evidence of past performance.
i.	Local history of instability with assessed trigger events.
j.	Identification of landslides, on plan or section or both, and discussed in terms of the geomorphic model, relevant slope forming process and process rates. Landslides need to be considered above the site, below the site and adjacent to the site.
k.	Assessed likelihood of each landslide with basis thereof.
l.	Assessed consequence to property and life for each landslide with basis thereof.
m.	Resulting risk for each landslide.
n.	Risk assessment in relation to tolerable risk criteria (e.g. regulator's published criteria where appropriate).
o.	Risk mitigation measures and options, including reassessed risk once these measures are implemented.
Where any of the above is not or cannot be completed, the report should document the missing elements, including an explanation as to why.	
The report needs to clearly state whether the risk assessment is based on existing conditions or with risk treatment measures implemented. In some cases, the assessment for both existing and after treatment should be documented to demonstrate the effect of risk control measures on reducing risk.	
A report which does not properly document the assessment is of limited value and would appear to have no reasonable basis.	

Figure 11 – Extract from AGS 2007c Section 10 Reporting Standards

6.2. Site Investigation

The Geotesta report describes the 1999 test pit investigation and includes the Geotechnique report (ref: 3034/1-AA) dated 21 January 2010. However, the *“Engineering Excavation Logs”* and *“Drawing No 3034/1-1 - Test Pit and Borehole Location Plan”* were not included. Results of the Geotechnique shrink/swell laboratory tests and Dynamic Cone Penetrometer (DCP) tests were also not included.

Geotesta noted that fill was logged in Geotechnique Test Pit 3. As such, soil and bedrock depths are expected to vary across the site. In *Section 7.2.3 - Footing Designs*, Geotesta recommends that:

“A new geotechnical investigation to be carried out to advice on the site classification, footing types, founding depths bearing capacity of footings/piers and lateral earth pressure for design of retaining walls.”

6.3. Interpreted Geotechnical Model

The Geotesta report provides a diagram showing the interpreted geotechnical model for the site, which is generally consistent with the description of the Geotechnique test pits. The Geotesta diagram is annotated with the indicative residential development and ‘potential modes of failure’.

An extract from the diagram in the Geotesta report is presented in Figure 12:

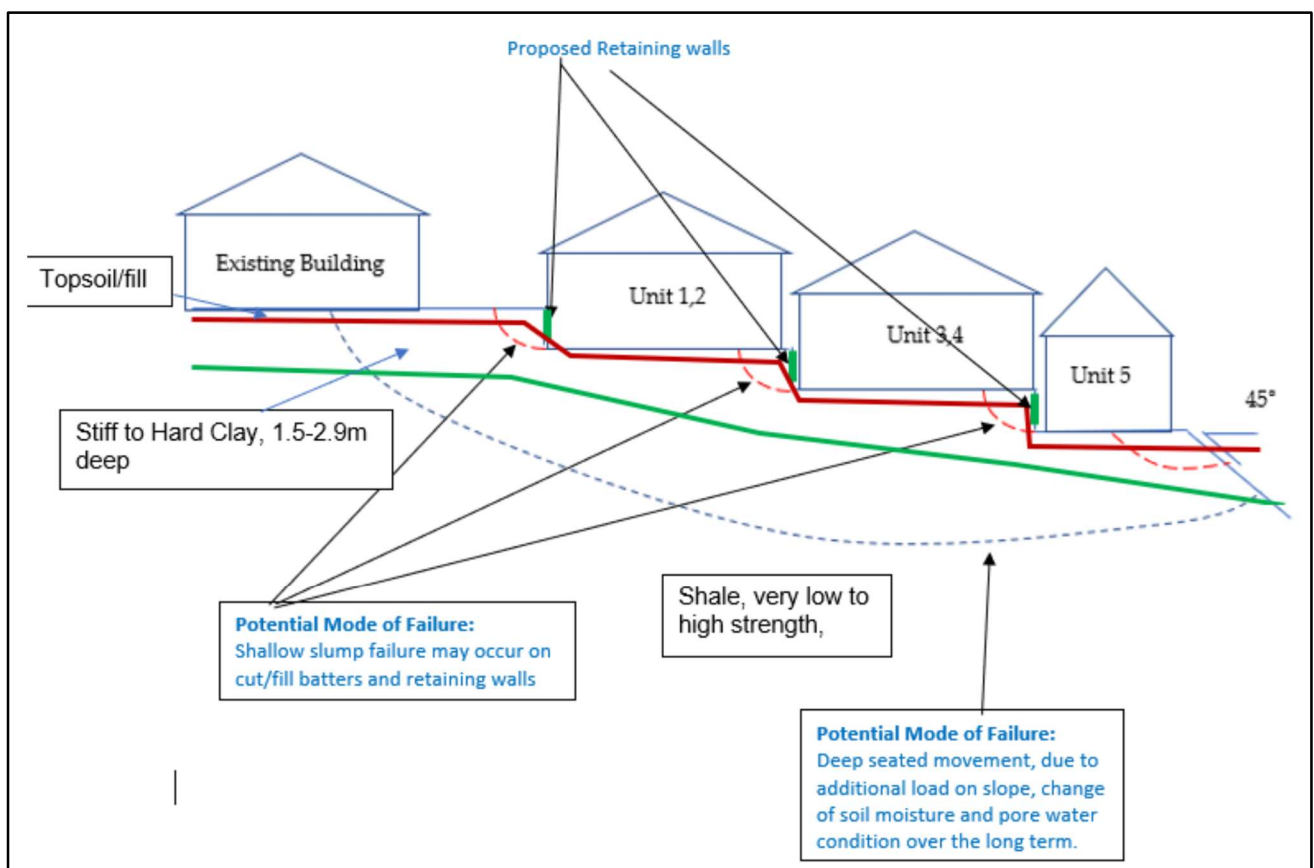


Figure 12 – Extract from Geotesta report (Section 4, Fig. 5, p9)

The Geotesta report diagram illustrates the interpreted geotechnical model, as follows:

- 'Topsoil/fill' (surface soil, above the red line);
- 'Stiff to hard clay' (residual soil, above the green line); and
- 'Shale, very low to high strength' (bedrock, below the green line).

The soil and bedrock profile described in the 2019 Geotesta report and Geotechnique report on the 1999 test pit investigation is consistent with the geological setting. The subsurface profile described in the Geotesta report is also consistent with the borehole logs, slope inclinometers and groundwater monitoring records in the historical geotechnical reports supplied by Council.

Site observations indicate that excavations have been carried out in the northern part of the land for the house, swimming pool and retaining walls. Fill may have been placed in the southern part of the land, as well as for the driveway and underground services.

6.4. Groundwater

The Geotesta report indicates in *Section 3 - Previous Geotechnical Investigation*, that:

"Groundwater was not encountered in the test pits for the short time they remained open. It should be noted that fluctuations in the levels of groundwater might occur due to variations in rainfall and/or other factors."

Groundwater seepage may be encountered at the site, especially in excavations taken below the interface of the residual soil (clay) and weathered bedrock (shale).

Seepage can exacerbate instability on sloping land, caused by inappropriate cut / fill earthworks, unsupported excavations, concentrated surface water and ground saturation. Risk management can be achieved by temporary drainage and ground support, with geotechnical engineering review.

Inadequate drainage, or earthworks construction can exacerbate slope instability mechanisms, by ground saturation and seepage. The ground conditions were noted to be 'wet' in parts of the site.

As such, it would be prudent to carry out further geotechnical investigations to assess groundwater levels and monitoring of groundwater conditions for potential for variability. Monitoring data may be used for engineering design and for geotechnical input to construction risk management.

From a geotechnical engineering and risk management perspective, the groundwater issues on the site will need to be addressed as part of future development proposals. Additional geotechnical investigations are needed to inform the engineering design and prepare details for the subdivision development application, or development applications on the individual lots.

Groundwater management is an important part of planning the future site development, because of the geological setting and history of landslides and instability in the region. However, based on the peer review and experience with subsurface investigations, it is considered feasible to develop the site for the proposed indicative residential subdivision. The site could also be reliably developed based on good hillside construction practice, for the other development types permitted in zone R2.

6.5. Water Tank

During the site inspection, the property owner advised there is a buried water tank in the back yard, used for drainage and irrigation. The water tank is not identified in the geotechnical report, survey plan or subdivision plan. The location, depth and condition of the tank will need to be assessed.

6.6. Landslide Risk Assessment

The diagram presented in *Section 4 – Potential Modes of Instability* of the Geotesta report (reproduced in Section 5.5 of this report), shows two 'modes of failure' for the indicative residential site development:

- Shallow slump failure (red dashed 'slip circles', cut/fill batters and retaining walls).
- Deep seated movement (grey/blue dashed 'slide plane', through soil and bedrock).

These modes of failure are considered suitable for the purposes of landslide risk assessment for the indicative development and the planning proposal. The Geotesta report concludes acceptable levels of 'risk to property' and 'risk to life' for the indicative development.

However, the AGS 2007 risk assessment will need to be updated with site-specific details of the proposed site development, after further geotechnical investigations and engineering design.

The geotechnical risk management principles can be adopted for all types of development which could be permitted for R2 Low Density Residential Development under Council's LEP 2019.

If for example, demolition of the existing house is proposed in the future, or an additional lot is to be created, the AGS principles of good hillside building practice (i.e. as presented in the Appendix of the Geotesta report) are to be adopted at the site. The assessed 'risk to life' and 'risk to property' are to be confirmed as Acceptable in accordance with the AGS 2007 risk criteria.

The risk assessment needs to be undertaken with specific details of the proposed development at the time of the development application. The level of geotechnical risk is managed by engineering review during the investigations, design and construction stages.

6.7. Construction Risk Management

The Geotesta report recommends 'good hillside construction practice' as per the Australian Geomechanics Society guidelines. The Geotesta report and the Geotechnique report (included in the Appendix to the Geotesta report), provide geotechnical recommendations for risk management in the engineering design and construction stages.

The engineering design for future site development will need to be planned to manage short-term construction risks, as well as long-term slope stability risks under adverse conditions.

Prior to construction (i.e. during the preliminary design, pre-DA or development consent stages), the project geotechnical engineer should review the civil and structural engineering details to confirm the 'risk to property' and 'risk to life' are Acceptable for the proposed construction stages.

In this regard, the following are noted:

- The AGS 2007 guidelines for landslide risk management can be applied to development planning, design and construction, as well as for risk management in future land use.
- The project geotechnical engineer should review the construction works, to enable the development to be achieved with Low to Very Low risk and geotechnical certification.

The recommendations in *Sections 7 and 8* of the Geotesta report are considered suitable for risk management and should be adopted in the development (e.g. as conditions of consent) for the purpose of the planning proposal and indicative residential subdivision development.

Future geotechnical report recommendations will be required during the development application and detailed engineering design stage, for construction certificate. The landslide risk management recommendations should be incorporated into the engineering design drawings and specifications.

The AGS guidelines provide extensive commentary on risk management approaches and the content to be included in geotechnical reports. The landslide risk management process can be applied to a variety of land use purposes and to analyse levels of risk for various development scenarios, which may use different engineering designs and construction methods.

It is noted that some of the permitted development types for R2 may include buildings with larger footprints (e.g. child care centres) and involve more persons being present and using the site. In this regard, it will be important to have sufficient geotechnical engineering information available to enable the geotechnical practitioner to undertake the AGS 2007 risk assessment.

7. CONCLUSIONS

Based on peer review of the supplied documents, the site inspection and discussion in this report, the following conclusions have been reached:

1. The planning proposal to designate the site as 'R2 – Low Density Residential' and to reduce the minimum lot size to 700 m², as well as future residential development on the lots, appears feasible from a geotechnical engineering point of view.
2. Regardless of the land zoning, future land use or development type, slope stability risks at the site can be managed by adopting 'good hillside construction practice' and by following the geotechnical report recommendations.
3. The landslide risk assessment in the Geotesta report is considered suitable for the indicative development described in the planning proposal. The Low 'risk to property' and Tolerable 'risk to life' are consistent with the AGS 2007c risk acceptance criteria.
4. The Geotesta report has been prepared in accordance with the AGS 2007c landslide risk assessment method and terminology. However, the Geotesta report does not address all items listed in the AGS 2007c 'reporting standards' (ref: Table 1 attached).
5. Further site investigations are required as part of the development application to confirm the geotechnical model, design parameters and construction staging (ref: Section 6).

8. RECOMMENDATIONS

Based on the geotechnical peer review and conclusions regarding the feasibility of the planning proposal for residential site development, it is recommended that:

1. Further geotechnical investigations be undertaken at the site to refine the geotechnical model, identify the existing buried water tank, services and groundwater. The geotechnical parameters be confirmed for engineering design of footings, piers, retaining walls, cut / fill earthworks, driveway levels and house layouts.
2. Preliminary engineering drawings (e.g. plan, long section and cross sections) be developed to illustrate the proposed site development layout, including the earthworks levels, driveway, retaining walls and inter-allotment drainage systems.
3. The development layout be reviewed by the project geotechnical engineer to advise on design details and construction risk management (e.g. stages, hold points, monitoring, etc.) and communicate the risk management controls to Council and other parties involved.
4. An updated risk assessment report be prepared by the project geotechnical engineer for the proposed development to confirm the short-term levels of 'risk to property' and 'risk to life' associated with the design and construction are acceptable to AGS 2007c.

As discussed in Section 6, the 'risk to life' and 'risk to property' can be reviewed by geotechnical practitioners for the specific land use proposed at the development application stage.

More information is then required to prepare the engineering design and building specifications, which then need to be reviewed in accordance with AGS 2007 for the construction certificate.

9. LIMITATIONS

This peer review report has been prepared for The Hills Shire Council, for the purposes described in the report introduction. Comments on the interpreted geotechnical model, hazards, landslide risk management and construction review are based on experience with developments in sloping land.

The report conclusions and recommendations are based on site observations with review of the supplied documents for the planning proposal and indicative residential development. However, the stability risks can be managed at the site for various potential land uses and development types, with suitable geotechnical engineering advice.

It has been assumed that any future site development will be undertaken in accordance with the Australian Geomechanics Society guidelines for 'good hillside construction practice' and with geotechnical engineering inspections at nominated hold points.

The landslide risk assessment will need to be updated if the site conditions are proposed to be modified by development, to ensure the 'risk to property' and 'risk to life' remain acceptable in accordance with AGS 2007.

If you need any further information or to discuss this report, please contact the undersigned.

Regards

A handwritten signature in black ink that reads "DWillows". The signature is written in a cursive, slightly slanted style.

David Willows
BE(Hons), CPEng(Civil), MIEAust, NER, A.CIRCEA

Attachments:

Table 1 – Comparison of Geotechnical Report with AGS 2007c 'Reporting Standards'

Table 1 – Comparison of Geotechnical Report with AGS 2007c ‘Reporting Standards’

(To be read in conjunction with Report No. 2122025-R1, dated 29 June 2022 by Willows Engineering)

Item	Description	Compliance with AGS 2007c			Comments or Additional Information Required?
		Included (Y/N)	Report Ref	Page No.	
a.	List of data sources	Y	2, 3	4-7	The geotechnical data is based on test pit investigations in 1999.
b.	Discussion of investigation methods used, and any limitations thereof.	Y	3	4-6	The location of test pits, test results and test pit logs from the Geotechnique report are described, with investigation method and encountered conditions.
c.	Site plan (to scale) with geomorphic mapping results.	Y	Fig. 1 and Fig. 3	4, 6	The site location is presented on an aerial photo, with a scale survey plan shown. Site mapping is not shown, slope angles and cut/fill are described in the report.
d.	All factual data from investigations, such as borehole and test pit logs, laboratory test results, groundwater level observations, record photographs.	N	3	7	A text description is provided, which includes some factual data on the fill, soil, rock depths, groundwater conditions, etc. However, the test location plan, test pit logs, DCP test results and laboratory test report were not included. Minimal data is available on groundwater conditions and previous earthworks.
e.	Location of all subsurface investigations and/or outcrops/cuttings.	N	3	7	See above. The site location plan for the test pits, DCP tests and soil sampling was not included in the Geotesta report.
f.	Location of cross section(s).	N	4	9	There is an indicative cross section in the report. No location is identified.
g.	Cross section(s) (to scale) with interpreted subsurface model showing investigation locations.	Y	4	9	The Geotesta report cross section diagram (Figure 5) is stated as ‘not to scale’ and the investigation locations are not shown. The interpreted subsurface model is consistent with the description of the Geotechnique test pits in <i>Section 3</i> .
h.	Evidence of past performance.	Y	2, 3	4, 6	The report describes the existing house, driveway, walls and pool. No significant stability issues were identified on the existing or surrounding property.

Table 1 – Comparison of Geotechnical Report with AGS 2007c ‘Reporting Standards’

(To be read in conjunction with Report No. 2122025-R1, dated 29 June 2022 by Willows Engineering)

Item	Description	Compliance with AGS 2007c			Comments or Additional Information Required?
		Included (Y/N)	Report Ref	Page No.	
i.	Local history of instability with assessed trigger events.	N	-	-	The Geotesta report does not discuss the local history of instability. The report should acknowledge studies on slope stability for development planning by the Soil Conservation Service and the landslide risk map in Council’s LEP.
j.	Identification of landslides, on plan or section or both, and discussed in terms of the geomorphic model, relevant slope forming process and process rates. Landslides need to be considered above the site, below the site and adjacent to the site.	Y	4 Fig. 9	9	The cross section diagram (Figure 5) in the Geotesta report shows two potential modes of failure for a ‘shallow slump’ or ‘deep-seated’ landslide on the site. However, there is no site plan provided to illustrate the identified hazards on the site and surrounding areas. The process for preparing a cross section with interpreted geotechnical model and landslide assessment is described in Section 5.2.5 of AGS 2007c.
k.	Assessed likelihood of each landslide with basis thereof.	Y	5.2.1, 5.2.2	13, 14	The Geotesta report indicated likelihood terms as ‘Unlikely’ for the shallow slump failure and ‘Rare’ for the deep-seated landslide. The basis for selection of the likelihood terms is explained in the report. Geotechnical recommendations are to be followed in the development to maintain the likelihood terms.
l.	Assessed consequence to property and life for each landslide with basis thereof.	Y	5, 6	10-17	The Geotesta report sets out the criteria for risk assessment as per AGS 2007c and discusses the selected consequence terms and risk calculations.
m.	Resulting risk for each landslide.	Y	5.3, 6.7	15, 16	Based on adopting the geotechnical recommendations, the ‘risk to property’ was reported as Low for both potential modes of failure.

Table 1 – Comparison of Geotechnical Report with AGS 2007c ‘Reporting Standards’

(To be read in conjunction with Report No. 2122025-R1, dated 29 June 2022 by Willows Engineering)

Item	Description	Compliance with AGS 2007c			Comments or Additional Information Required?
		Included (Y/N)	Report Ref	Page No.	
n.	Risk assessment in relation to tolerable risk criteria (e.g. regulator’s published criteria where appropriate).	Y	5.6	10	The Geotesta report concludes the ‘risk to property’ and ‘risk to life’ for the proposed indicative development are acceptable by comparison with the AGS 2007 risk criteria. The report does not refer to Council’s landslide risk map, or land zoning with regard to geotechnical risk management.
o.	Risk mitigation measures and options, including reassessed risk once these measures are implemented.	Y	7, 8 and 9	18-23	Recommendations in <i>Section 7</i> of the Geotesta report are considered suitable for the risk management and should be adopted for future site development. However, as discussed in the peer review report, engineering design, planning and geotechnical investigations are necessary to assess the development details. Short-term construction risks and long-term soil creep are likely to be important geotechnical considerations for development on the created lots.

Note: Items a. to o. in the table have been adapted from Section 10.2 of AGS 2007c.



SEASONED TREE CONSULTING

ARBORICULTURAL IMPACT ASSESSMENT REPORT

Prepared for
JS Architects

Site address
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Castle Hill**

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- Appendix 5 – Structural Root Zone
- Appendix 6 – Amenity Value
- Appendix 7 – Age Class
- Appendix 8 – Structural Condition
- Appendix 9 – SULE Categories
- Appendix 10 – Trees AZ

1. INTRODUCTION

- 1.1 This report has been commissioned by JS Architects to provide an Arboricultural Impact Assessment Report in relation to trees located on or close to the site that may be affected by development resulting from a Planning Proposal to amend the land use zoning and minimum lot size control for the site at 30-32 Telfer Road, Castle Hill.

TABLE 1: DOCUMENTS PROVIDED FOR THE ASSESSMENT

Title	Author	Date	Reference on document
Plan of detail and levels	Summit Geomatic	07.12.2011	Issue B
Subdivision Plans	JS Architects	25.10.2019	Issue A

- 1.2 One site inspection was carried out for the purpose of this assessment on 22 July 2022. The site inspection was undertaken to collect tree and site data.
- 1.3 The weather during of the site inspection was cloudy with good visibility.

2. SCOPE OF THE REPORT

- 2.1 **This report has been undertaken to meet the following objectives.**
- 2.2 Conduct a visual assessment from ground level of all trees located on or close to the site.
- 2.3 Determine the trees estimated contributing years, remaining useful life expectancy and award the tree a retention value.
- 2.4 Provide an assessment of the potential impact the proposed development is likely to have on the condition of the subject trees in accordance with AS4970 Protection of trees on development sites (2009).
- 2.5 Recommend methods to mitigate development impacts where appropriate.
- 2.6 Recommend pragmatic tree protection measures for any tree to be retained in accordance with AS4970 Protection of Trees on Development Sites - 2009.

3. LIMITATIONS

- 3.1 Observations and recommendations are based on the single site inspection. The findings of this report are based on the observations and site conditions at the time inspection.
- 3.2 All observations were carried out from ground level. No detailed additional testing was carried out on trees or soil on site and none of the surrounding surfaces were lifted for investigation.
- 3.3 Root decay can sometimes be present with no visual indication above ground. It is also impossible to know the extent of any root damage caused by mechanical damage such as underground root cutting during the installation of services without undertaking detailed root investigation. Any form of tree failure due to these activities is beyond the scope of this assessment.
- 3.4 The report reflects the subject tree(s) as found on the day of inspection. Any changes to the growing environment of the subject tree, or tree management works beyond those recommended in this report may alter the findings of the report. There is no warranty, expressed or implied, that problems or deficiencies relating to the subject tree, or subject site may not arise in the future.
- 3.5 Tree identification is based on accessible visual characteristics at the time of inspection. As key identifying features are not always available the accuracy of identification is not guaranteed. Where tree species is unknown, it is indicated with a spp.
- 3.6 All diagrams, plans and photographs included in this report are visual aids only and are not to scale unless otherwise indicated.
- 3.7 Seasoned Tree Consulting neither guarantees, nor is responsible for, the accuracy of information provided by others that is contained within this report.
- 3.8 While an assessment of the subject trees estimated useful life expectancy is included in this report, no specific tree risk assessment has been undertaken for any of trees at the site.
- 3.9 Where trees are stated as retainable under the current proposal, this will only become a reality if all recommendations and specifications are followed exactly.
- 3.10 The ultimate safety of any tree cannot be categorically guaranteed. Even trees apparently free of defects can collapse or partially collapse in extreme weather conditions. Trees are dynamic, biological entities subject to changes in their environment, the presence of pathogens and the effects of ageing. These factors reinforce the need for regular inspections. It is generally accepted that hazards can only be identified from distinct defects or from other failure-prone characteristics of a tree or its locality.
- 3.11 Alteration of this report invalidates the entire report.

4. METHODOLOGY

- 4.1 The following information was collected during the assessment of the subject tree(s).
- 4.2 Tree common name
- 4.3 Tree botanical name
- 4.4 Tree age class
- 4.5 DBH (Trunk/Stem diameter at breast height/1.4m above ground level) - millimetres.
- 4.6 Estimated height - metres
- 4.7 Estimated crown spread (Radius of crown) - metres
- 4.8 Health
- 4.9 Structural condition
- 4.10 Amenity value
- 4.11 Estimated remaining contribution years (SULE)¹
- 4.12 Retention value (Tree AZ)²
- 4.13 Notes/comments
- 4.14 An assessment of the trees condition was made using the visual tree assessment (VTA) model (Mattheck & Breloer, 1994).³
- 4.15 Tree diameter was measured using a DBH tape or in some cases estimated. All other measurements were estimations unless otherwise stated. The other tools I used during the assessment were a digital camera and a Leica DistoD410 digital laser tape.
- 4.16 All DBH measurements, tree protection zones, and structural root zones were calculated in accordance with methods set out in AS4970 Protection of trees on development sites (2009) ⁴ and in some cases estimated. See appendices for information.
- 4.17 Details of how the observations in this report have been assessed are listed in the appendices.

¹ Barrell Tree Consultancy, *SULE: Its use and status into the New Millennium*, TreeAZ/03/2001, <http://www.treeaz.com/>.

² Barrell Tree Consultancy, *Tree AZ version 10.10-ANZ*, <http://www.treeaz.com/>.

³ Mattheck, C. & Breloer, H., *The body language of trees - A handbook for failure analysis*, The Stationary Office, London, England (1994).

⁴ Council of Standards Australia, *AS4970 Protection of trees on development sites* (2009).

5. SITE LOCATION AND BRIEF DESCRIPTION OF PROPOSAL

- 5.1 The site is located in the suburb of Castle Hill in the Hills Shire Council LGA. This assessment has been carried out in accordance with the following documents and legislation;
- 5.1.1 The Hills Local Environmental Plan 2019
 - 5.1.2 The Hills (DCP) 2012
 - 5.1.3 State Environmental Planning Policy (Biodiversity and Conservation 2021).
- 5.2 The site is zoned C4 (Environmental Living) and is 4293 sqm in size. The site has an existing house and driveway towards the front of the site. The site has no environmental protection overlays nor heritage overlay⁵. The site is gently sloping from the road back into the site.
- 5.3 The proposal consists of an application for a Planning Proposal which seeks to enable a rezoning of the site to R2 Low Density Residential from its C4 Environmental Living zoning and reduce the minimum lot size control from 2000m² to 700m². The proposed amendments to The Hills Local Environmental Plan 2019 will then enable the subdivision to be assessed through the DA process.

Tile 1: Site location⁶



⁵ <https://www.planningportal.nsw.gov.au/spatialviewer/#/find-a-property/address>

⁶ <https://maps.six.nsw.gov.au/>

6. OBSERVATIONS AND GENERAL INFORMATION IN RELATION TO PROTECTING TREES ON DEVELOPMENT SITES

- 6.1 **Tree information:** Details of each individual tree assessed, including the observations taken during the site inspection can be found in the tree inspection schedule in appendix 2, where the indicative tree protection zone (TPZ) for the subject trees has been calculated. The TPZ and SRZ should be measured in radius from the centre of the trunk. Trees have been awarded a retention value based on site observations. The system used to award the retention value is Tree AZ. Tree AZ is used to identify higher value trees worthy of being a constraint to development and lower value trees that should generally not be a constraint to the development. A field sheet of Tree AZ categories sheet (Barrell Tree Consultancy) has been included at the end of the report to assist with understanding the retention values. The retention value that has been allocated to the subject trees in this report is not definitive and should only be used as a guideline.
- 6.2 **Site plans:** Appendix 1 contains an existing site plan identifying tree locations and an overlay of the indicative TPZ and SRZ of each tree. Appendix 1A contains the proposed site plans and calculated encroachments Appendix 1B contains a tree protection plan.
- 6.3 **Tree protection zone (TPZ):** The TPZ is principle means of protecting trees on development sites and is an area required to maintain the viability of trees during development. It is commonly observed that tree roots will extend significantly further than the indicative TPZ, however the TPZ is an area identified AS4970-2009 to be the extent where root loss or disturbance will generally impact the viability of the tree. The TPZ is identified as a restricted area to prevent damage to trees either above or below ground during a development. Where trees are intended to be retained proposed developments must provide an adequate TPZ around trees. The TPZ is set aside for the tree's root zone, trunk and crown and it is essential for the stability and longevity of the tree. The tree protection also incorporates the SRZ (see below for more information about the SRZ). The TPZ of palms, other monocots, cycads and tree ferns has been calculated at one metre outside the crown projection. Appendix 4 contains additional information about the TPZ including information about calculating the TPZ and examples of TPZ encroachment.
- 6.4 **Structural Root Zone (SRZ):** This is the area around the base of a tree required for the trees stability in the ground. An area larger than the SRZ always needs to be maintained to preserve a viable tree. There are several factors that can vary the SRZ which include height, crown area, soil type and soil moisture. It can also be influenced by other factors such as natural or built structures. Generally work within the SRZ should be avoided. Soil level changes should also generally be avoided inside the SRZ of trees to be retained. Palms, other monocots, cycads and tree ferns do not have an SRZ. See appendix 5 for more information about the SRZ.

- 6.5 **Minor encroachment into TPZ:** Sometimes encroachment into the TPZ is unavoidable. Encroachment includes but is not limited to activities such as excavation, compacted fill and machine trenching. Minor encroachment of up to 10% of the overall TPZ area is normally considered acceptable, providing there is space adjacent to the TPZ for the tree to compensate and the tree is displaying adequate vigour/health to tolerate changes to its growing environment.
- 6.6 **Major encroachment into TPZ:** Where encroachment of more than 10% of the overall TPZ area is proposed an Arborist must investigate and demonstrate that the tree will remain in a viable condition. In some cases, tree sensitive construction methods such as pier and beam footings, suspended slabs, or cantilevered sections, can be utilised to allow additional encroachment into the TPZ by bridging over roots and minimising root disturbance. Major encroachment is only possible if it can be undertaken without severing significant size roots, or if it can be demonstrated that significant roots will not be impacted.

7. ASSESSEMENT OF CONSTRUCTION IMPACTS

7.1 **Table 2:** The table below contains a summary of the impact of proposed development impact to all trees included in the assessment.

Tree ID	Common name	Retention value	TPZ radius (m)	SRZ Radius (m)	TPZ Area (sq m)	TPZ Encroachment See Appendix 1A	Discussion/ Conclusion	Recommendation
1	<i>Agonis flexuosa</i> , West Australian Peppermint	A1	4.8	2.4	72.4	Nil	Tree is located within the northern neighbours front yard and is in good overall condition. There is no encroachment from proposed plans. The tree should be retained and protected.	Retain.
2	<i>Melaleuca linariifolia</i> , Snow-in-summer	A2	5.28	2.4	87.6	Nil	Tree is located within the northern neighbours front yard and is in good overall condition. There is no encroachment from proposed plans. The tree should be retained and protected.	Retain.
3	<i>Cupressus sempervirens</i> , Pencil pine x many	Z3				Nil	Tree is an exempt species and can be removed without Council permission if desired.	Exempt tree species.
4	4 x hedged <i>Ficus topiary</i>	Z3				Nil	Tree is an exempt species and can be removed without Council permission if desired.	Exempt tree species.
5	<i>Jacaranda mimosifolia</i> , Jacaranda	Z3				Nil	Tree is an exempt due to its small size (the tree has been previously removed down to ground level with multiple basal coppice regrowth) and can be removed without Council permission if desired.	Exempt tree.
6	<i>Cupressus x leylandii</i> , Leighton green Cypress Pine (Many hedge species)	Z3	2.4	1.8	18.1	Nil	The group of trees are exempt species and can be removed without Council permission if desired. The group of trees are located within the footprint of the proposed right of way driveway and would be required to be removed to facilitate this subdivision development.	Exempt tree species.

Tree ID	Common name	Retention value	TPZ radius (m)	SRZ Radius (m)	TPZ Area (sq m)	TPZ Encroachment See Appendix 1A	Discussion/ Conclusion	Recommendation
7	<i>Fraxinus sp.</i> , Ash	A2	4.44	2.3	61.9	Minor	Tree would be subject to a minor encroachment from a small portion of the proposed right of way driveway and will likely be able to be retained long term with arboriculturally sensitive design.	Retain.
8	<i>Nyssa sylvatica</i> , Black Tupelo	A1	4.56	2.4	65.3	Footprint.	Tree is located within the footprint of the proposed right of way driveway and would be required to be removed to facilitate this subdivision development.	Remove and replace.
9	<i>Fraxinus sp.</i> , Ash	A1	4.08	2.4	52.3	Footprint.	Tree is located within the footprint of the proposed right of way driveway and would be required to be removed to facilitate this subdivision development.	Remove and replace.
10	<i>Lagerstroemia indica</i> , Crepe myrtle	A2	3	1.8	28.3	Footprint.	Tree is located within the footprint of the proposed right of way driveway and would be required to be removed to facilitate this subdivision development.	Remove and replace.
11	<i>Ulmus parvifolia</i> , Chinese elm	A1	5.28	2.3	87.6	Nil	Tree is located outside of the subdivision development area and may be able to be retained long term with arboriculturally sensitive design.	Retain.
12	<i>Eucalyptus saligna</i> , Sydney blue gum	Z5	8.4	3	221.7	Nil	Tree is in poor condition with multiple bracket fungi, a secondary leader has failed years ago and has internal brown rot. At this stage the tree can be retained but will be recommended for removal once a DA is lodged for a house on this subdivided block of land.	Retain.

Tree ID	Common name	Retention value	TPZ radius (m)	SRZ Radius (m)	TPZ Area (sq m)	TPZ Encroachment See Appendix 1A	Discussion/ Conclusion	Recommendation
13	<i>Ligustrum lucidum</i> , Large-leaf privet,	Z3				Nil	Noxious weed species to be removed.	Remove.
14	<i>Eucalyptus saligna</i> , Sydney blue gum	Z5	7.8	2.9	191.1	Nil	Tree is in poor condition with internal decay, a large wound close to ground with multiple bracket fungi. At this stage the tree can be retained but will be recommended for removal once a DA is lodged for a house on this subdivided block of land.	Retain.
15	<i>Eucalyptus saligna</i> , Sydney blue gum	AA	9.6	3.1	289.5	Nil	Tree is located outside of the subdivision development area and must be retained long term with arboriculturally sensitive design due to the trees very high retention value.	Retain.
16	<i>Eucalyptus saligna</i> , Sydney blue gum	AA	9.6	3.1	289.5	Nil	Tree is located outside of the subdivision development area and must be retained long term with arboriculturally sensitive design due to the trees very high retention value.	Retain.
17	<i>Eucalyptus saligna</i> , Sydney blue gum	A1	9.6	3.1	289.5	Nil	Tree is located outside of the subdivision development area and must be retained long term with arboriculturally sensitive design due to the trees very high retention value.	Retain.
18	<i>Eucalyptus saligna</i> , Sydney blue gum	A1	4.8	2.4	72.4	Nil	Tree is located outside of the subdivision development area and must be retained long term with arboriculturally sensitive design due to the trees very high retention value.	Retain.
19	<i>Eucalyptus saligna</i> , Sydney blue gum	A1	4.8	2.4	72.4	Nil	Tree is located outside of the subdivision development area and must be retained long term with arboriculturally sensitive design due to the trees very high retention value.	Retain.

Tree ID	Common name	Retention value	TPZ radius (m)	SRZ Radius (m)	TPZ Area (sq m)	TPZ Encroachment See Appendix 1A	Discussion/ Conclusion	Recommendation
20	<i>Cupressus × leylandii</i> , Leighton green Cypress Pine	Z3				Nil	Tree is an exempt species and can be removed without Council permission if desired.	Exempt tree species.
21	<i>Pyrus calleryana</i> , Callery pear	Z5	3.48	2.2	38	Nil	Tree is in poor condition with a large wound from a codminant trunk failure. At this stage the tree can be retained but will be recommended for removal once a DA is lodged for a house on this subdivided block of land.	Retain.
22	<i>Quercus robur</i> , English oak	Z10	6	2.7	113.1	Nil	Tree is in poor condition with being codominant from 1.5m in height with internal decay. There are structural roots that have been heavily scalped, the internal heartwood as been exposed and fungi is present. At this stage the tree can be retained but will be recommended for removal once a DA is lodged for a house on this subdivided block of land.	Retain.
23	<i>Eucalyptus scoparia</i> , Wallangarra white gum	A2	7.8	2.8	191.1	Nil	Tree is located within the northern neighbours back yard and is in good overall condition. There is no encroachment from proposed plans. The tree should be retained and protected.	Retain.
24	<i>Cupressus sempervirens</i> , Pencil pine x 4	Z3				Nil	Tree is an exempt species and can be removed without Council permission if desired.	Exempt tree species.

8. CONCLUSIONS

8.1 **Table 3:** Summary of the impact to trees during the development;

Impact	Reason	A	Z
Trees to be removed	Building construction, new surfacing and/or proximity, trees in poor condition	T8, T9, T10 (3 trees)	None
Retained trees that will be subject to TPZ encroachment	Removal of existing surfacing/structures and/or installation of new surfacing/structures	T7 (1 tree)	None
Trees to be retained that will not be subject to TPZ encroachment	Space for development	T1, T2, T11, T15, T16, T17, T18, T19, T23 (9 trees)	T12, T14, T21, T22 (4 trees)
Trees requiring further investigation (Root Mapping)	Soil characteristics, topography and level changes within the TPZ	None	None
Exempt trees	Exempt under the Hills Shire Council DCP (No permission required to remove or prune)	None	T3, T4, T5, T6, T13 T20, T24 (7 trees)

9. PHOTOGRAPHS



Image a: T3,

T1,

T2,



Image b: T4



Image c: T5,

T6

T4



Image d: T7



Image e: T10, T9, T8, T11



Image f: T14, T12,



Image g: T12



Image h: T14,



Image h: T18,

T17,

T16,

T15



Image i: T21



Image j: T22



Image K: T23

10. RECOMMENDATIONS

- 10.1 This report assesses the impact of a proposed development at the site on 24 trees located on or close to the site in accordance with AS4970 Protection of trees on development sites (2009).
- 10.2 **Trees numbered T3, T4, T5, T6, T13, T20 and T24 (total of 7 trees),** are all Exempt under the Hills Shire Council DCP (which means that no permission is required to remove or prune these trees).
- 10.3 It is recommended that **Trees numbered T1, T2, T7, T11, T12, T14, T15, T16, T17, T18, T19, T21, T22 and T23 (total of 14 trees) be retained and protected.**
- 10.4 It is recommended that **Trees numbered T8, T9, T10 (total of 3 trees) be approved for removal** to cater for the subdivision development of the right of way driveway.
- 10.5 **TPZ fencing for Trees T7 and T11** (and Arboricultural certification of this) that accurately follows the **Tree Protection Plan** must be carried out prior to attaining the construction certificate. **Only these 2 trees require protecting as part of this subdivision development as all other trees to be retained are well over 10m in distance from this proposed driveway right of way.**
- 10.6 All construction activity is to comply with Australian Standard AS4970 Protection of Trees on Development Sites (2009), sections 7, 11 and 12 of this report.
- 10.7 This report does not provide approval for tree removal or pruning works. All recommendations in this report are subject to approval by the relevant authorities and/or tree owners. This report should be submitted as supporting evidence with any tree removal/pruning or development application.

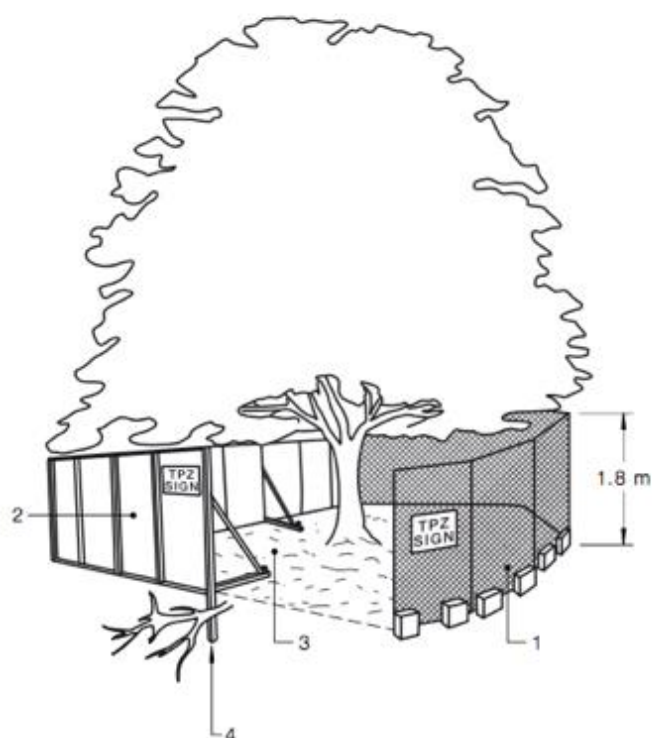
11. ARBORICULTURAL WORK METHOD STATEMENT (AMS) AND TREE PROTECTION REQUIREMENTS

- 11.1 Use of this report:** All contractors must be made aware of the tree protection requirements prior to commencing works at the site and be provided a copy of this report.
- 11.2 Project Arborist:** Prior to any works commencing at the site a project Arborist should be appointed. The project Arborist should be qualified to a minimum AQF level 5 and/or equivalent qualifications and experience and should assist with any development issues relating to trees that may arise. If at any time it is not feasible to carryout works in accordance with this, an alternative must be agreed in writing with the project Arborist.
- 11.3 Tree work:** All tree work must be carried out by a qualified and experienced Arborist with a minimum of AQF level 3 in arboriculture, in accordance with NSW Work Cover Code of Practice for the Amenity Tree Industry (1998) and AS4373 Pruning of amenity trees (2007).
- 11.4 Initial site meeting/on-going regular inspections:** The project Arborist is to hold a pre-construction site meeting with the principle contractor to discuss methods and importance of tree protection measures and resolve any issues in relation to tree protection that may arise. In accordance with AS4970-2009, the project Arborist should carryout regular site inspections to ensure works are carried out in accordance with this document throughout the development process. I recommend regular site inspections on a frequency based on the longevity of the project, this is to be agreed in the initial meeting.
- 11.5 Site Specific Tree Protection Recommendations:**
Table 4: Individual tree protection requirements, see Appendix 1B for locations and further guidance.

Tree Number	Protection specification
T7, T11	- TPZ Fencing

- 11.6 Tree protection Specifications:** It is the responsibility of the principle contractor to install tree protection prior to works commencing at the site (prior to demolition works) and to ensure that the tree protection remains in adequate condition for the duration of the development. The tree protection must not be moved without prior agreement of the project Arborist. The project Arborist must inspect that the tree protection has been installed in accordance with this document and AS4970-2009 prior to works commencing.

- 11.7 **Protective fencing:** Where it is not feasible to install fencing at the specified location due to factors such as restricting access to areas of the site or for constructing new structures, an alternative location and protection specification must be agreed with the project Arborist. Where the installation of fencing is unfeasible due to restrictions on space, trunk and branch protection will be required (see below). The protective fencing must be constructed of 1.8 metre 'cyclone chainmesh fence'. The fencing must only be removed for the landscaping phase and must be authorised by the project Arborist. Any modifications to the fencing locations must be approved by the project Arborist.
- 11.8 **TPZ signage:** Tree protection signage is to be attached to the protective fencing, displayed in a prominent position and the sign repeated at 10 metres intervals or closer where the fence changes direction. Each sign shall contain in a clearly legible form, the following information:
- Tree protection zone/No access.
 - This fence has been installed to prevent damage to the tree/s and their growing environment both above and below ground. Do not move fencing or enter TPZ without the agreement of the project Arborist.
 - The name, address, and telephone number of the developer/builder and project Arborist

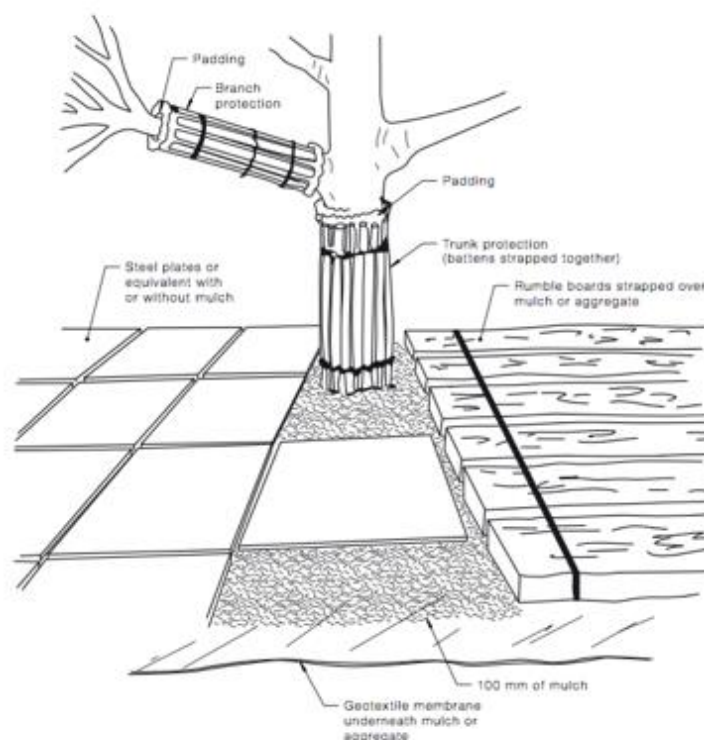


LEGEND:

- 1 Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.
- 2 Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ.
- 3 Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.
- 4 Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

An image from AS4970-2009,⁷ with example tree protection.

⁷ Council of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 16.



NOTES:

- 1 For trunk and branch protection use boards and padding that will prevent damage to bark. Boards are to be strapped to trees, not nailed or screwed.
- 2 Rumble boards should be of a suitable thickness to prevent soil compaction and root damage.

An image from AS4970-2009,⁸ with example tree protection.

11.9 Restricted activities inside TPZ: The following activities must be avoided inside the TPZ of all trees to be retained unless approved by the project Arborist. If at any time these activities cannot be avoided an alternative must be agreed in writing with the project Arborist to minimise the impact to the tree.

- A) Machine excavation.
- B) Ripping or cultivation of soil.
- C) Storage of spoil, soil or any such materials
- D) Preparation of chemicals, including preparation of cement products.
- E) Refueling.
- F) Dumping of waste.
- G) Wash down and cleaning of equipment.
- H) Placement of fill.
- I) Lighting of fires.
- J) Soil level changes.
- K) Any physical damage to the crown, trunk, or root system.
- L) Parking of vehicles.

⁸ Council of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 17.

- 11.10 **Demolition:** The demolition of all existing structures inside or directly adjacent to the TPZ of trees to be retained must be undertaken in consultation with the project Arborist. Any machinery is to work from inside the footprint of the existing structures or outside the TPZ, reaching in to minimise soil disturbance and compaction. If it is not feasible to locate demolition machinery outside the TPZ of trees to be retained, ground protection will be required. The demolition should be undertaken inwards into the footprint of the existing structures, sometimes referred to as the 'top down, pull back' method.
- 11.11 **Excavations and root pruning:** The project Arborist must supervise and certify that all excavations are in accordance with AS4373-2007 and AS4970-2009. For excavations within the TPZ, manual excavation is required along the edge of the structures closest to the subject trees.
- 11.12 **Landscaping:** All landscaping works within the TPZ of trees to be retained are to be undertaken in consultation with a consulting Arborist to minimize the impact to trees. General guidance is provided below to minimise the impact of new landscaping to trees to be retained.
- 11.13 **Sediment and Contamination:** All contamination run off from the development such as but not limited to concrete, sediment and toxic wastes must be prevented from entering the TPZ at all times.
- 11.14 **Tree Wounding/Injury:** Any wounding or injury that occurs to a tree during the construction process will require the project Arborist to be contacted for an assessment of the injury and provide mitigation/remediation advice. It is generally accepted that trees may take many years to decline and eventually die from root damage. All repair work is to be carried out by the project Arborist, at the contractor's expense.
- 11.15 **Completion of Development Works:** After all construction works are complete the project Arborist should assess that the subject trees have been retained in the same condition and vigour. If changes to condition are identified the project Arborist should provide recommendations for remediation.

12. HOLD POINTS

12.1 Hold Points: Below is a sequence of hold points requiring project Arborist certification throughout the development process. It provides a list of hold points that must be checked and certified. All certification must be provided in written format upon completion of the development. The final certification must include details of any instructions for remediation undertaken during the development.

12.2 Hold points applicable to the development have been shaded in grey.

Hold Point	Stage	Responsibility	Certification	Complete Y/N and date
Project Arborist to hold pre construction site meeting with principle contractor to discuss methods and importance of tree protection measures and resolve any issues in relation to feasibility of tree protection requirements that may arise.	Prior to work commencing.	Principle contractor	Project Arborist	
Project Arborist to assess and certify that tree protection has been installed in accordance with section 11 and AS4970-2009 prior to works commencing at site.	Prior to development work commencing.	Principle contractor	Project Arborist	
In accordance with AS4970-2009 the project arborist should carryout regular site inspections to ensure works are carried out in accordance with the recommendations. I recommend site inspections every second month for this site.	Ongoing throughout the development	Principle contractor	Project Arborist	
After all construction works are complete the project Arborist should assess that the subject trees have been retained in the same condition and vigor and authorize the removal of protective fencing. If changes to condition are identified the project Arborist should provide recommendations for remediation.	Upon completion of construction	Principle contractor	Project Arborist	
Any wounding or injury that occurs to a tree during the demolition/construction process will require the project arborist to be contacted for an assessment of the injury and provide mitigation/remediation advice. All remediation work is to be carried out by the project arborist, at the contractor's expense.	Ongoing throughout the development	Principle contractor	Project Arborist	

13. BIBLIOGRAPHY/REFERENCES

- Council of Standards Australia, *AS4970 Protection of trees on development sites* (2009).
- Mattheck, C. & Breloer, H., *The body language of trees - A handbook for failure analysis*, The Stationary Office, London, England (1994).
- Barrell Tree Consultancy, *SULE: Its use and status into the New Millennium*, TreeAZ/03/2001, <http://www.treeaz.com/>.
- Barrell Tree Consultancy, *Tree AZ version 10.10-ANZ*, <http://www.treeaz.com/>. Property.
- State Environmental Planning Policy (Vegetation in Non-Rural Areas 2017).

14. LIST OF APPENDICES

The following are included in the appendices:

- Appendix 1 - Existing Site Plan
- Appendix 1A – Proposed Site Plan and Tree Protection Plan
- Appendix 2 - Tree Inspection schedule
- Appendix 3 - Tree Health
- Appendix 4 – Tree Protection Zone
- Appendix 5 – Structural Root Zone
- Appendix 6 – Amenity Value
- Appendix 7 – Age Class
- Appendix 8 – Structural Condition
- Appendix 9 – SULE Categories
- Appendix 10 – Trees AZ

APPENDIX 1 - SITE PLAN

Tree Location Plan

(Seasoned Tree Consulting 19/07/2022)

Legend

Tree Number **T1**

No tree here X

18/5/5/5/5 - TREE 5m Radius Spread / 0.5m Dia Trunk / 15m High
W1: WINDOW TOP
W2: WINDOW SILL
RL: REDUCED LEVEL
FLR: FLOOR LEVEL
AWN: AWNING
LP: LAMP POLE
PP: POWER POLE
SV: STOP VALVE
WW: WATER WHEEL
ELP: ELECTRICITY LIGHT POLE
GAS: GAS METER
GASV: GAS VALVE
GUT: TOP OF GUTTER
PARA: PARAPET
HYD: HYDRANT
SLN: SUNKEN LAMP WHEEL
SPN: SUNKEN HAMMOLE
GRIT: GRATED PIT
TPT: TELECOMMUNICATION PIT
SERV: SERVICE HOIST
BRET: BOTTOM OF RETAINING WALL
TRET: TOP OF RETAINING WALL

----- APPROXIMATE BOUNDARY POSITION ONLY.

[illegible]

CLIENT:
Mark Mina
85 Grose Street
Parramatta NSW 2150

Revisions:				LOT A	SECTION -	SURVEYOR	DRYIN BY:	CHKD BY:
ISSUE	DATE	AMENDMENT	BY	LO#		P.N.	S.S.	P.N.
A	01/12/2011	Preliminary Drawing Issued	P.N.	DP 356163	TITLE: A/356163	DATE OF SURVEY: 29/11/2011		
B	07/12/2011	Revised Drawing Issued	P.N.		L.G.A: THE HILLS SHIRE	LEVEL DATUM AND ORIGIN:		
C					PARISH: FIELD OF MARS	ORIGIN RL: SOURCE: SCMS -		
D					COUNTY: CLIMBERG AND	CONTROLLER INTERVAL: 0.5m		

PLAN OF DETAIL AND LEVELS Lot A in DP 358163 No's. 30 - 32 Telfer Road, Castle Hill, NSW 2154			
ORIENTATION: M.G.A. (see note)		SCALE: 1:200 @A1	SCALE:

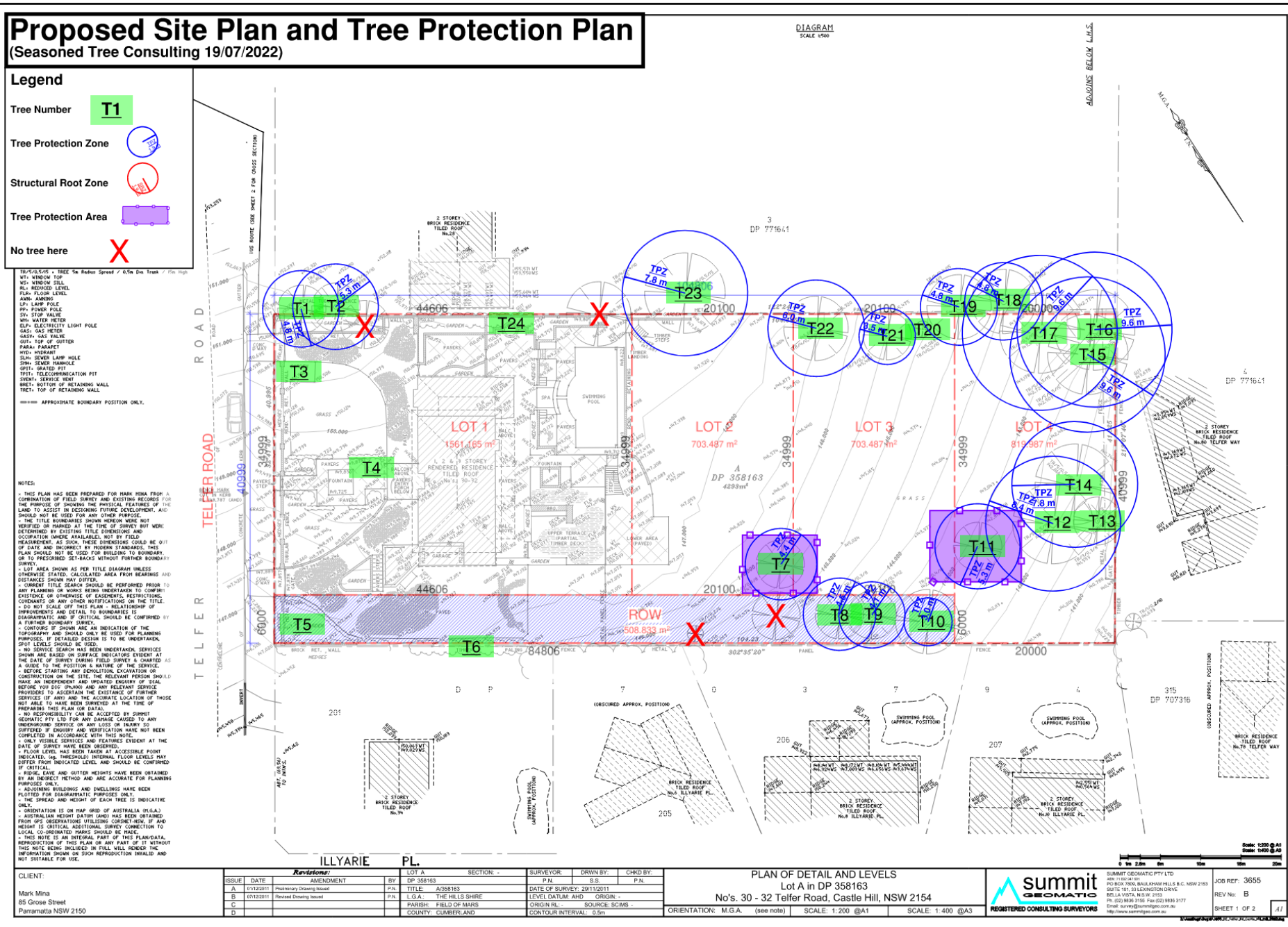


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 BELLA VISTA, N.S.W. 2153
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 Email: survey@summitgeo.com.au
<http://www.summitgeo.com.au>

JOB REF: 3655
REV No: B
SHEET 1 OF 2

APPENDIX 1A – PROPOSED SITE PLAN AND TREE PROTECTION PLAN



APPENDIX 2- TREE INSPECTION SCHEDULE

Tree Inspection Site: 30 - 32 Telfer Road, Castle Hill

Surveyed by: David Gowenlock

Date of Inspection: 14.07.2022

Tagged: No

Tree ID	Tree Species	DBH (CM)	TPZ radius (M)	TPZ Area (Sq.M)	DAB (CM)	SRZ radius (M)	Height (M)	Spread (M)	Age Class	Health	Structure	Amenity value	SULE (yrs.)	TreeAZ retention Value	Comments
1	<i>Agonis flexuosa</i> , West Australian Peppermint	40	4.8	72.4	45	2.4	9	10	Mature	Good	Good	Medium	15 > 40	A1	
2	<i>Melaleuca linariifolia</i> , Snow-in-summer	40*19 (=44)	5.28	87.6	45	2.4	10	6	Mature	Good	Good	Medium	15 > 40	A2	
3	<i>Cupressus sempervirens</i> , Pencil pine x many													Z3	Exempt
4	4 x hedged <i>Ficus</i> topiary													Z3	Exempt
5	<i>Jacaranda mimosifolia</i> , Jacaranda													Z3	Basal coppicing/ shoots from cut stump in ground
6	<i>Cupressus</i> × <i>leylandii</i> , Leighton green Cypress Pine (Many hedge species)	20	2.4	18.1	25	1.8	5	3	Semi-mature	Fair	Good	Medium	15 > 40	Z3	Hedged- some are browning off
7	<i>Fraxinus sp.</i> , Ash	25*27	4.44	61.9	40	2.3	8	11	Mature	Good	Good	Medium	15 > 40	A2	Separates stems from ground level
8	<i>Nyssa sylvatica</i> , Black Tupelo	38	4.56	65.3	46	2.4	15	10	Mature	Good	Good	High	>40	A1	
9	<i>Fraxinus sp.</i> , Ash	34	4.08	52.3	47	2.4	12	10	Mature	Good	Good	High	15 > 40	A1	
10	<i>Lagerstroemia indica</i> , Crepe myrtle	25	3	28.3	25	1.8	4	3	Mature	Good	Good	Low	15 > 40	A2	Multistem from ground level
11	<i>Ulmus parvifolia</i> , Chinese elm	19*23*21*24 (=44)	5.28	87.6	44	2.3	10	15	Mature	Good	Good	Medium	>40	A1	
12	<i>Eucalyptus saligna</i> , Sydney blue gum	70	8.4	221.7	80	3	18	14	Mature	Good	Poor / fair	High	<5	Z5	Multiple bracket fungi, secondary leader has failed years ago. Internal brown rot, Epicormics
13	<i>Ligustrum lucidum</i> , Large-leaf privet,													Z3	Exempt- weed species
14	<i>Eucalyptus saligna</i> , Sydney blue gum	65	7.8	191.1	75	2.9	18	11	Mature	Good	Poor / fair	High	5 > 15	Z5	Internal decay; large wound close to ground with multiple bracket fungis
15	<i>Eucalyptus saligna</i> , Sydney blue gum	80	9.6	289.5	85	3.1	25	18	Mature	Good	Good	Very high	>40	AA	Hard to assess, very dense vegetation here

Tree ID	Tree Species	DBH (CM)	TPZ radius (M)	TPZ Area (Sq.M)	DAB (CM)	SRZ radius (M)	Height (M)	Spread (M)	Age Class	Health	Structure	Amenity value	SULE (yrs.)	TreeAZ retention Value	Comments
16	<i>Eucalyptus saligna</i> , Sydney blue gum	80	9.6	289.5	85	3.1	25	18	Mature	Good	Good	Very high	>40	AA	Hard to assess, very dense vegetation here
17	<i>Eucalyptus saligna</i> , Sydney blue gum	80	9.6	289.5	85	3.1	25	18	Mature	Good	Good	Very high	>40	A1	
18	<i>Eucalyptus saligna</i> , Sydney blue gum	40	4.8	72.4	45	2.4	20	9	Mature	Good	Good	High	>40	A1	
19	<i>Eucalyptus saligna</i> , Sydney blue gum	40	4.8	72.4	45	2.4	20	11	Mature	Good	Good	High	>40	A1	
20	<i>Cupressus × leylandii</i> , Leighton green Cypress Pine													Z3	Exempt
21	<i>Pyrus calleryana</i> , Callery pear	22*19 (=29)	3.48	38	36	2.2	7	5	Mature	Good	Poor	Medium	<5	Z5	Large failure close to ground, hollow
22	<i>Quercus robur</i> , English oak	32*39 (=50)	6	113.1	61	2.7	10	8	Mature	Fair	Fair	Medium	5 > 15	Z10	Codominant from 1.5m, with internal decay. Structural roots scalped, heartwood exposed and fungi present see photos in poor condition
23	<i>Eucalyptus scoparia</i> , Wallangarra white gum	65	7.8	191.1	70	2.8	15	16	Mature	Good	Fair	High	5 > 15	A2	Large trunk wound at 6m
24	<i>Cupressus sempervirens</i> , Pencil pine x 4													Z3	Exempt

Explanatory Notes

Tree Species - Botanical name followed by common name in brackets. Where species is unknown it is indicated with an 'spp'.

Diameter at Breast Height (DBH) - Measured with a DBH tape or estimated at approximately 1.4m above ground level. If trees are inaccessible due to dense bush or being located in private property they are generally estimated.

Tree Protection Zone (TPZ) - DBH x 12. Measured in radius from the center of the trunk. Rounded to nearest 0.1m. For monocots, the TPZ is set at 1 meter outside the crown projection.

TPZ Area (Sq.M) - The area of the TPZ calculated in square metres.

Diameter Above root Buttresses (DAB): Measured with a DBH tape or estimated above root buttresses (DAB) for calculating the SRZ.

Structural Root Zone (SRZ) - $(DAB \times 50)^{0.42} \times 0.64$. Measured in radius from the center of the trunk. Rounded up to nearest 0.1m.

Height - Height from ground level to top of crown. All heights are estimated unless otherwise indicated.

Spread - Radius of crown at widest section. All tree spreads are estimated unless otherwise indicated.

Age Class - Over mature (OM), Mature (M), Early mature (EM), Semi mature (SM), Young (Y), Dead (D).

Health - Good/Fair/Poor/Dead

Structure - Good/Fair/Poor

Amenity Value - Very High/High/Medium/Low/Very Low.

Safe Useful Life Expectancy (SULE) - 1. Long >40 (40+years), 2. Medium 15 > 40 (15 - 40 years), 3. Short 5 > 15 (5 - 15 years), 4. Remove <5 (under 5 years)

TreeAZ retention Value - See Appendix 10

Appendix 3 – Condition/Overall health

Category	Example condition	Summary
Good	• Crown has good foliage density for species. • Tree shows no or minimal signs of pathogens that are unlikely to have an effect on the health of the tree. • Tree is displaying good vigour and reactive growth development. • Branch unions appear to be strong with no sign of defects. • There are no significant cavities. • The tree is unlikely to fail in usual conditions. • The tree has a balanced crown shape and form.	• The tree is in above average health and condition and no remedial works are required. • The tree is considered structurally good with well developed form.
Fair	• The tree may be starting to dieback or have over 25% deadwood. • Tree may have slightly reduced crown density or thinning. • There may be some discolouration of foliage. • Average reactive growth development. • There may be early signs of pathogens which may further deteriorate the health of the tree. • There may be epicormic growth indicating increased levels of stress within the tree. • The tree may have minor structural defects within the structure of the crown that could potentially develop into more significant defects. • The tree may have a cavity that is currently unlikely to fail but may deteriorate in the future. • The tree is an unbalanced shape or leans significantly. • The tree may have minor damage to its roots. • The root plate may have moved in the past but the tree has now compensated for this. • Branches may be rubbing or crossing.	• The tree is in below average health and condition and may require remedial works to improve the trees health. • The identified defects are unlikely cause major failure. • Some branch failure may occur in usual conditions. • Remedial works can be undertaken to alleviate potential defects.
Poor	• The tree may be in decline, have extensive dieback or have over 30% deadwood. • The canopy may be sparse or the leaves may be unusually small for species. • Pathogens or pests are having a significant detrimental effect on the tree health. • The tree has significant structural defects. • Branch unions may be poor or weak. • The tree may have a cavity or cavities with excessive levels of decay that could cause catastrophic failure. • The tree may have root damage or is displaying signs of recent movement. • The tree crown may have poor weight distribution which could cause failure.	• The tree is displaying low levels of health and removal or remedial works may be required. • The identified defects are likely to cause either partial or whole failure of the tree.
Dangerous	• The tree is dead or almost dead. • The tree is an imminent danger to people or property.	• The tree should generally be removed.

Appendix 4 - Tree Protection Zone (TPZ)

The tree protection zone (TPZ) is the principle means of protecting trees on development sites. The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable. The TPZ incorporates the structural root zone (SRZ).

Determining the TPZ

The radius of the TPZ is calculated for each tree by multiplying its DBH $\times$ 12.

$$\text{TPZ} = \text{DBH} \times 12$$

Where

DBH = trunk diameter measured at 1.4 m above ground

Radius is measured from the centre of the stem at ground level.

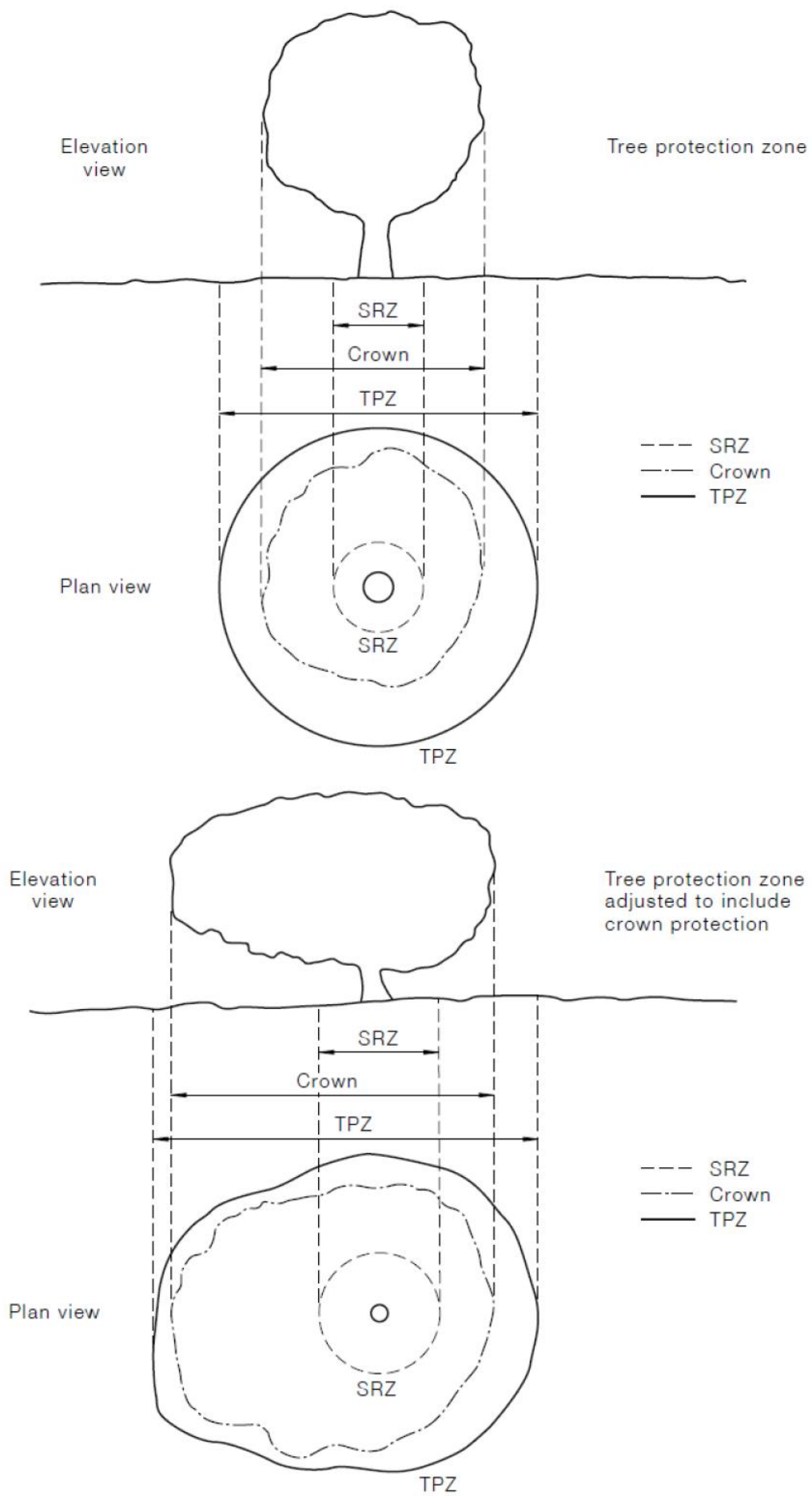
A TPZ should not be less than 2 m nor greater than 15 m (except where crown protection is required).

Minor encroachment into the TPZ

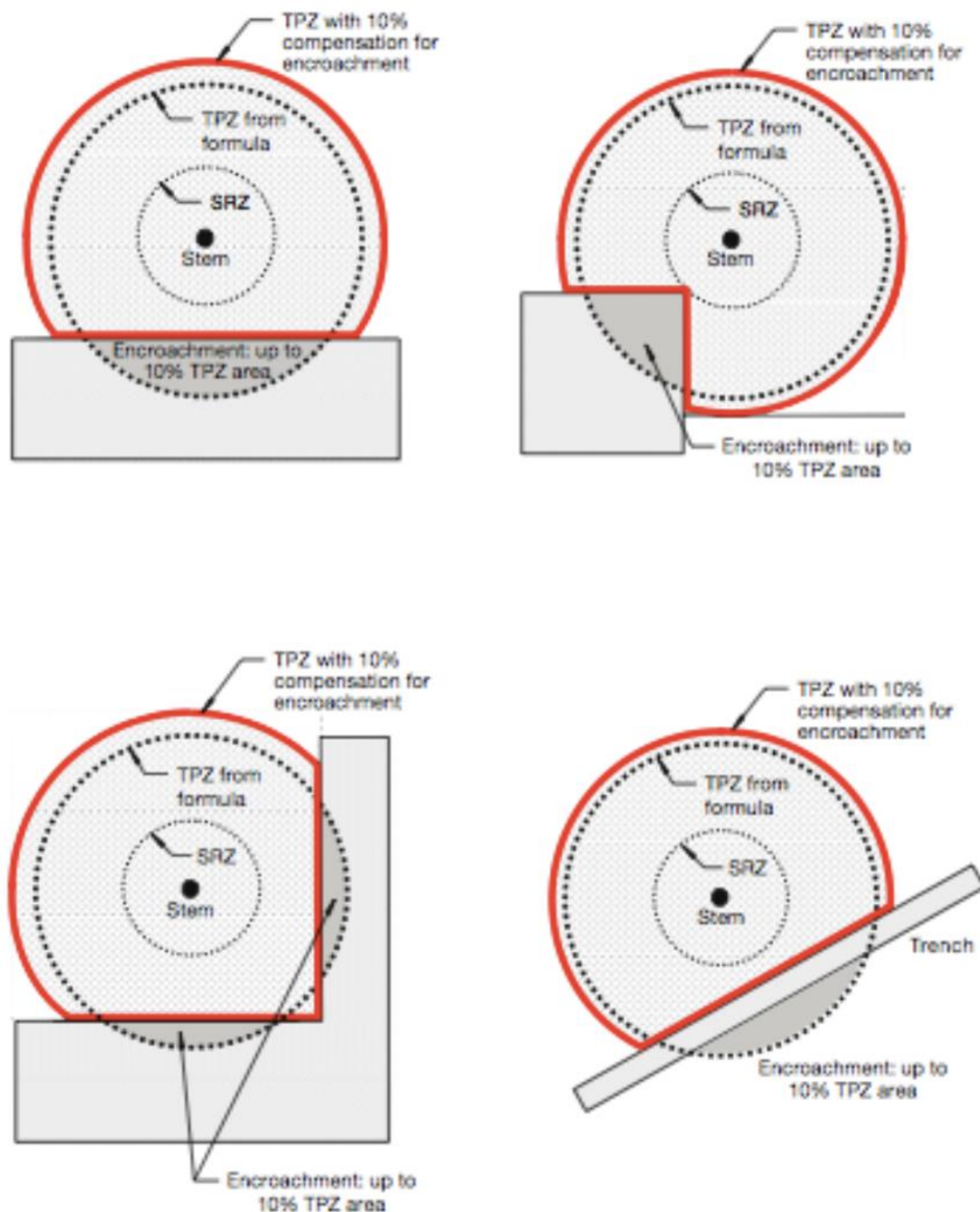
Where encroachment into the TPZ is unavoidable it is generally accepted that encroachment of under 10% of the total TPZ is possible without carrying out detailed root investigations. This minor loss of root area is normally compensated by the roots developing elsewhere.

Major encroachment into the TPZ

If an encroachment of more than 10% is proposed into the TPZ it would be necessary to demonstrate that the tree would remain viable. Non destructive root investigations may be required to determine any potential impact the encroachment may have on the tree.



Encroachment into the tree protection zone (TPZ) is sometimes unavoidable. Figure D1 provides examples of TPZ encroachment by area, to assist in reducing the impact of such incursions.



NOTE: Less than 10% TPZ area and outside SRZ. Any loss of TPZ compensated for elsewhere.

Appendix 5 - Structural root zone (SRZ)

This is the area around the base of a tree required for the trees stability in the ground. An area larger than the SRZ always need to be maintained to preserve a viable tree as it will only have a minor effect on the trees vigour and health. There are several factors that determine the SRZ which include height, crown area, soil type and soil moisture. It can also be influenced by other factors such as natural or built structures. Generally work within the SRZ should be avoided.

Determining the SRZ

An indicative SRZ radius can be determined from the diameter of the trunk measured immediately above the root buttresses. Root investigation could provide more information about the extent of the SRZ. The following formula should be used to calculate the SRZ.

$$\text{SRZ radius} = (D \times 50)^{0.42} \times 0.64$$

where

D = trunk diameter in m, measured above the root buttress.

Note - The SRZ for trees with trunk diameters less than 0.15 will be 1.5m.

Appendix 6 - Amenity value

To determine the amenity value of a tree we assess a number of different factors which include but are not limited to the information below.

- The visibility of the tree to adjacent sites.
- The relationship between the tree and the site.
- Whether the tree is protected by any statutory conditions.
- The habitat value of the tree.
- Whether the tree is considered a noxious weed species.

Appendix 7 - Age class

If can be difficult to determine the age of a tree without carrying out invasive tests that may damage the tree, so we have categorised there likely age class which is defined below.

<u>Category</u>	<u>Description</u>
Young/Newly planted	• Young or recently planted tree.
Semi Mature	• Up to 20% of the usual life expectancy for the species.
Early mature/Mature	• Between 20% - 80% of the usual life expectancy for the species.
Over mature	• Over 80% of the usual life expectancy for the species.
Dead	• Tree is dead or almost dead.

Appendix 8 - Structural condition

<u>Category</u>	<u>Example condition</u>	<u>Summary</u>
Good	• Branch unions appear to be strong with no sign of defects. • There are no significant cavities. • The tree is unlikely to fail in usual conditions. • The tree has a balanced crown shape and form.	• The tree is considered structurally good with well developed form.
Fair	• The tree may have minor structural defects within the structure of the crown that could potentially develop into more significant defects. • The tree may have a cavity that is currently unlikely to fail but may deteriorate in the future. • The tree is an unbalanced shape or leans significantly. • The tree may have minor damage to its roots. • The root plate may have moved in the past but the tree has now compensated for this. • Branches may be rubbing or crossing.	• The identified defects are unlikely cause major failure. • Some branch failure may occur in usual conditions. • Remedial works can be undertaken to alleviate potential defects.
Poor	• The tree has significant structural defects. • Branch unions may be poor or weak. • The tree may have a cavity or cavities with excessive levels of decay that could cause catastrophic failure. • The tree may have root damage or is displaying signs of recent movement. • The tree crown may have poor weight distribution which could cause failure.	• The identified defects are likely to cause either partial or whole failure of the tree.

Appendix 9 - Safe Useful Life Expectancy (SULE), (Barrel, 2001)

A trees safe useful life expectancy is determined by assessing a number of different factors including the health and vitality, estimated age in relation to expected life expectancy for the species, structural defects, and remedial works that could allow retention in the existing situation.

Category	Description
1. Long - Over 40 years	(a) Structurally sound trees located in positions that can accommodate future growth. (b) Trees that could be made suitable for retention in the long term by remedial tree care. (c) Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long term retention.
2. Medium - 15 to 40 years	(a) Trees that may only live between 15 and 40 more years. (b) Trees that could live for more than 40 years but may be removed for safety or nuisance reasons. (c) Trees that could live for more than 40 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (d) Trees that could be made suitable for retention in the medium term by remedial tree care.
3. Short - 5 to 15 years	(a) Trees that may only live between 5 and 15 more years. (b) Trees that could live for more than 15 years but may be removed for safety or nuisance reasons. (c) Trees that could live for more than 15 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (d) Trees that require substantial remedial tree care and are only suitable for retention in the short term.
4. Remove - Under 5 years	(a) Dead, dying, suppressed or declining trees because of disease or inhospitable conditions. (b) Dangerous trees because of instability or recent loss of adjacent trees. (c) Dangerous trees because of structural defects including cavities, decay, included bark, wounds or poor form. (d) Damaged trees that are clearly not safe to retain. (e) Trees that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (f) Trees that are damaging or may cause damage to existing structures within 5 years. (g) Trees that will become dangerous after removal of other trees for the reasons given in (a) to (f). (h) Trees in categories (a) to (g) that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review.
5. Small/Young	(a) Small trees less than 5m in height. (b) Young trees less than 15 years old but over 5m in height. (c) Formal hedges and trees intended for regular pruning to artificially control growth.

Appendix 10- TreeAZ Categories

TreeAZ Categories (Version 10.04-ANZ)

CAUTION: TreeAZ assessments must be carried out by a competent person qualified and experienced in arboriculture. The following category descriptions are designed to be a brief field reference and are not intended to be self-explanatory. They must be read in conjunction with the most current explanations published at www.TreeAZ.com.

Category Z: Unimportant trees not worthy of being a material constraint

Local policy exemptions: Trees that are unsuitable for legal protection for local policy reasons including size, proximity and species

Z1	Young or insignificant small trees, i.e. below the local size threshold for legal protection, etc
Z2	Too close to a building, i.e. exempt from legal protection because of proximity, etc
Z3	Species that cannot be protected for other reasons, i.e. scheduled noxious weeds, out of character in a setting of acknowledged importance, etc

High risk of death or failure: Trees that are likely to be removed within 10 years because of acute health issues or severe structural failure

Z4	Dead, dying, diseased or declining
Z5	Severe damage and/or structural defects where a high risk of failure <u>cannot</u> be satisfactorily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, overgrown and vulnerable to adverse weather conditions, etc
Z6	Instability, i.e. poor anchorage, increased exposure, etc

Excessive nuisance: Trees that are likely to be removed within 10 years because of unacceptable impact on people

Z7	Excessive, severe and intolerable inconvenience to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. dominance, debris, interference, etc
Z8	Excessive, severe and intolerable damage to property to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. severe structural damage to surfacing and buildings, etc

Good management: Trees that are likely to be removed within 10 years through responsible management of the tree population

Z9	Severe damage and/or structural defects where a high risk of failure can be <u>temporarily</u> reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, vulnerable to adverse weather conditions, etc
Z10	Poor condition or location with a low potential for recovery or improvement, i.e. dominated by adjacent trees or buildings, poor architectural framework, etc
Z11	Removal would benefit better adjacent trees, i.e. relieve physical interference, suppression, etc
Z12	Unacceptably expensive to retain, i.e. severe defects requiring excessive levels of maintenance, etc

NOTE: Z trees with a high risk of death/failure (Z4, Z5 & Z6) or causing severe inconvenience (Z7 & Z8) at the time of assessment and need an urgent risk assessment can be designated as ZZ. ZZ trees are likely to be unsuitable for retention and at the bottom of the categorization hierarchy. In contrast, although Z trees are not worthy of influencing new designs, urgent removal is not essential and they could be retained in the short term, if appropriate.

Category A: Important trees suitable for retention for more than 10 years and worthy of being a material constraint

A1	No significant defects and could be retained with minimal remedial care
A2	Minor defects that could be addressed by remedial care and/or work to adjacent trees
A3	Special significance for historical, cultural, commemorative or rarity reasons that would warrant extraordinary efforts to retain for more than 10 years
A4	Trees that may be worthy of legal protection for ecological reasons (Advisory requiring specialist assessment)

NOTE: Category A1 trees that are already large and exceptional, or have the potential to become so with minimal maintenance, can be designated as AA at the discretion of the assessor. Although all A and AA trees are sufficiently important to be material constraints, AA trees are at the top of the categorization hierarchy and should be given the most weight in any selection process.