

7. FLOOD HAZARD

Floodplain modeling by the RTA, allowing for afflux from the new bridge over the Pambula River, derived a peak 1% flood level upstream of the bridge between 4.41 metres and 4.63 metres AHD, with flood levels varying slightly between locations on the floodplain. The average 1% level is 4.52 metres AHD.

Council has adopted a peak 1% flood level at Pambula of 4.5 metres AHD. Maps accompanying draft LEP 2010 show the extent of flooding with 0.5 metres freeboard above this level, adopting a current flood planning level for future residential development of **5.0 metres AHD**.

These levels make no allowance for climate change factors such as increases in rainfall intensity and sea level rise. No modeling of these factors has been carried out, yet land rezoning should incorporate allowances to the year 2100.

A NSW Government Policy Statement specifies High Range sea level planning benchmarks for the NSW coastline. These benchmarks are an increase above 1990 mean sea levels of 40 centimetres by 2050 and 90 centimetres by 2100. The *Coastal Risk Management Guide (NSW Government, 2010)* provides further detail. It is noted that these benchmarks are now under review by the state government.

Sea level rise would be expected to be all but negated by friction losses in the long entrance channel leading to the lake. Residual sea level rise increases would be expected to be absorbed by Pambula Lake. A small allowance of 0.1 metres at Pambula Bridge would conservatively allow for sea level rise to the year 2100.

Flood levels at Pambula Bridge would increase due to increased rainfall intensity. No data is available on catchments the size of Pambula River to estimate the magnitude of increase. Modelling the Shoalhaven River under future rainfall intensity shows an additional climate-change allowance for the lower Shoalhaven of 0.4 metres. In the absence of better data, we would propose to adopt an identical allowance of 0.4 metres for the Pambula River at the bridge.

In summary, a conservative estimate of future (nominally the year 2100) 1% flood level for the investigation area would add a total of 0.5 metres to current peak 1% flood levels. The future peak 1% (nominally the year 2100) flood level at Pambula Bridge would therefore be 5.0 metres AHD. Addition to this level of a standard 0.5 metre freeboard allowance is required for a future flood planning level of **5.5 metres AHD**. The extent of flooding at 5.0 metres AHD is shown in Figure 7.1.

In order to refine this flood level estimate, a flood study incorporating both sea level rise and increased rainfall intensity factors is recommended to be prepared for the investigation area at the time of rezoning.

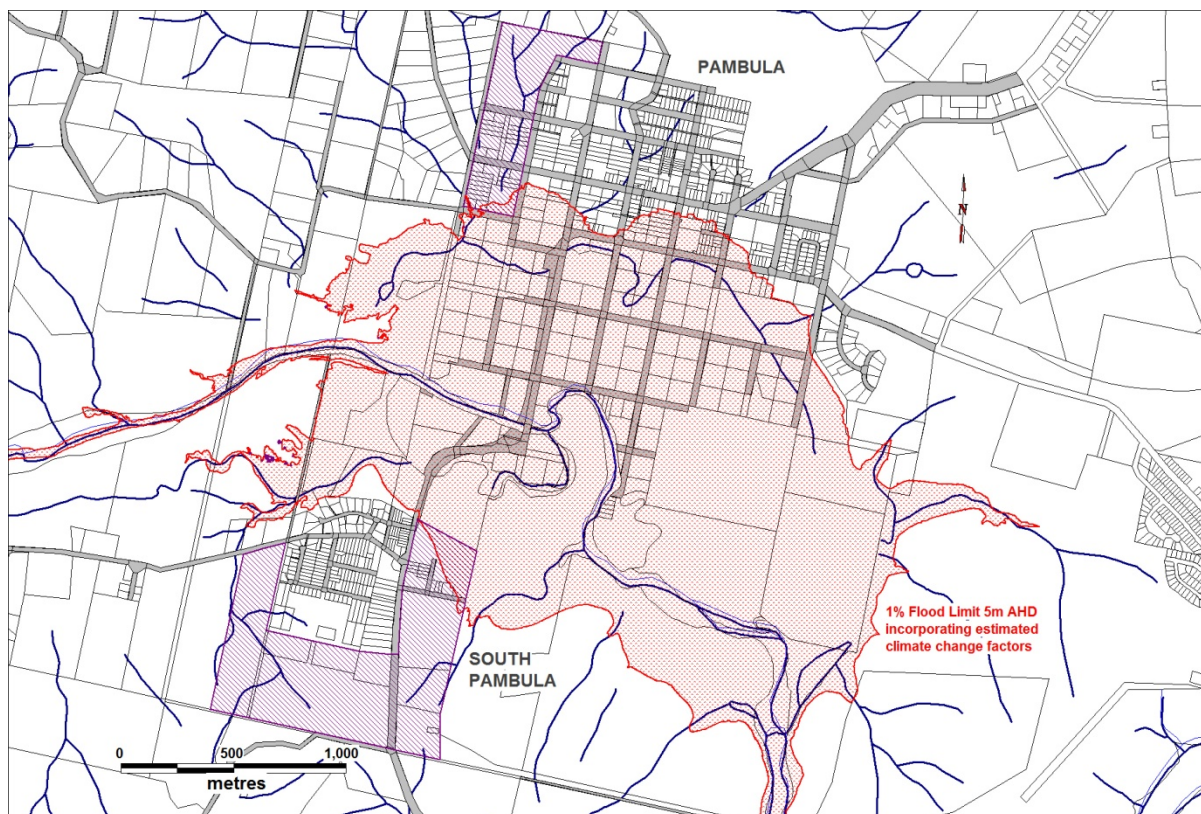


Figure 7.1: 1% flood extent at 5 metres AHD

8. BUSH FIRE HAZARD

The Rural Fires and Environmental Assessment Legislation Amendment Act 2002 (Amendment Act) amended both the Environmental Planning and Assessment Act 1979 and the Rural Fires Act 1997 to require councils to map bush fire prone land within their local government area. This becomes the basis for planning for bush fire protection

A *Bushfire Prone Area* is an area that can support a bushfire or is likely to be subject to bushfire attack. The guideline Bush Fire Prone Land Mapping (version 3 issued on 28 June 2006) provides the details for mapping bush fire prone land to be used by both the NSW Rural Fire Service and councils. Bush Fire Prone Land Maps act as a trigger mechanism for development of land within bushfire prone areas to ensure where appropriate the bush fire safety provisions are incorporated into the development.

Section 100B of the *Rural Fires Act 1997* provides the Commissioner an ability to issue a bush fire safety authority for residential or rural residential subdivision or for special fire protection purpose developments of bush fire prone land where the Commissioner believes that the development complies with standards which provide the development with appropriate protection measures. For the purposes of the Building Code of Australia (BCA), designated bush fire prone land maps are also used to give effect to Australian Standard AS 3959 – 1999 Construction in Bush Fire Prone Areas.

The Bush Fire Prone Land Map requires the generation of a spatial dataset consisting of a bush fire vegetation and buffer dataset as one layer. The bush fire vegetation data is derived from vegetation classification. Vegetation is divided into 3 groups as per the Planning for Bush Fire Protection document and appropriate buffering is then applied to produce the bush fire prone land map.

The methodology for the determination of bush fire vegetation buffering is as follows:

- Bush Fire Vegetation Category 1 – apply a 100 metre external buffer to each vegetation polygon
- Bush Fire Vegetation Category 2 – apply a 30 metre external buffer to each vegetation polygon

The Bega Valley bush fire prone land shows bush fire vegetation categories. Buffers are shown on a separate GIS layer. The bush fire prone land map excludes the majority of the urban area of Pambula. In the case of the investigation area, the bulk of the land is category 1 with only the area to at the southern end of the investigation area and bounded by Bega, Toallo and Rainbow Streets and Oaklands Road being category 2. However, most of this category 2 land is developed and occupied other than the large parcel in the south eastern corner. Lots fronting Bega Street within the block bounded by Bega, Toallo, Rainbow and Oregon Streets is shown as not being bushfire prone.

The existing urban area of South Pambula is shown as Category 2 as mapping is based primarily upon zoning (South Pambula is currently zoned rural). Within the investigation area,

all land east of the Princes Highway is category 2, as are areas of land at the south eastern corner of the land west of the highway and fronting Mount Darragh Road at the north western corner.

It is considered prudent to discount land shown as category 1 as developable land. The application of a 100 metre buffer to existing vegetation would cause significant impacts on any ecological values and compromise visual qualities. The application of the 30 metre buffer to category 2 land may be accommodated as permitter roads to provide adequate separation from the more significant bush fire hazard.

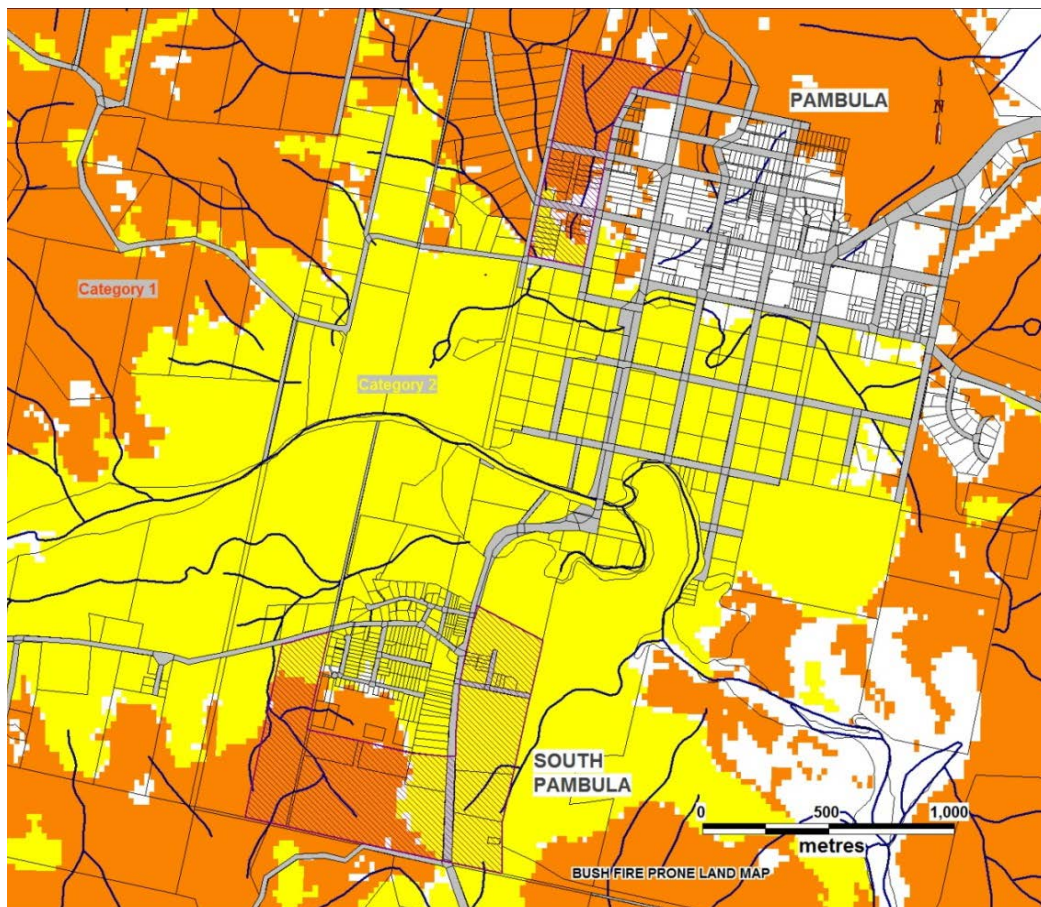


Figure 8.1: Bushfire Prone Land mapping: Source: Bega Valley Shire Council

Certain planning objectives apply to development on bush fire prone land. These objectives will need to be addressed in the preparation of concept subdivision design for the land deemed to be developable in this review. Relevant objectives are:

- Minimise perimeters of the subdivision that is exposed to bush fire hazard and ensure clear and ready access from all properties to the public road system,
- Minimise bushland corridors that permit the passage of fire,
- Provide for the siting of dwellings away from ridge tops and steep slopes, and

- Enable adequate separation distances, or asset protection zones, between the hazard and future dwellings.

In relation to determining appropriate APZs, Bega Valley Shire has a Fire Danger Index of 100 (assumed a 1 in 50 year event) and the vegetation type is classified as 'forest' being dry sclerophyll forest. An APZ of 25 metres would be required in the direction of any adjoining vegetation where slopes are 0 to 5 degrees and 35 metres for slopes of between 5 and 10 degrees. Development should be limited to less than 10 degrees (17%) in order to minimise earthworks and maximise affordability.

9. LANDSCAPE CONSTRAINTS

Soil and terrain properties have an important bearing on the performance and sustainability of development, particularly development related to intensification of land use. This report utilises Soils Landscape mapping and interpretation contained in a consultancy project by SLCC (*Compilation and Interpretation of Soil Survey Data for Bega Valley Shire December 2000*). This provided a GIS compatible interpretation of data presented as derivative maps for various applications, including those utilised for this project:

- soil erodibility (expressed as soil regolith stability),
- footing class, and
- building capability.

9.1 Soil landscapes

Soil Landscapes vary across the investigation area, with the following four broad categories evident:

1. The Pambula Investigation area comprises the Yellow Pinch soils landscape, similar to much of the Pambula urban area. This landscape comprises a sedimentary geology with gravely sandy soils over sandy clays. Some 45% of this landscape is typically very stony steep sideslopes. Urban development of the northern shoreline of Merimbula Lake within the past decade resulted in highly erodible Yellow Pinch soils discharging into the lake when sediment controls failed. Small areas in the extreme southern part of the investigation area grade to the Jellat Jellat Flat and Millingandi landscapes based on alluvial soils.
2. At South Pambula, the area east of the highway is quite distinct, mapped as the Bald Hills landscape. This comprises mostly basalt soils interbedded with rhyolite and sediments and is notably formed with dark structured chocolate soils on broad crests and gentle sideslopes.
3. West of the highway and north of Summerhill Road a large area of the Bournda soils landscape extends north into much of the existing South Pambula urban area. This comprises shallow sandy loam topsoil over medium to heavy clay with scattered rock outcrops. Rhyolite is the dominant base geology. It is also mapped as a narrow band extending east across the highway into the Bald Hills landscape.
4. The Mount Darragh Road part of the South Pambula investigation area is mapped as a Quondolo soils landscape, merging with the Bournda landscape further south. The Quondolo landscape comprises sandy Tertiary sediments with gently undulating low hills. Topsoils are typically well-drained sandy soils with some surface gravels, with a sandy clay loam subsoil.

The classification of soil landscapes is mapped at the relatively broad scale of 1:100,000. The information is useful for strategic planning purposes to determine broad landscape attributes, and should not be used as an indication of soil type on individual lots. Soils Landscapes are mapped in Figures 9.1 and 9.2 below.

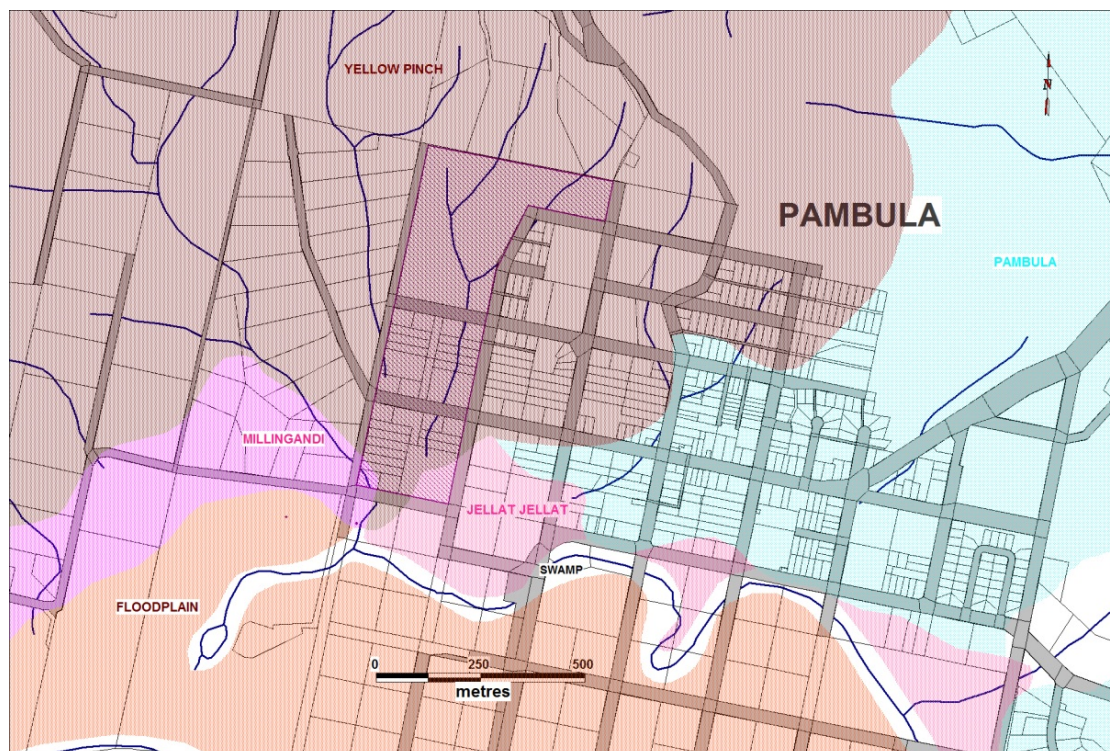


Figure 9.1: Soil landscapes, Pambula

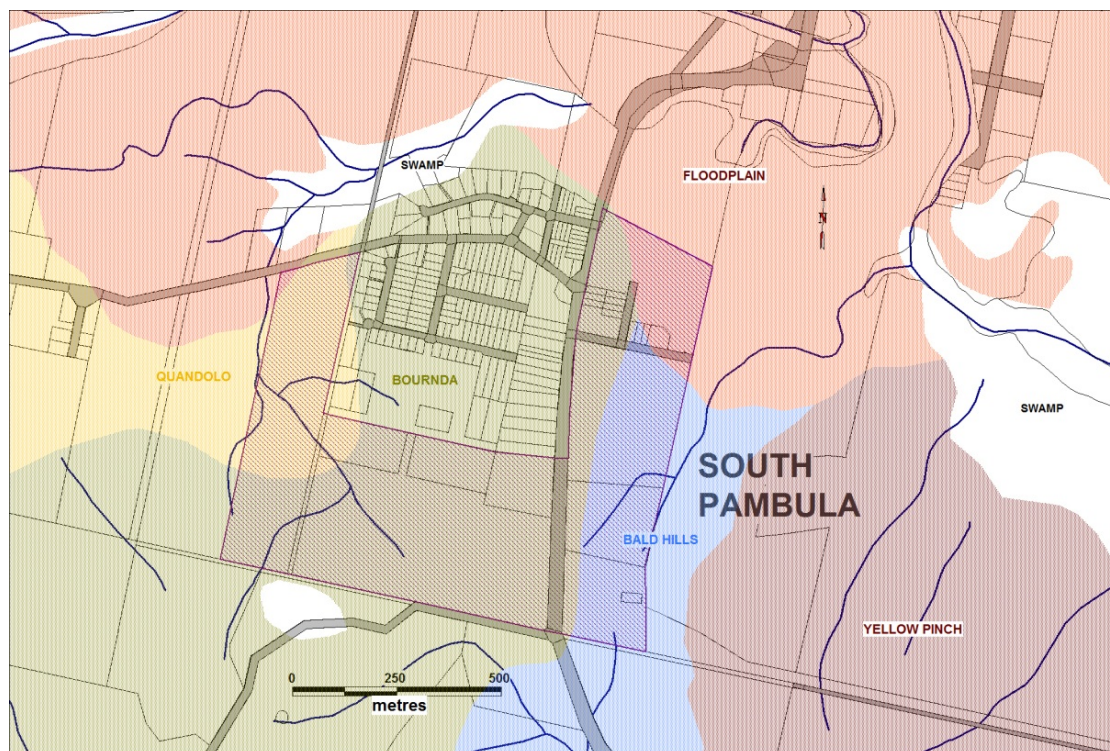


Figure 9.2: Soil landscapes, South Pambula

9.2 Regolith stability

Soil regolith stability ratings indicate the combined erodibility and sediment delivery hazard of a particular soil type as follows:

- Class R1 - low sediment delivery and high coherence soil regolith, represents stable soils.
- Class R2 - low sediment delivery and low coherence soil regolith, includes materials which are sandy and weakly structured throughout. Sediment transport only occurs over relatively short distances and most sediment is retained near-source and not delivered to drainage lines.
- Class R3 - high sediment delivery and high coherence soil regoliths, is applied to soils which are weakly to moderately strongly structured with fine to medium-grained textures. The presence of higher clay content compared to Class R2 soils means that they have a higher degree of coherence and hence a greater resistance to detachment. However erosion will generate material that is susceptible to transport well beyond the source and potentially into receiving waters. Class R3 soil, where exposed, may display minor gully development in drainage lines and moderate incision along road gutters.
- Class R4 - high sediment delivery and low coherence soil regoliths, are highly unstable material. These soils lack coherence when wet and detachment generates readily transportable sediment. Class R4 soils typically display severe rill and sheet erosion on exposed surfaces such as road batters and snig tracks, and moderate to severe gully in drainage lines.

Most of the Pambula Investigation area has soil landscapes with a regolith stability rating of R3. These soils are generally coherent but can generate significant volumes of fine sediment when disturbed. The network of gully lines have a rating of R4. Drainage gullies are very prone to erosion. Soils on the lower flatter floodplain areas merge into more stable coherent Class R1 soils.

At the South Pambula Investigation area soil landscapes show more variability. East of the highway soils are mostly stable and coherent Class R1 soils. Along Summerhill Road the rhyolite-based soils are similar to most of the existing South Pambula urban area. They have weak structure and can generate significant volumes of fine sediment when disturbed. This area has an R3 rating. The area extending southwards from Mount Darragh Road has a rating of R2 with mostly sandy or stony soils of low coherence producing small volumes of fine sediment when eroded.

Affordable housing should ideally avoid areas where high construction costs would be incurred to manage issues such as erosive soil types. None of the regolith stability ratings presents an absolute constraint to suitability for urban development. Some additional risk in the Yellow Pinch soils landscape area at Pambula would require more expensive sediment controls. Obviously the steeper drainage gullies in the Pambula investigation area are not suited to development and would require healthy buffering to any adjacent disturbed areas.

Based on soil regolith ratings South Pambula is considered more suitable for urban development than Pambula, with the area east of the highway being more suited followed by the Mount Darragh Road area. The Summerhill Road area is least suited but should not be ruled out on this factor alone.

9.3 Footing class

Classification of the soil landscapes into foundation stability classes was based on AS 2870-1996. All parts of the investigation area would fall under the Class M foundation class. These are moderately reactive clay or silt sites, which can experience moderate ground movement from moisture changes. Class M soils are common across the LGA and this classification does not have a bearing on the investigation area's suitability for affordable housing.

9.4 Slope constraints

Slope mapping has been supplied by Bega Valley Shire Council for this project. This has been prepared from detailed aerial laser survey data using Light Detection and Ranging (LiDAR) technology. This is aided by derived building capability ratings which maps this factor across soils landscapes as discussed above.

The building capability ratings indicate high, medium and low capability for building. These capability classes broadly provide the degree of physical limitation present in the various landscapes and relate commonly to slope constraints. The slope classes commonly used by planners and adopted for this assessment are:

- slope gradients less than 15%,
- slope gradients between 15 and 25%, and
- slope gradients greater than 25%.

Accordingly the three building capability classes were defined by SLCC as follows:

- Class 1- minor or no limitation to development based on slope and general absence of physical limitations;
- Class 2 - moderate limitation to development, readily managed with general conditions; applies to slope gradients between 15 and 25%, or where other significant physical limitations occur, such as shallow soil, common rock outcrop, seasonal waterlogging;
- Class 3 - severe limitations to development, such that development should be excluded, or managed on a site by site basis; applied to units where slope gradient generally exceeds 25%.

At the Pambula investigation area steep slopes form the major control of building capability class. Where grades are suitable, Class 1 is achieved, with areas of steep slopes categorised as Class 3.

At South Pambula there is again some variation in class. The landscape east of the highway is typically rated Class 2 as defined by slope constraints over 15%. Much of this land however

is flatter than 15% and would fall into a Class 1 category locally. Along Summerhill Road the soils are similar to most of the existing South Pambula urban area and have a rating of 1 or 2 dependant again on slope. The land fronting Mount Darragh Road has a rating of Class 1 with minor limitations to building development.

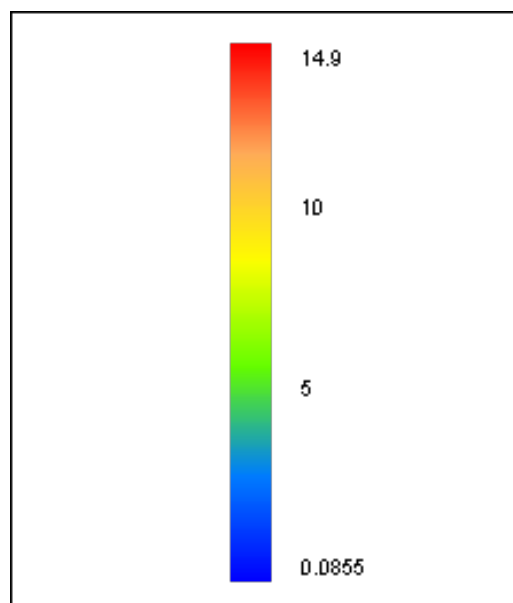
The slope mapping shows red areas of steeper slope grading through orange, yellow green and blue for flatter areas. Slope maps of both investigation areas are presented in Figures 9.3 and 9.4 with slope classes expressed in degrees.

Clearly the drainage gullies in the northern portion of the Pambula Investigation area are located in areas of steep gradient, and are prone to erosion as discussed above. A large proportion of this land is steep with a 50 metre to 70 metre wide flatter central north-south ridge evident. A second ridge is located in the west of the block. The developed parts of the Pambula investigation area are mostly on flatter grades.

The South Pambula investigation area shows variability in slope consistent with its variable landscapes. East of the highway the land is generally less than 15% with steep banks to incised drainage lines. The flat floodplain is evident as dark blue in the north-east corner of this area.

The Summerhill Road area displays variable gradient with generally flatter ridges in the east and steeper areas falling to the drainage gully in the west. The Mount Darragh Road area has gentle grades generally less than 15%. Steeper areas occur around the drainage line.

Legend: SLOPE CLASSES (Degrees)



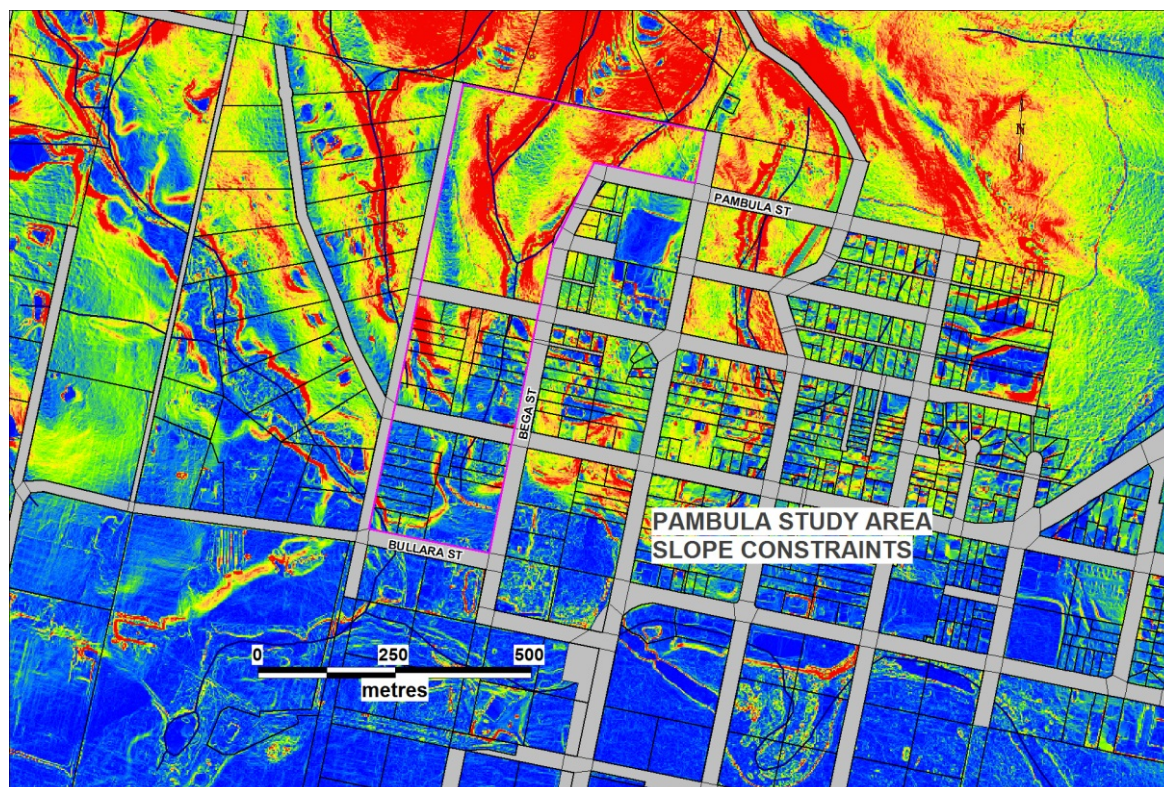


Figure 9.3: Slope mapping, Pambula

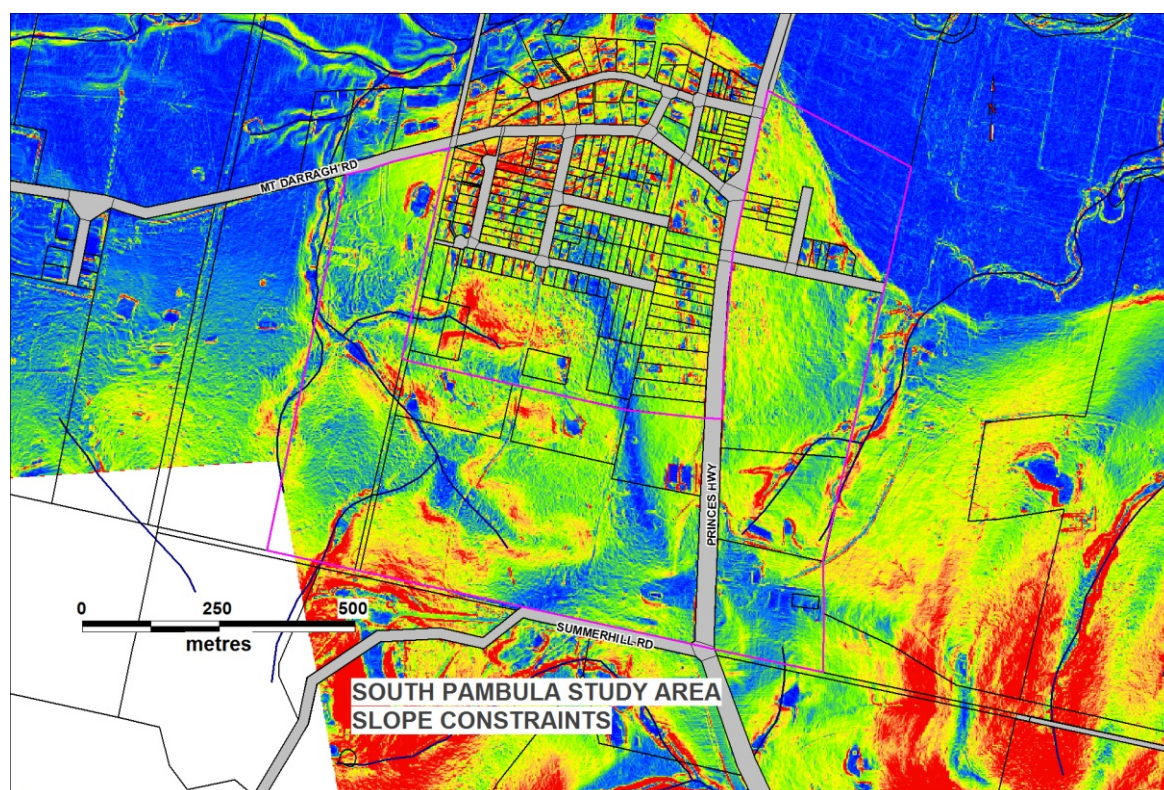


Figure 9.4: Slope mapping, South Pambula

Ch. 10 CULTURAL HERITAGE

The Eden Local Aboriginal Lands Council has been approached to ascertain whether the Aboriginal community has knowledge of any land that should be precluded from development due to being of indigenous heritage significance and/or to identify any areas that require further archaeological investigation before development proceeds. This enquiry is particularly relevant to land in the ownership of Eden LALC located at Pambula and within the northern investigation area. This land was previously vacant Crown land and was acquired by the LALC as a result of a successful land claim. No information has been able to be obtained from the council.

A review of the draft Stage 3A report of the Bega Valley Shire Aboriginal Cultural Heritage Study entitled *Understanding Aboriginal Cultural Heritage* prepared by Susan Dale Donaldson Environmental and Cultural Services in 2010 was also carried out. There were no matters of indigenous cultural heritage identified in this oral history relating to either investigation area.

On-line searches were carried out of the Aboriginal Heritage Information Management Service (AHIMS) that is maintained by the Office of Environment and Heritage. The searches spanned wide areas that included the investigation areas and surrounding lands. Land in the ownership of the Eden LALC was included in the AHIMS search of Pambula. The search areas are shown in Figures 10.1 and 10.2 below and extend to include a buffer of an additional 50 metres surrounding these areas.



Figure 10.1: The AHIMS search area at Pambula



Figure 10.2: The AHIMS search area at South Pambula

The AHIMS searches found that:

- There are no Aboriginal sites recorded in or near the selected locations, and
- There are no Aboriginal places that have been declared in or near the selected locations.

A refined search was also carried out of the three large allotments being recommended for urban residential development at South Pambula. These lots are legally described as Lot 321 DP 1098908, Lot 510 DP 877207 and Lot 302 DP 749405. Each search allowed for a 50 metre buffer adjoining each property but no Aboriginal sites or places have been recorded in AHIMS on these properties.

It is noted that surveys for Aboriginal objects have not been carried out in all parts of NSW and Aboriginal objects may exist on a parcel of land even though they have not been recorded in AHIMS. Further, not all known Aboriginal sites are registered on the AHIMS database and not all sites consist of physical evidence or remains, e.g. dreaming and ceremonial sites.

11 CONCLUSIONS AND RECOMMENDATIONS

Land considered to be suited to urban residential development is identified in this chapter. The criteria described in *Chapter 1. Introduction* have been applied to each investigation area to determine suitability. The results given below are based on the constraints analysis contained in the body of this report. An indicative land supply estimate is also provided based on the recommendations given in this chapter.

11.1 Pambula investigation area

Land in the Pambula investigation area is assessed against each criteria below.

- x. Slope equal to or less than 15% (to minimise costly earthworks for dwelling and access construction)

Comment: The drainage gullies in the northern portion of the Pambula investigation area are located in areas of steep gradient greater than 15% and are prone to erosion. A large proportion of this land is steep with a 50 - 70m wide flatter central north-south ridge evident. A second ridge is located in the west of the block. The developed parts of the Pambula investigation area are mostly on flatter grades less than 15%.

- xi. Building capability Class 1 (to avoid costly earthworks or further geotechnical studies)

Comment: Soil types on steeper slopes in this investigation area can generate high volumes of sediment when disturbed and drainage gullies are very prone to erosion. These steeper areas are also of class 3 building capability meaning that there are severe limitations to development. The lower flatter areas are typically of more stable soils and class 1 building capability with minor or now limitations to development on the basis of slope.

- xii. Able to utilise or extend existing road access off arterial, main or collector road (to avoid intersection upgrades or construct new access roads)

Comment: Access to the lower portion, south of Oregon Street, is capable via formed local roads without the need for upgrades to intersections with collector roads. The northern portion is more problematic to access as public roads in the vicinity of this area are unformed and are vegetated with some steep slopes. Internal access would necessitate costly infrastructure to cross gullies.

- xiii. Able to be serviced from existing sewer pump station with minor extension of gravity sewers

Comment: The development servicing plan indicates that the lower flatter portion is to be serviced with reticulated sewer which may assist further development of residual allotments.

- xiv. Not subject to flooding at 1:100 ARI (to avoid need for raised floor level and/or construction of flood-free access)

Comment: The south eastern corner of the block bounded by Oaklands Road and Bega, Toallo and Rainbow Streets (lot 103 DP 734647) is constrained by flooding being below the 1% flood limit of 5 metres AHD. Almost half of the allotment is mapped as flood prone.

- xv. Free of environmental sensitivity:

- Vegetation not an EEC or of high conservation value (to avoid need for further research or siting/design to protect environmental asset and potential sterilisation of land)
- Not threatened species habitat that is likely to be affected by residential development (to avoid need for further research or siting/design to protect environmental asset)
- Able to avoid riparian corridors (sufficient area for dwelling construction)

Comment: The forested part of this area includes elements of two forest communities on the more elevated areas and a third in the lower parts of the gullies. The most abundant community is Southeast Lowlands Dry Shrub Forest and there is a minority element of Far South Coast Foothills Dry Shrub Forest. In the gullies is a wetter community closely matching Southeast Hinterland Wet Shrub Forest. These communities are generally of low to moderate conservation significance and may be highly significant for threatened fauna species. This area has a very low level of disturbance and hollow-bearing trees are abundant. Evidence of the threatened species yellow-bellied gliders were found and Glossy Black Cockatoos would be expected to feed on the black she-oaks. There is also a fragment of the endangered ecological community Bega Wet Shrub Forest at the southern end near Oaklands Road. No threatened flora species were found in this area.

The upper portion of the investigation area in the ownership Eden LALC is heavily vegetated and contains 1st and 2nd order watercourses which necessitate 10 metre and 20 metre buffers each side of the channels to protect water quality and environmental values. The areas between these gullies are limited in area and difficult to access without significant works.

The lower portion of the investigation area is vegetated in the north western corner and affected by 2nd order watercourses, one of which cuts north-south into the large residue allotment at the south eastern corner. The south western corner is affected by a 4th order watercourse although this area is largely developed.

- xvi. Predominantly cleared of native vegetation (for bushfire protection and to reduce costs associated with removal)

Comment: The upper portion of the investigation area in the ownership Eden LALC and land immediately adjoining to the south across Oregon Street is heavily

vegetated. It is mapped as Category 1 bush fire hazard. Cleared land to the south has been largely developed except where constrained by riparian corridors and flood hazard.

- xvii. No evidence of significant indigenous or non-indigenous cultural heritage items or values (to avoid the need for heritage assessment)

Comment: There are no known indigenous or non-indigenous cultural heritage items or values on this land. However, a significant portion of the investigation area is in the ownership of Eden Local Aboriginal Lands Council, and although no information concerning indigenous heritage has been obtained, further investigation of this area may yield items or values of significance to local Aboriginal people.

- xviii. Adjoins existing urban settlement and will be contiguous (to ensure visual amenity protected and to minimise costs for access roads)

Comment: This investigation area immediately adjoins land to be zoned R2 Low Density Residential, being the western edge of the existing settlement of Pambula. The lower part of the area has already been largely subdivided and built upon at larger lot sizes than the adjoining urban area. Land to the west has also been subdivided and developed to even larger lot sizes and it is proposed to zone that land E4 Environmental Living in recognition of its significant visual and scenic values. The lower part therefore acts as a transition in terms of lot sizes and the scale of development between proposed zones R2 and E4. The upper part of the investigation area, although adjoining the existing urban area, provides a scenic vegetated backdrop to the settlement of Pambula.

Recommendation 1: On balance, it is considered that this area is not suited to further urban residential subdivision other than that currently permitted under draft LEP 2010. It is heavily constrained and offers only limited and fragmented potential for further residential development.

It is recommended that the land use zone R5 Large Lot Residential with a minimum lot size of 2,000m² as applied by draft LEP 2010 over the area bounded by Oaklands Road and Bega, Oregon and Rainbow Streets be retained. It is noted that the proposed R5 zone is to be fully serviced under the development servicing plan, and that dual occupancy and secondary dwellings are to be permitted with consent in the zone which may contribute to housing stock.

The area may yield some additional 12 lots at a minimum lot size of 2,000m². However, the largest residue lots are constrained by riparian corridors and flood hazard meaning that this potential will be curtailed and not able to be fully achieved. Lot 101 DP 734647 has an area of 8,138m² but is bisected by a 2nd order watercourse that requires a 20 metre buffer to the top of either bank. Lot 103 DP 734647 has an area of 14,900m² but almost half of this is constrained by flood hazard. Development potential is restricted by structures that have been located in the centre of the allotment.

Council may consider the application of the E3 Environmental Management zone to the constrained areas using a landscape planning approach rather than applying zones based on cadastral boundaries. The landscape planning approach encourages development in unconstrained areas and protection of constrained parts of the land. Landscape function can be maintained through reducing the fragmentation caused by traditional subdivision.

Development near key environmental features such as riparian corridors, identified by site survey, can be avoided and ecological integrity maintained. Archaeological features, which once identified and mapped often coincide with undisturbed environmentally sensitive areas, can also be afforded protection rather than requiring a 'Consent to Destroy' Aboriginal heritage. Conservation of landscape function and amenity, while addressing land saleability and lot yields can be a direct result.

Due to the significant environmental constraints (riparian corridors, slope and vegetation) over the area bounded by Oregon, Bega, Pambula, Monaro and Rainbow Streets, it is recommended that zone RU2 Rural Landscape with a minimum lot size of 120 hectares as proposed in draft LEP 2010 be retained on this land.

11.2 South Pambula investigation area

Land in the South Pambula investigation area is assessed against each criteria below. To provide clarity, the land is separated into three sections – land east of the highway, land that fronts Mount Darragh Road, and land west of the highway and south of the existing settlement that is accessed via Summerhill Road.

- i. Slope equal to or less than 15% (to minimise costly earthworks for dwelling and access construction)

Comment: East of the highway the land is generally less than 15% with steep banks to incised drainage lines. The Mount Darragh Road area has gentle grades generally less than 15%. Steeper areas occur around the drainage line. The Summerhill Road area displays variable gradient with generally flatter ridges in the east and steeper areas falling to the drainage gully in the west. A ridge runs north-south parallel to the highway and approximately 100 metres to the west of the highway in this latter section of land.

- ii. Building capability Class 1 (to avoid costly earthworks or further geotechnical studies)

Comment: Land to the east of the Princes Highway comprises soils that are mostly stable and coherent. This area is predominantly class 1 building capability and suffers little or no limitation to development based on slope. Elsewhere soils demonstrate a weak structure and can generate significant volumes of fine sediment when disturbed, particularly the land along Summerhill Road. Both Summerhill Road and land fronting Mount Darragh Road are of class 1 building capability except on steeper

slopes where class 2 prevails meaning that slope presents moderate limitations to development.

- iii. Able to utilise or extend existing road access off arterial, main or collector road (to avoid intersection upgrades or construct new access roads)

Comment: Land to the east is able to be accessed directly off the Princes Highway using the existing sealed Furner Street. The intersection is safe and possesses adequate sight distances from each approach. Internal roads could then service future subdivision of this land. Land to the south of the settlement would need to gain access off the highway at Summerhill Road or by forming a new intersection to replace Summerhill Road. The existing intersection would not achieve minimum sight distances and would require significant upgrading. Land to the west is able to be accessed from Mount Darragh Road using an existing driveway.

- iv. Able to be serviced from existing sewer pump station with minor extension of gravity sewers

Comment: Land to the east of the Princes Highway is able to be readily serviced via an existing sewer pump station (PS 16B) located at the eastern end of Furner Street. Land to the west of the urban area along Mount Darragh Road is able to be serviced via extensions of the existing reticulated sewer system however this involves placing a line that crosses Mount Darragh Road then through private property to access sewer mains to the north. Fall to the north west in this area would necessitate the installation of a sewer pump station to service the western half of the lot, significantly adding to land development costs. Servicing the western part of the land to the south of the settlement would attract significant costs due to the existence of a large area of vacant unserviced intervening land. A sewer line runs along the highway which would enable connection of the land that is east of the ridge located approximately 100 metres west of the highway and that slopes towards the highway.

- v. Not subject to flooding at 1:100 ARI (to avoid need for raised floor level and/or construction of flood-free access)

Comment: Land at the north eastern corner of the investigation area off Furner Street is subject to flooding being below the 1% flood limit of 5 metres AHD and should be excluded from land suited to residential development.

- vi. Free of environmental sensitivity:
- Vegetation not an EEC or of high conservation value (to avoid need for further research or siting/design to protect environmental asset and potential sterilisation of land)
 - Not threatened species habitat that is likely to be affected by residential development (to avoid need for further research or siting/design to protect environmental asset)
 - Able to avoid riparian corridors (sufficient area for dwelling construction)

Comment: The forested part of the South Pambula investigation area is characterised by Southeast lowlands Dry Shrub Forest on the more elevated areas. Vegetation in the drainage lines matches Eden Shrubby Swamp Woodland. Remnants of two endangered ecological communities, Lowland Grassy Woodland and River-flat Eucalypt Forest on Coastal Floodplains, indicated by remnant forest red gum are present in paddocks east of the highway and on the verges of Furner Street though neither could be said to still be present as both have been largely cleared and replaced with exotic pasture and scattered re-growth. Forested land west of the highway appears to be re-growth varying from 20 to 40 years old and does not contain any hollow-bearing trees but has the potential for locally occurring threatened species. The abundance of black she-oak means that the area may be frequented by glossy black cockatoos. No threatened flora species were detected.

Three 1st order watercourses flow in a north westerly direction from the vegetated land south and south west of the existing settlement and progressively merge into a 2nd order watercourse that commences south of the existing settlement and crosses Mount Darragh Road at the north western extremity of the investigation area. A fourth 1st order watercourse flows from the undeveloped portion of the existing settlement and enters the 2nd order watercourse roughly at the centre of the western allotment of the investigation area. In addition, the headwaters of two 1st order watercourses are located east of the highway at the south eastern corner of the investigation area that flow towards the north east before entering SEPP 14 Wetland No. 40. A buffer to a 1st order watercourse is located on land within the investigation area just north of Furner Street.

- vii. Predominantly cleared of native vegetation (for bushfire protection and to reduce costs associated with removal)

Comment: Within the investigation area, all land east of the Princes Highway and fronting Mount Darragh Road at the north western corner being almost fully cleared is mapped as category 2 bushfire prone land. An area of land at the south eastern corner of the land west of the highway which is scattered re-growth is also mapped as category 2. The remainder of the investigation area being more densely vegetated is shown as category 1.

- viii. No evidence of significant indigenous or non-indigenous cultural heritage items or values (to avoid the need for heritage assessment)

Comment: There are no known indigenous or non-indigenous cultural heritage items or values on this land. A refined search of AHIMS for the large residue lots within the investigation area that are identified as being suited to urban subdivision revealed that there are no records of any indigenous items or values on the land.

- ix. Adjoins existing urban settlement and will be contiguous (to ensure visual amenity protected and to minimise costs for access roads)

Comment: The land east of the highway and fronting Mount Darragh Road forms a continuous extension of the existing settlement of South Pambula in an easterly and westerly direction. The land to the east is limited in terms of its southern extent in order to maintain a contiguous settlement. Visual amenity is also an important consideration that would need to be addressed by making an allowance for a buffer vegetated buffer to the highway.

Access to the section east of the Princes Highway may be achieved using the existing formed Furner Street. Access to the section to the west may be achieved using the existing access off Mount Darragh Road. Neither of these access points, i.e. the intersection of Furner Street with the Princes Highway and the entry off Mount Darragh Road, presents a road safety hazard as adequate sight distances may be achieved in each direction.

Recommendation 2: The following recommendations are made for each separate section of the South Pambula investigation area. Land considered suited to future urban development is shown shaded in orange in Figure 11.1 below.

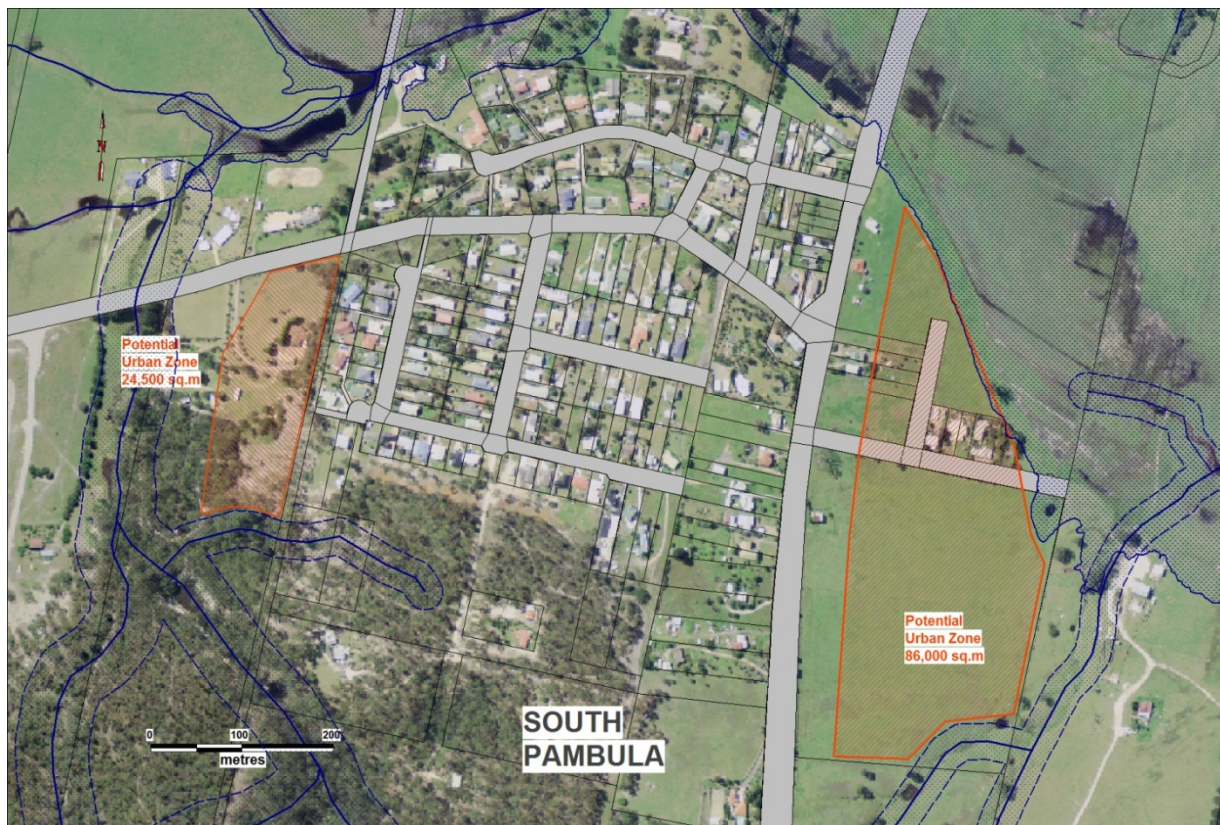


Figure 11.1: Potential urban zones, South Pambula

Land east of the Princes Highway

It is recommended that the area of land located east of the Princes Highway be considered for rezoning for urban residential development. This may be effected by a planning proposal to amend draft LEP 2010 after gazettal to zone the land as R2 Low Density Residential consistent with the existing settlement of South Pambula. It is further recommended that secondary dwellings be a land use that is permitted with consent in zone R2 to enable the provision of additional housing for rent or for use by extended family.

This area is relatively unconstrained other than being identified as a 'premium rural landscape'. In recognition of scenic landscape values, it is recommended that lot sizes be large, say around 1,000m², so that adequate landscaping may be carried out on each allotment to screen built form when viewed from the highway looking towards the river flats and wetlands. Lots of this size would generate densities that are not excessive in terms of visual impacts. With an area of 86,000m², the land east of the highway would yield around 60 lots at the minimum lot size having deducted 20% of the total area for services such as roads and deducting the existing 9 lots.

Subdivision design should incorporate north-south roads and a perimeter road parallel to the eastern boundary so that lots are oriented east-west to maximise solar access and energy efficiency. The proposed rezoning area is setback from the highway at least 40 metres to enable adequate vegetation screening from the highway and lots within the subdivision should face the highway so that the front facades of dwellings are visible to motorists rather than the rear yards and rear fences.

This area defined is above the 1% flood level based on best available information used for this study and is unaffected by watercourses and riparian corridor buffers. Prior to any future development it is recommended that Council carry out a flood study to identify accurate flood planning levels for this area and other areas subject to flooding in the Pambula district including the land to be zoned R5 Large Lot Residential and within the Pambula investigation area.

This recommendation is consistent with plans and strategies in that it will lead to additional low cost housing stock in an area adjacent to an existing settlement. Council should ensure that landscape values are considered during assessment of subsequent development applications for dwellings whilst at the same time encouraging flexible and adaptable housing. Development of these areas should not require further assessment of flora and fauna, cultural heritage, natural hazards or geotechnical constraints other than would normally be required by legislation, e.g. a bushfire hazard assessment and structural compliance.

Land fronting Mount Darragh Road

Land to the west of Mount Darragh Road adjoins land to be zoned industrial under draft LEP 2010 and is zoned E3 Environmental Management to act as a buffer between the existing settlement and future industrial development. An extractive industry was approved on 27

September 2011 on adjoining Lot 31 DP 749613 that enables the extraction and stockpiling of 25,000m³ of material over 5 to 10 years after commencement. Should Council see the need in the longer term to add to land supplies then this land may be considered depending upon the nature of industrial development that is built in what is proposed to be an IN2 Light Industrial zone. At a minimum lot size of 550m² (consistent with that to apply to the existing urban area under draft LEP 2010) the area of 24,500m² would generate about 35 lots allowing for 20% of the total area for services. However, residential use would have the potential to sterilise adjoining industrial land and Council would need to consider rezoning that industrial land to a zone that is more compatible with residential development.

Land south of the existing settlement

An area south of the existing settlement was also examined as to its suitability for urban development over the longer term as land supply elsewhere in Pambula and South Pambula is depleted. The area that fronts and falls towards the highway is able to be serviced with sewer by connecting to existing mains. However, direct access to the highway would not be encouraged and a new formed intersection would be required to replace Summerhill Road. This would necessitate land acquisition and possibly road widening at a point where sight distances could be achieved. The Summerhill Road-Princes Highway intersection is located along a 100 kilometres per hour stretch of the highway and cannot achieve Safe Intersection Sight Distances.

An alternative accessway could be achieved if land is dedicated or acquired to create a new road running north-south to connect to the eastern end of George Street. This could follow an existing unsealed track that runs parallel to the highway at a distance of about 160 to 200 metres west of the highway. This would place all of Lot 10 DP 1076297 which is 2.1 hectares in area and the eastern section of Lot 453 DP 747031 with an area of about 5 hectares to the east of the new road. A single allotment of approximately 2,200m² that adjoins Lot 10 to the north that is in the same ownership as Lot 10 is currently available for urban residential development in its existing configuration. Road acquisition would have cost implications for land values and impact upon the affordability of any new lots created.

Given that any new allotments would need to be in keeping with the existing long narrow lots to the north that are about 2,200m² in size, subdivision of Lot 10 would yield about three lots given the presence of existing structures and allowing for 20% of land to be utilised by services and a visual buffer set aside to the highway. This land is partially vegetated and lots of this size would also enable bushfire asset protection zones to be contained wholly within each lot. Similarly, Lot 453 could yield about nine lots based on an englobo area of 2.6 hectares having allowed for the existing dwelling and associated structures. The land falls away from the existing settlement towards the south of Lot 453 meaning that significant costs would be involved in providing sewer services.

This area is also identified in the draft DCP as a premium rural landscape and removal of vegetation would affect the visual qualities particularly when viewed from the highway. This bushland provides a backdrop to the existing settlement when viewed from the north and for motorists travelling in either direction on the highway. An allowance would be required for

landscape screening to the highway which would reduce the capacity for this land to accommodate building envelopes with APZs. This area's landscape value differs in this regard to that of the land east of the highway which has value in terms of distant vistas that are viewed from the land or across the land when travelling on the highway.

The area to the west of the ridgeline and south of the existing settlement falls to the west towards unserviced land. It would be difficult and expensive to provide connections to existing sewer mains which are located about 400 metres away at the nearest point. This area is not considered suited to urban development at this point in time.

11.3 Land supply estimate

An approximate estimate of land supply has been calculated for Pambula and South Pambula having regard to the recommendations made above and for estimated population forecasts based on average annual growth rates of 0.4% and 1% to the year 2031. These estimates are given in Tables 11.1 and 11.2 below.

Table 11.1: Housing requirements and land supply (at average annual growth of 0.4% p.a.)

Locality	Additional persons in 2031	Housing needs at 2011 ABS Census occupancy rates	Current land supply (lots)	New lots after rezoning at South Pambula	Revised land supply (lots) after rezoning at South Pambula	Surplus or deficit of lots in 2021
Pambula	72	33 (2.2ppd)	69	12	57	24
South Pambula	35	12 (2.8ppd)	117	60	177	165

Table 11.2: Housing requirements and land supply (at average annual growth of 1% p.a.)

Locality	Additional persons in 2031	Housing needs at 2011 ABS Census occupancy rates	Current land supply (lots)	New lots after rezoning at South Pambula	Revised land supply (lots) after rezoning at South Pambula	Surplus or deficit of lots in 2021
Pambula	191	87 (2.2ppd)	69	12	57	-30
South Pambula	92	33 (2.8ppd)	117	60	177	85

If the recent demand for housing continues, whereby an average of 10 construction certificates are issued per year, then stocks would be exhausted in Pambula within 6 years and in South Pambula within 18 years.

Supply in Pambula is relatively constrained and this reflects the presence of environmental attributes and natural hazards that limit the expansion of the settlement to the west.

However, with the addition of land east of the highway at South Pambula, there would be a total of 24 years supply of zoned vacant urban land available for residential development. The provision of dual occupancy dwellings, semi-detached dwellings and secondary dwellings would extend this supply beyond this period. It will be necessary for Council to guide new development towards South Pambula through a staged urban release program to ensure that incoming residents can be accommodated within the district. Of increasing importance will be the development of seniors housing to accommodate the aging population - a land use permitted with consent in the R2 Low Density Residential zone under draft LEP 2010.
