

19 August 2014
Ref No: 1499-1053

General Manager
Bellingen Shire Council
Po Box 117
Bellingen NSW 2454

Attention: **Matthew Hutchings**

Dear Matthew

Addendum to Statement of Environmental Effects for the subdivision of Lots 1 and 2 DP792596, 8140 Pacific Highway, South Urunga into 233 residential lots

Preamble

The purpose of this letter is to provide additional information to be read in conjunction with the Statement of Environmental Effects (SEE) for a 233 residential lot subdivision of Lots 1 and 2 DP792596, 8140 Pacific Highway, South Urunga. The addendum deals with three matters:

1. A waiver issued by the Department of Planning and Environment for the need to prepare a master plan under State Environmental Planning Policy No. 71 – Coastal Protection (SEPP 71);
2. Additional information relating to the Aboriginal Heritage Impact Assessment prepared by McCardle Cultural Heritage Pty Ltd; and
3. Clarification and justification for the identified low level/intermittent Koala activity within the site.

SEPP 71 Waiver

Clause 18 (1) of SEPP 71 requires that a master plan must be prepared and adopted by the Minister of Planning and Environment prior to a consent authority granting consent for subdivision of residential land, if part or all of the land is in a sensitive coastal location.

Clause 18(2) of SEPP 71 provides that the Minister may waive the need for a master plan to be adopted based on:

- the nature of the development concerned;
- the adequacy of other planning controls that apply to the proposed development; and/or
- for other such reasons as the Minister considers sufficient.

The Trustees of the Roman Catholic Church, St Mary's Parish Bellingen (the Church) requested that, pursuant to Clause 18(2) of SEPP 71, the Minister of Planning waive the need for a master plan to be adopted for the abovementioned land.

The Minister (via a delegate) has advised in writing (refer **Attachment A**) that the requirements to prepare and adopt a master plan may be waived for the subject land. The master plan requirement was waived because it was considered that there was adequate development in place to ensure the development is carried out with due regard to the aims of SEPP 71.

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Additional Information - Aboriginal Heritage Impact Assessment

GeoLINK engaged Penny McCardle from McCardle Heritage to carry out an Aboriginal Heritage Impact Assessment (AHIA) for the proposed residential subdivision for the subject land. The purpose of the assessment was to identify any archaeological constraints on the site, assess the proposed subdivision and to provide opportunities and options to ensure any cultural materials present are protected.

The archaeological assessment was undertaken in strict compliance with the NSW Office of Environment and Heritage (OEH) AHIA guidelines including Aboriginal Cultural Heritage Consultation Requirements for Proponents (2010). The specifics of the consultation undertaken by McCardle Heritage are outlined in Appendix A of the AHIA which is Appendix J of the SEE. The AHIA was completed on 24 April 2013 after giving all stakeholders ample opportunity to have input into the process and provide comment on the Draft AHIA. A letter was received on 27 May 2013 by the Coffs Harbour and District Local Aboriginal Land Council (CHDLALC) (refer **Attachment B**). This was received after the AHIA report was finalised. However McCardle Heritage has provided responses to the points raised by CHDLALC which are outlined below.

1. *It appears that the final report does not accurately relate or reflect discussions during the assessment of the significance of the cultural landscape of the area and for the property. It is noted in the report that the property is situated between two major river systems and is also positioned directly south of a significant wetland. (*Note: Wetland is currently contaminated through old mine processing plant). This is a preferred location for Aboriginal sites to occur.*

The AHIA reflects the discussions regarding cultural significance as much as is possible given the discussions between MCH archaeologist, Viki Gordon and the CHDLALC site officers. Additionally, the AHIA is an archaeological report and includes only what knowledge is provided by the Aboriginal groups and included with the permission of those people. The cultural significance of the area can only be addressed by the Aboriginal groups. MCH requested, in a letter sent with the draft report that a cultural heritage report be provided by the registered interested parties. No cultural heritage report was received.

2. *Additionally CHDLALC staff notified of the insistence to consult with specific Gumbaynggirr Elders from Urunga regarding the proposed development of the property.*

The CHDLALC did advise MCH archaeologist Viki Gordon that they wanted to consult with elders. However, Viki was informed that they would not be able to attend the survey but that they would have a talk to them about the significance and present this information and significance in their report.

3. *It is noted in the report that no detailed maps of area for consideration for the development of the property are included. Only property boundary maps were provided. How can CHDLALC be confident that the entire property won't be developed, if detailed subdivision mapping is not provided for further comment? Considering that only approximately 40-50% of the property has been exposed to the assessment with the remainder of the property for Environmental Conservation. Detailed mapping will provide clearer guidance in this area.*

Plans of the development showing the proposed subdivision have been provided to CHDLALC during the consultation process and previous correspondence. These plans clearly show the proposed development footprint. The notification and consultation process will provide further opportunity to CHDLALC to review the subdivision plans and provide further comment.

4. *CHDLALC agrees that should items of Aboriginal origin be located on the property that they would more than likely not be in situ, as is evident with SU 1. However CHDLALC does not agree that due to previous land use activities that the Cultural significance of the landscape would be reduced. As previously mentioned the property is situated between two major river systems with easy manoeuvring between the two. CHDLALC has previously been involved in assessments with extremely similar characteristics for*

example North Sapphire Beach residential development where the property had been used for agriculture production with countless occurrences of ploughing and cropping. But nevertheless Aboriginal objects were recovered in these areas and in very large numbers.

The AHIA identified the area as well resourced in terms of water sources and elevated landforms (slopes and flat crests) all of which are considered suitable for past occupation although the presence of the Kalang River to the west and the Urunga Lagoon to the east are considered to have been more likely places for long term encampment. However, the AHIA identified the study area, given its location between two major water sources, would have been typically used as travel routes for the hunting and gathering of local resources. Much of the development area has been cleared and used primarily for agricultural purposes in the western portions and possibly for pastoral purposes (grazing) in the remainder. These uses involved the wholesale clearance of native vegetation and the introduction of pasture grass. Other disturbances noted include the construction of dams, housing, fencing, numerous motor vehicle and motorbike access tracks, associated infrastructure and two electricity easements. As such the AHIA determined that the disturbances and landforms negated the identification of any PADs.

5. *The areas where current residential properties are located were excluded from the initial assessment. These areas are a continuum of the Cultural Landscape identified in 1 above. Further information should be provided to include or exclude these residences for the subdivision.*

Existing residential properties were outside the proposed development footprint and the study area. They were included briefly as the CHDLALC site officers' main interest was in the adjoining property to the South and South West. Whilst discussing likely places for camp sites, Viki Gordon looked at the adjoining residence and advised that it "looked like a good place". The CHDLALC site officers agreed and said they also thought the property to the South East was in the right place as well. The CHDLALC site officers also stated that "they always build nice houses on the best spots which are where our sites are as well". The residential areas are outside the study area, were considered, discussed and all present were of the opinion those locations would have been the preferred location to camp. However, as stated previously these locations are outside of the study area and do not require assessment in the AHIA.

6. *It is also noted that the map 5.3 "Archaeological Potential" indicates areas of **high and moderate archaeological potential**. I am perplexed as to how you can identify these areas as having high to moderate potential, but there is no need for further investigation?*

The Figure 5.3 Archaeological Potential is derived from an archaeological background only. This does not take into account past and present land uses. The archaeological potential is updated following the survey whereby the landscape and both natural and human disturbances are evident. Hence the disturbances and discussions on site resulted in no potential within the study area. In order to recommend further investigations, we must justify why and in this case, due to the levels of disturbances, there is no scientific justification as there is no potential for in situ archaeological deposits.

7. *CHDLALC strongly recommends that the above matters be considered and further consultation needs to be undertaken to ensure that the report accurately reflects the opinions of the local Aboriginal community.*

The final report was intended to reflect the opinions of all registered stakeholders, hence the request for the cultural heritage reports. The AHIA has been finalised and will be placed on public exhibition along with the development application. We would be happy to address any comments and concerns as part of the development application assessment process.

Clarification and justification - Low Level/Intermittent Koala Activity

The SEE identifies that the Koala was a confirmed species at the site during the ecological surveys. It needs to be noted that this confirmation was by the identification of Koala scats located under two separate Tallowood trees outside of the proposed development footprint. There was also a very low detection rate of Koala scratches across the study area. All potential feed trees inspected for scats/ scratches during fauna meanders and six of the seven Koala SAT surveys failed to show any signs of Koala usage. Only one of the seven Koala SAT surveys detected any Koala usage (two of the Tallowood trees inspected each contained a single Koala scat).

The low detection rates of habitat use by Koalas and the fact that this species was not detected at all during surveys (that included SATs) in 2002 and 2003 (EcoPro 2006) demonstrates the study area contains low levels of Koala usage. The ecological assessment discussed the reasons for low Koala usage, despite high habitat quality, which included:

- Possible differences in nutritional or chemical values within foliage of feed trees at the site compared to other sites in area which have higher usage rates;
- the existence of cleared but thickly grassed electricity line easements;
- the location of the site between a wetland, a highway and adjacent to an urban area;
- the quality of forested areas to the south of the site, which adjoin extensive tracts of State Forests and National Parks, are favoured by the local Koala population; and
- the site functioning as an adjacent supplementary foraging site or more likely as a Koala dispersal or commuting area.

A comprehensive assessment of Koala impacts was undertaken and is provided in the Ecological Assessment (Appendix D of the SEE). This assessment included a seven-part test of significance in accordance with Section 5A of the EP&A Act and an assessment under the EPBC Act Administrative Guidelines of Significance for the Koala. The Section 5A Assessment concluded that the proposal is unlikely to result in a significant impact on a local population of the Koala species. Similarly, the assessment of significance using the Administrative Guidelines for EPBC Act listed species concluded that the proposal is unlikely to result in a significant impact on a local population of the Koala.

Yours sincerely

GeoLINK



Simon Waterworth

Director / Planner

Attach: Attachment A Letter from Minister of Planning - SEPP 71 waiver
 Attachment B Letter from CHDLALC



Planning & Environment

Mr S Waterworth
GeoLINK
PO Box 1446
COFFS HARBOUR NSW 2450

Our ref: 14/08524
Your ref: 1499-1052

GeoLINK Received 24/7/14
Project 1499
☐ reviewed
☐ noted file-no action required
☒ action, as follows
file (scanned)
SSW

Dear Mr Waterworth

REQUEST TO WAIVE THE REQUIREMENTS FOR A MASTER PLAN FOR SUBDIVISION OF LOT 1 AND 2 DP 792596 PACIFIC HIGHWAY, URUNGA

I refer to the above request received on 21 May 2014 to waive the need for a master plan (development control plan) for a proposed residential development at the above address.

As delegate of the Minister for Planning, I have determined, pursuant to clause 18(2) of *State Environmental Planning Policy 71 – Coastal Protection* (SEPP71), that the requirements for a master plan in clause 18(1) may be waived.

The proposal is permissible under the current planning standards within the R1 General Residential zone. The master plan requirement is waived for the reasons that the objectives and controls contained in *Bellingen LEP 2010* and *Bellingen's Development Control Plan 2010*, section 79C of the *Environmental Planning and Assessment Act* and the matters for consideration in clause 8 of SEPP 71, are considered adequate to ensure this development is carried out with due regard to the aims of SEPP 71.

Should you have any further enquiries about this matter I have arranged for Jenny Johnson of the Grafton Regional Office to assist you. Jenny can be contacted in (02) 6641 6614.

Yours sincerely

Jim Clark
Team Leader Local Planning
Northern Region


cc: Bellingen Shire Council



Coffs Harbour & District Local Aboriginal Land Council

Cnr Pacific Highway & Arthur Street, Coffs Harbour 2450
PO Box 6150, Coffs Harbour Plaza NSW 2450

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27th May 2013

Attention: Penny McCardle

McCardle Cultural Heritage Pty Ltd
PO Box 166
Adamstown NSW 2289

Re: Aboriginal Cultural Heritage Assessment – Lot 2 Deposited Plan 792596, Pacific Highway, Urunga South, NSW.

Dear Ms McCardle,

The Coffs Harbour and District Local Aboriginal Land Council (CHDLALC) performed a Cultural Heritage assessment of Lot 2 DP 792596 Pacific Highway, Urunga, to ascertain if any Aboriginal Cultural Heritage constraints exist for the proposed subdividing of this Lot and DP.

The assessment was undertaken by Mark Flanders and Ian Brown, Cultural Heritage Officers of CHDLALC on 8th March 2013.

During this assessment an isolated object of Aboriginal origin was located within the property boundary. This object has been recorded on the DECC's AHIMS database and is now protected under the National Parks and Wildlife Act 1974.

It has been advised during field discussions that the area of location for SU 1 is outside of any proposed ground disturbance activities for the property.

CHDLALC has carefully considered the final report provided by McCardle Cultural Heritage Pty Ltd for Lot 2 DP 792596 Pacific Highway, Urunga and provides the following comments on the content of the report.

1. It appears that the final report does not accurately relate or reflect discussions during the assessment of the significance of the cultural landscape of the area and for the property. It is noted in the report that the property is situated between two major river systems and is also positioned directly south of a significant wetland. (* Note: Wetland is currently contaminated through old mine processing plant) This is a preferred location for Aboriginal sites to occur.
2. Additionally CHDLALC staff notified of the insistence to consult with Uncle Tom Kelly (Gumbaynggirr Elder) from Urunga regarding the proposed development of the property.
3. It is noted in the report that no detailed maps of area for consideration for the development of the property are included. Only property boundary maps were provided. How can CHDLALC be confident that the entire property won't be developed, if detailed subdivision mapping is not provided for further comment? Considering that only approximately 40-50% of the property has been exposed to the assessment with the remainder of the property for Environmental Conservation. Detailed mapping will provide clearer guidance in this area.

4. CHDLALC agrees that should items of Aboriginal origin be located on the property that they would more than likely not be in situ, as is evident with SU 1. However CHDLALC does not agree that due to previous land use activities that the Cultural significance of the landscape would be reduced. As previously mentioned the property is situated between two major river systems with easy manoeuvring between the two. CHDLALC has previously been involved in assessments with extremely similar characteristics for example North Sapphire Beach residential development where the property had been used for agriculture production with countless occurrences of ploughing and cropping. But nevertheless Aboriginal objects were recovered in these areas and in very large numbers.
5. The areas where current residential properties are located were excluded from the initial assessment. These areas are a continuum of the Cultural Landscape identified in 1 above. Further information should be provided to include or exclude these residences for the subdivision.
6. It is also noted that the map 5.3 "*Archaeological Potential*" indicates areas of **high and moderate archaeological potential**. I am perplexed as to how you can identify these areas as having high to moderate potential, but there is NO NEED for further investigation???
7. CHDLALC strongly recommends that the above matters be considered and further consultation needs to be undertaken to ensure that the report accurately reflects the opinions of the local Aboriginal community.

It is CHDLALC's opinion that the Final Report is not accurate and that further consultation and discussions should be held to ensure the development application can move forward.

If you have any questions in relation to this matter please contact the undersigned on the number listed above.

Yours truly,



Chris Spencer
Chief Executive Officer

31 August 2015
Ref No: 1499-1054

General Manager
Bellingen Shire Council
PO Box 117
BELLINGEN NSW 2454

Attention: Matthew Hutchings

Dear Matthew,

Development Application 2014/DA-00129 South Urunga Subdivision

I refer to Council's letter dated 11 October 2014 requesting further information to enable the assessment of the abovementioned development application (DA). I refer also to a meeting with Council and GeoLINK staff on 29 October 2014 to discuss various aspects of this correspondence. This response to Council's letter along with attached plans and information should be read as an addendum to the original SEE lodged with the Development Application.

Response to Rural Fire Service Request for Additional Information

1. *Planning for Bushfire Protection Guidelines 2006 (PBP) requires dead ended roads to be not more than 200 metres in length. Details the area required to demonstrate compliance with PBP in relation to public road access.*

GeoLINK met with Mr Brad Sellings of NSW RFS on Friday 9 February 2015 to discuss concerns raised about the single access serving the most eastern section of the subdivision and other matters. RFS suggested two options to address the single access issue:

- Design the road so that the Radiant Heat Flux levels are reduced down to 10 kW/m² in the section of road that would be exposed to fire. This could then be considered as an alternate solution; or
- Provide an additional access road.

We investigated keeping the single road and determined how much clearing would be required to achieve the required Radiant Heat Flux levels. Preliminary modelling suggested that a cleared area of approximately 100 metres either side of the road would be required to achieve this. Given the level of clearing required, this option was not pursued. We have therefore redesigned the subdivision to include an additional road to meet the requirements of the PBP. This road is shown on the amended plans for the subdivision attached as **Appendix A**.

We understand that this additional road will address RFS's concerns about dead end roads. It has, however, necessitated further vegetation removal through the EEC between area 1 and area 2 which has been unavoidable. We have undertaken additional ecological assessment of the impacts of the new road on the EEC. This is provided later in this correspondence under 'additional matters'.

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2. *Request for the perimeter road not to exclude Lots 70-76.*

Proposed lots 70 – 76 (on the previous plan) did not include a perimeter road around them because they adjoined land zoned for residential development. RFS has requested that the proposed subdivision layout be amended to ensure the perimeter road incorporates these lots. The subdivision layout (refer **Appendix A**) has been revised to address RFS's requirements. A revised Bushfire Asset Protection Zones map is provided as **Appendix B**. Additional assessment and information on bushfire impacts is included later in this correspondence under 'additional matters'

3. *Provide details on how the blackbutt woodland to the west of Lots 70-76 will be able to be relied upon into the future as a woodland vegetation formation for the purposes of PBPG 2006.*

The land to the west of these lots is described as Lot 1 DP 604508. This land is zoned as R1 General Residential under BLEP 2010. This land is currently utilised for grazing of cattle. It is highly unlikely that this land will change significantly before it is ultimately developed. However as a precautionary measure we have reclassified this land as forest. This along with the amendments to the proposed subdivision layout (as proposed in point 2 above) are considered to have resolved this issue. This is discussed further under 'additional matters'.

Response to OEH Comments 6 and 7 in Development Application 2014/DA-00129- 223 Lot Subdivision, Pacific Highway, South Urunga (OEH Comments Reference DOC14/189586)

Additional field surveys were undertaken on 25 and 27 November 2014 to document the characteristics of the seven hollow-bearing trees within the South Urunga study area and determine their suitability as potential nesting sites for the Glossy Black Cockatoo (*Calyptorhynchus lathami*). This species is listed as Vulnerable under the NSW *Threatened Species Conservation Act 1995* (TSC Act).

Potential Glossy Black Cockatoo nest trees are large hollow-bearing eucalypts (living or dead) with a diameter at breast height (DBH) >40 cm (Garnett *et al.*, (1999), cited in CBC (2010)). Characteristics of potential nest hollows are: (i) >8 m above ground level, (ii) situated in branches or stems >30 cm in diameter, (iii) angle of branch or stem not more than 45° from vertical, and (iv) a minimum entrance diameter of >15 cm (Cameron (2006), cited in CBC (2010)).

Characteristics of the seven hollow-bearing trees within the study area are provided in **Appendix C** and the location of the seven hollow bearing trees is shown on **Appendix D**. Four of the seven hollow-bearing trees are located within the development footprint (trees 4, 5, 6 and 7). None of these trees provide potential Glossy Black Cockatoo nesting trees. Of the three hollow-bearing trees located outside the development footprint, two (trees 1 and 2) provide potential (although marginal) Glossy Black Cockatoo nesting sites. These trees are located a distance greater than their height from the development area and do not require removal as part of the Proposal. No additional Glossy Black Cockatoo nesting surveys are therefore considered necessary.

As discussed in the GeoLINK (2013) ecological assessment, EcoPro (2006) noted that a population of 12-15 Glossy Black Cockatoos utilises the general locality, which includes the development footprint and broader study area, and adjacent land to the north, east and south. This population forms part of the larger mid-North Coast population and was considered the 'local population' for the statutory Seven- Part Test of Significance Assessment in GeoLINK (2013).

EcoPro (2006) made 65 observations of Glossy Black Cockatoos and/ or evidence of their feeding across their broad study area, noting that the most commonly used and important area was in the

north-east of their study area which is not within the study area that is the subject of this assessment. During the GeoLINK (2013) assessment Glossy Black Cockatoo feed trees (oaks or she-oaks with chewed cones) were recorded at four locations within the study area and at one location along the proposed sewerage pipeline between the proposed development and the Urunga Sewage treatment plant. A group of three individuals was commonly seen foraging within the study area.

The development footprint forms a small part of the available foraging habitat for the local Glossy Black Cockatoo population. This includes connected adjacent vegetated lands (which are mostly zoned for environmental protection in the Bellingen LEP 2010) to the east and south, and Newry State Forest and Jaaninga Nature Reserve to the south and south-west.

As discussed in the GeoLINK (2013) ecological assessment, the development footprint would impact 1.24 hectares of moderately dense oak, 3.85 hectares of dense oak and 1.68 hectares of very dense oak. The revised development footprint would impact 1.24 hectares of moderately dense oak, 3.85 hectares of dense oak and 1.71 hectares of very dense oak. Considering the extent of alternative foraging habitat available locally, it is unlikely that the Proposal would result in a significant loss of foraging resources for the local Glossy Black Cockatoo population.

The conclusions of the GeoLINK (2013) assessment remain valid. That is, the Proposal is unlikely to result in a significant impact on the local Glossy Black Cockatoo population.

Response to BSC's Request for Further information

1. Lot size data

The lot size data is shown in the revised set of engineering plans (refer **Appendix A**).

2. Water supply reservoir Design

Councils Manager, Water and Waste Water was contacted to determine design requirements for the required water supply reservoir. A conceptual plan (refer **Appendix E**) has been prepared based on advice received.

Height of the Structure

The objective of Clause 4.3 Height of Buildings of BLEP 2010 is to restrict the height of buildings in a manner that preserves the character and amenity of localities in Bellingen. The clause states that the height of a building on any land is not to exceed the maximum height shown for the land on the Height of Buildings Map. The maximum height for the site is set at 10 metres. The required water tower would be defined as a building and will be approximately 30 metres in height and therefore contravenes this development standard.

Clause 4.6 Exception to development standards of BLEP 2013 provides an appropriate degree of flexibility in applying certain development standards to particular development in order to achieve better outcomes for and from development. An assessment of the proposed water tower against Clause 4.6 is provided below.

Clause 4.6 (2) Development consent must not be granted for development that contravenes a development standard unless the consent authority has considered a written request from the applicant that seeks to justify the contravention of the development standard by demonstrating:

- a) that compliance with the development standard is unreasonable or unnecessary in the circumstances of the case; and*

- b) that there are sufficient environmental planning grounds to justify contravening the development standard.*

The water service reservoir is required on the site to provide adequate water supply pressure to the development. In order to provide this water supply pressure the reservoir needs to be elevated (refer Section 3.11.1 of SEE for specific details). This is the most cost effective sustainable method of providing adequate water supply pressure.

Height controls are generally aimed at 'buildings', as a control on the overall scale and bulk of buildings. The reservoir structure, whilst tall, is a relatively low scale structure that will provide a visual feature for the development. The elevation is required to enable the reticulation of water from this tank by gravity. The system would not work if the tank were to be lowered to comply with the height requirement. Elevated water reservoirs such as this were and still are common part of small towns and villages in Australia. They can provide a visual focus and reference point. On balance, given the function of the reservoir, its historic reference and context and the relative low bulk and scale of the structure, it is considered that there is sufficient environmental planning grounds to justify the non-compliance with Clause 4.3 Height of Buildings requirements in this instance. It is therefore considered unreasonable for a water service reservoir to be required to comply with a height restriction of 10 metres under Clause 4.3 Height of Buildings of BLEP 2010 and should be relaxed in this instance.

3. Open space requirements

GeoLINK made a submission to Council (dated 4 March 2015) on the public open space provided in the subdivision proposal. Council has now assessed the local park proposal as acceptable. Council have also advised that further to supporting the construction of the facility, the on-going operation and maintenance implications need to be considered. In this regard, Council will be looking at an extended maintenance period by the proponent to allow Council to build on financial reserves during the development of the subdivision. It is understood that Council will condition this requirement.

4. Owners consent - Land Owned by Coffs Harbour and District Local Aboriginal Land Council (CHDLALC) and Australian Rail Track Corporation

The subdivision proposal has been amended to exclude any works on land owned by CHDLALC or ARTC. As such owners consent is no longer required from CHDLALC or ARTC. An alternate rising sewer main route is now proposed which is discussed below under 'additional matters'.

5. Concerns about the road geometry of the road layout

The subdivision road layout has been redesigned to address Council's concerns in regard to road geometry. A full set of engineering plans are provided as **Appendix A**. The minor amendments to the subdivision layout have necessitated additional assessment with regard to bushfire and ecological impacts. This is included below under 'additional matters'.

6. Stormwater quality development controls and criteria

Council has requested further justification for adopting Option B for Level 3 development under Bellingen Development Control Plan 2010. The 'Level 3 - performance based solution' Option B criteria represent best practice in Australia as indicated in various documents such as those listed below. These guidelines do not require stricter criteria such as the Option A criteria (no net increase in average annual pollutant load above predevelopment conditions) when applied to a 'green field' site.

It is also noted that Council's Option B criteria are also slightly more stringent than the guidelines below in respect to TSS and TP as indicated in the table below.

Contemporary WSUD guidelines:

- *Urban stormwater—Queensland best practice environmental management guidelines 2009 - Technical Note: Derivation of Design Objectives*. Prepared for Environmental Protection Agency by EDAW Ecological Engineering Practice Area. January 2009.
- Water by Design's *Water Sensitive Urban Design – Technical Design Guidelines for South East Queensland*. Produced by the Moreton Bay Waterways and Catchments Partnership with assistance from consultants WBM Oceanics and Ecological Engineering. June 2006
- *Water Sensitive Urban Design (WSUD) Guidelines*. City of Melbourne
- Brisbane City Council's *Water Sensitive Urban Design Engineering Guidelines: Stormwater*.
- *Water Sensitive Urban Design. Technical Guidelines for Western Sydney*. May 2004. Prepared by URS Australia Pty Ltd (URS) for the Upper Parramatta River Catchment Trust (UPRCT)

Criteria	Minimum reduction in developed site pollutant loads (%)				
	Bellingen Council	SE Queensland	Western Sydney	Melbourne Water	Coffs Harbour City Council (refers to SE Queensland Deemed to Comply Solutions)
Total Suspended Solids	90	80	80	80	80
Total Phosphorus	65	60	45	45	60
Total Nitrogen	45	45	45	45	45
Average Annual Gross Pollutant load	90	90	90	70 (litter)	90

7. Amended Plans and Addendum to the Statement of Environmental Effects (SEE).

This response to Council's letter should be read as an addendum to the original SEE (GeoLINK 2014). In the event of any inconsistency between this addendum and the original SEE, this addendum shall prevail to the extent of the inconsistency. All amended plans, additional information and additional assessment are provided as appendices to this addendum.

Additional Matters

1. Alternate Sewer Route

As Council is aware, we have been unable to secure an agreement to obtain land owners consent for the sewer to be approved through its land. We have discussed a number of options with Council's Manager, Water and Waste Water and believe the best option is to construct a new sewer main from the land north along the Pacific Highway road reserve, along Hillside Drive, under Pilot Street and into Council's Pilot Street pump station where effluent would be pumped to the Urunga sewerage treatment plant. **Appendix F** shows the proposed new route for the sewer rising main.

The rising main would be constructed via a mix of trenching and underboring. Given the highly disturbed nature of the route (road reserve) it is not envisaged that the works would create any significant impacts subject to appropriate mitigation measures. The works would also be subject to approval under Section 138 of the Roads Act 1993 and under Section 68 of the Local Government Act

1983 which would provide Council opportunity to require any required assessment of potential construction impacts of the rising main.

The Pilot Street pump station would need to be upgraded in order to accommodate the subdivision. Council's Manager, Water and Waste Water has advised that Council is planning to upgrade the pump station and that the Church would need to contribute to the upgrade on a proportionate basis.

2. Ecological Assessment – Additional Road and Subdivision Layout Amendments

Vegetation/Habitat Removal

Native vegetation removal requirements of the revised development are shown in the table below and illustrated in **Appendix D**. The revised development footprint would result in the removal of 20.46 ha of native vegetation, an increase of 1.34 ha. This includes removal of an additional 0.14 ha of the *Threatened Species Conservation Act 1995* (TSC Act) listed Endangered Ecological Community (EEC) Swamp Sclerophyll on Coastal Floodplain. Approximately 0.08 ha of Subtropical Coastal Floodplains Forest of the NSW North Coast Bioregion would also require removal.

Vegetation Community	Conservation Significance	Original Development Footprint Vegetation Removal (ha)	Revised Development Footprint Vegetation Removal (ha)	Difference (ha)
Blackbutt Dry Sclerophyll Forest	Low	15.31	15.58	0.27
Mixed Open Woodland	Low	1.75	2.16	0.41
Ironbark/ Tallowwood/ Mahogany Dry Sclerophyll Forest	Low: non-EEC High: Subtropical Coastal Floodplains Forest of the NSW North Coast Bioregion EEC	1.48 (non-EEC)	2.00 (1.92 ha non-EEC; 0.08 ha EEC)	0.52
Blackbutt Woodland	Low	0.35	0.35	0
Swamp Mahogany/ Swamp Box Dry Sclerophyll Forest	High: Swamp Sclerophyll on Coastal Floodplain EEC	0.18	0.28	0.10
Swamp Mahogany Woodland	High: Swamp Sclerophyll on Coastal Floodplain EEC	0.05	0.09	0.04
Total	-	19.12	20.46	1.34

In total four hollow-bearing trees require removal as part of the revised development, as documented in the original ecological assessment (GeoLINK 2013).

Additional impacts from the revised development included:

- Increased habitat fragmentation associated with the additional access road.
- Increased edge effects predominantly associated with the additional access road.
- Increased road collision risk due to the additional access road.

The revised development would overall result in a minor increase to the biodiversity impacts detailed in GeoLINK (2013) ecological assessment. The conclusions of the GeoLINK (2013) ecological assessment remain valid, that is:

- The proposal is unlikely to result in a significant impact on any TSC Act listed threatened species, populations or endangered communities and therefore preparation of a Species Impact Statement is not required for the proposal.
- The proposal is unlikely to result in significant impacts to any threatened species, communities or migratory species listed under the EPBC Act and referral to the Commonwealth Department of Environment (DoE) and approval by the Minister is not required.

The safeguards of GeoLINK (2013) ecological assessment remain valid, except where revised below:

Safeguard Number (GeoLINK 2013)	Original Safeguard	Revised Safeguard
2	EECs in good condition would be protected by a 20-50 m buffer.	EECs in good condition would be protected by a 20-50 m buffer (excluding access roads)
4	Low condition EECs would be rehabilitated and buffers replanted or rehabilitated as shown in Illustration 6.1 .	Low condition EECs would be rehabilitated and buffers replanted or rehabilitated as shown in revised Rehabilitation Areas (Appendix G). Rehabilitation and replanting areas are quantified in the table below.
5	EECs would be connected within the study area by replanting at least 0.37 ha of appropriate vegetation.	EEC connectivity would be improved through rehabilitating and replanting as shown in revised Rehabilitation Areas (Appendix G) and the table below.

Revised rehabilitation and replanting areas are shown in the revised Rehabilitation Areas illustration in **Appendix G** and quantified in the table below:

Vegetation Community	Area (ha)
Rehabilitate: EEC	1.405
Replant: EEC	0.263
Replant: Fauna Habitat	0.250
Replant: Buffer	3.814

3. Bushfire Assessment – Additional Road and Subdivision Layout Amendments

The amendments to the layout have required some minor adjustments to the determination of asset protection zones. The table below shows the summary of Asset Protection Zones (APZs) required for compliance with PBP 2006 for the new lot layout. It also includes the lot numbers for the previous layout so that they can be compared. The APZs for the new subdivision lay out are shown in **Appendix B**.

It should also be noted that as a result of the subdivision redesign a cul-de-sac has been included in Area 3. This cul-de-sac has been designed to be no more than 200 metres in length and therefore complies with PBP.

Previous lot numbers	Proposed new lot number	Direction	Effective Slope (degrees)	Effective Slope Category	Dominant Vegetation Formation	Inner Protection Area	Outer Protection Area	Total APZ
AREA 1 (Lots 1-20)	AREA 1 (Lots 1-20)							
6-11	6-11	North-east	3.25	>0-5°	Grassland	-	-	10
11-13	11-13	East	3.09	>0-5°	Forest	15	5	20
1, 13-16	1, 13-16	South-east	4.24	>0-5°	Forest	15	5	20
AREA 2 (Lots 21-76)	AREA 2 (Lots 21-82)							
21-22	21-22	North-east	6.71	>5-10°	Forest	15	15	30
21, 40-41	21, 61 - 62	North-west	4.76	>0-5°	Forest	15	5	20
23, 42-43	23 - 27	North-east	10.3	>10-15°	Forest	20	20	40
34	75	North	6.17	>0-5°	Forest	15	15	20
35-39	76 - 82	North-west	4.01	>0-5°	Forest	15	5	20
43-47	27 - 33	South-east	8.75	>5-10°	Forest	15	15	30
48-55	34 - 41	South	7.35	>5-10°	Forest	15	15	30
70	74	North	6.17	>5-10°	Forest	15	15	30
70-76	73-74 and 42- 44	West	4.97	Upslope/flat	Forest	10	10	20
76	42	South	6.34	>5-10°	Forest	15	15	30
AREA 3 (Lots 77-233)	AREA 3 (Lots 77-244)							
77-80	99-103	West	8.75	>5-10°	Forest	15	15	30
81-86	104-109	West	4.76	>0-5°	Forest	15	5	20
87-89	110, 111, 83	South-west	5.08	>5-10°	Forest	15	15	30
89	83	North-west	6.81	>5-10°	Forest	15	15	30
89-91	83-85	North	1.46	>0-5°	Forest	15	5	20
108-110, 126-127	112-114, 125-126	North	2.36	>0-5°	Forest	15	5	20
128-129, 153-156	127-128, 149-152	North	7.8	>5-10°	Forest	15	15	30
156	152	North	7.8	>5-10°	Forest	15	15	30
156-157	152-153	East	10.89	>10-15°	Forest	20	20	40
158-159	154-156	South-east	8.91	>5-10°	Forest	15	15	30
160	160	South-east	3.01	>0-5°	Forest	15	5	20
161-164	161-164	South-east	8.53	>5-10°	Forest	15	15	30

<i>Previous lot numbers</i>	<i>Proposed new lot number</i>	<i>Direction</i>	<i>Effective Slope (degrees)</i>	<i>Effective Slope Category</i>	<i>Dominant Vegetation Formation</i>	<i>Inner Protection Area</i>	<i>Outer Protection Area</i>	<i>Total APZ</i>
165-169	165-169	South-east	7.85	>5-10°	Forest	15	15	30
170	170	South-east	4.86	>0-5°	Forest	15	5	20
175-180	171,187-189	East	10.89	>10-15°	Forest	20	20	40
181-184	190-194	South-east	9.09	>5-10°	Forest	15	15	30
185-188	195-196	South-east	7.77	>5-10°	Forest	15	15	30
188-189, 214-216	197-201	South	2.6	>0-5°	Forest	15	5	20
216-217	202-203	West	9.46	>5-10°	Forest	15	15	30
217-226	203—206, 233-237	North-west	4.4	>0-5°	Forest	15	5	20
227-233	238-244	North-west	8.75	>5-10°	Forest	15	15	30

Conclusion

We believe the additional information addresses all of Councils concerns raised in its correspondence dated 11 October 2014 and we look forward to the application being determined.

Yours sincerely

GeoLINK



Simon Waterworth

Senior Planner / Director

Copy to: "Insert Copy Address Details Here"

Attach:

Appendix A	Revised Engineering Plans
Appendix B	Revised Bushfire Map
Appendix C	Hollow Bearing Tree Data
Appendix D	Revised Development Footprint
Appendix E	Conceptual Water Supply Reservoir Plan
Appendix F	Proposed new route for the Sewer Rising Main
Appendix G	Rehabilitation Areas

Appendix A

Revised Engineering Plans

SOUTH URUNGA RESIDENTIAL SUBDIVISION ENGINEERING DESIGN

1499 / 10	Cover Sheet
1499 / 11	Existing Site Layout Plan
1499 / 12	Proposed Subdivision Overall Layout Plan
1499 / 13	Proposed Subdivision Water Reticulation Plan
1499 / 14	Proposed Subdivision Sewerage Reticulation Plan
1499 / 15	Proposed Stormwater Management Plan
1499 / 16	Proposed Road Classification



A	Layout Design Updated	21/08/2015	TVE	SDW	RE
Rev	Description	Date	Des.	App.	Chk.
Amendments					

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quality solutions sustainable future

Project Title

South Urunga Residential Subdivision

Client

Lismore Diocese, Bellingen Parish

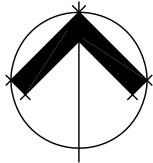
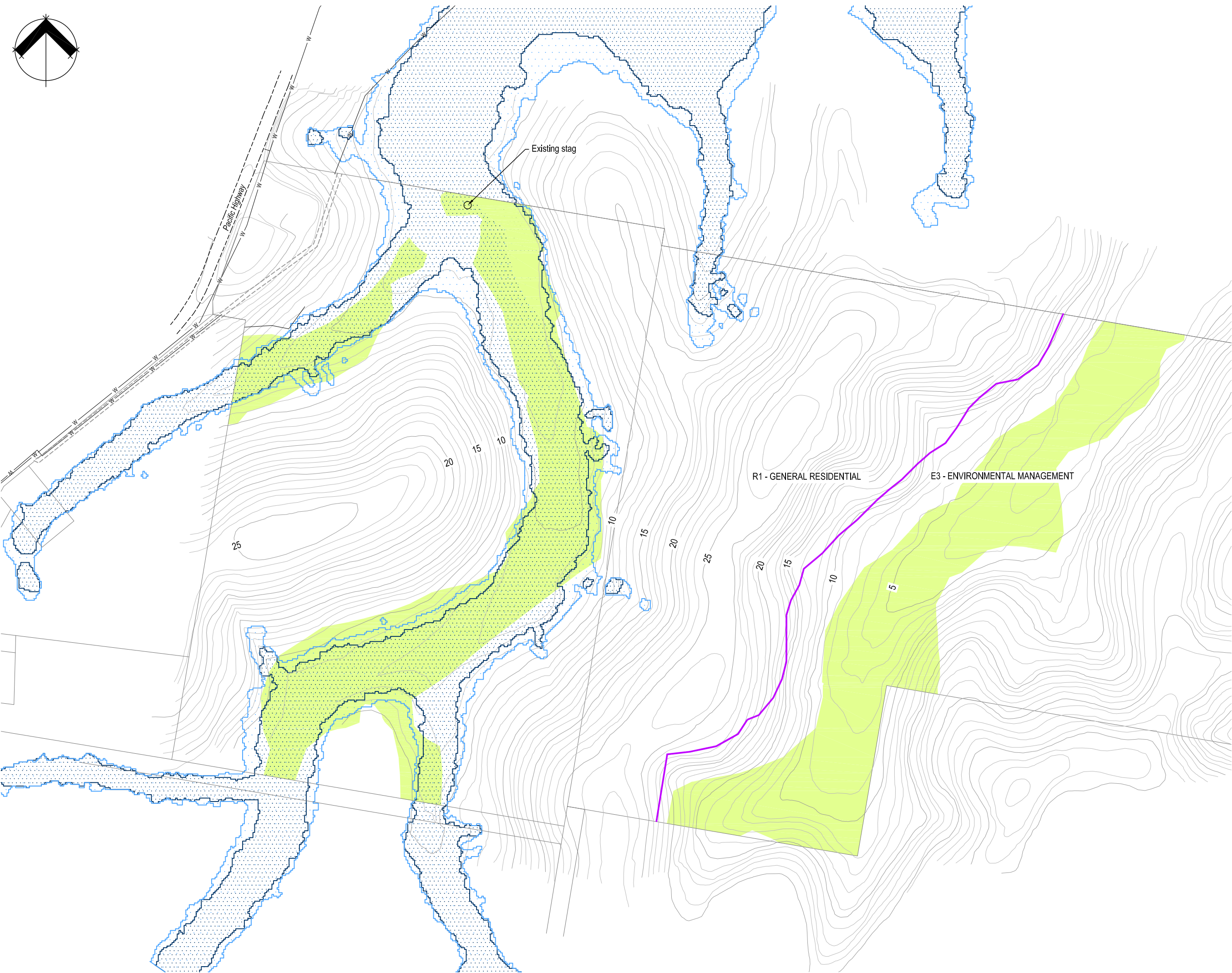
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Approved		Date	Aug 2015	
XREFs				

Scale				
metres	0	20	40	60 80 100

Drawing Title

Cover Sheet

Drawing Number		Revision
1499/10		A



- LEGEND
- Existing contours at 1 m intervals
 - Existing property boundary
 - Existing easement
 - W Existing water main
 - Q100 flood inundation area
 - PMF inundation area
 - Endangered ecological community
 - LEP zone boundary

A	Layout Design Updated	21/08/2015	TVE	SDW	RE
Rev	Description	Date	Des.	App.	Chk.
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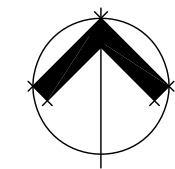
Project Title
South Urunga Residential Subdivision

Client Lismore Diocese, Bellingen Parish					
Designed	TRE	Drawn	TRE	Checked	
Approved		Date	Aug 2015		
XREFs					
Scale					
metres 0 20 40 60 80 100					

Drawing Title
Existing Site
Constraints Plan

Drawing Number
1499/11

Revision
A



- LEGEND
- Existing contours at 1 m intervals
 - Existing property boundary
 - Existing easement
 - Existing water main
 - Proposed lot boundary
 - Proposed road centreline
 - Proposed stormwater bioretention
 - Proposed stormwater swale

A	Layout Design Updated	21/08/2015	TVE	SDW	RE
Rev	Description	Date	Des.	App.	Chk.
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Approved		Date	Aug 2015		
XREFs					
Scale					
metres 0 20 40 60 80 100					

Drawing Title	
Proposed Subdivision Revised Layout Plan	
Drawing Number	Revision
1499/12	A



- LEGEND
- Existing property boundary
 - Existing easement
 - Existing water main
 - Proposed lot boundary
 - Proposed road centreline
 - Proposed water main
 - Proposed Reservoir feed main
 - Proposed water service under road

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Rev	Description	Date	Des.	App.	Chk.
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Project Title

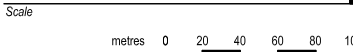
South Urunga Residential Subdivision

Client

Lismore Diocese, Bellingen Parish

Designed	TRE	Drawn	TRE	Checked	
Approved		Date	Aug 2015		

XREFs



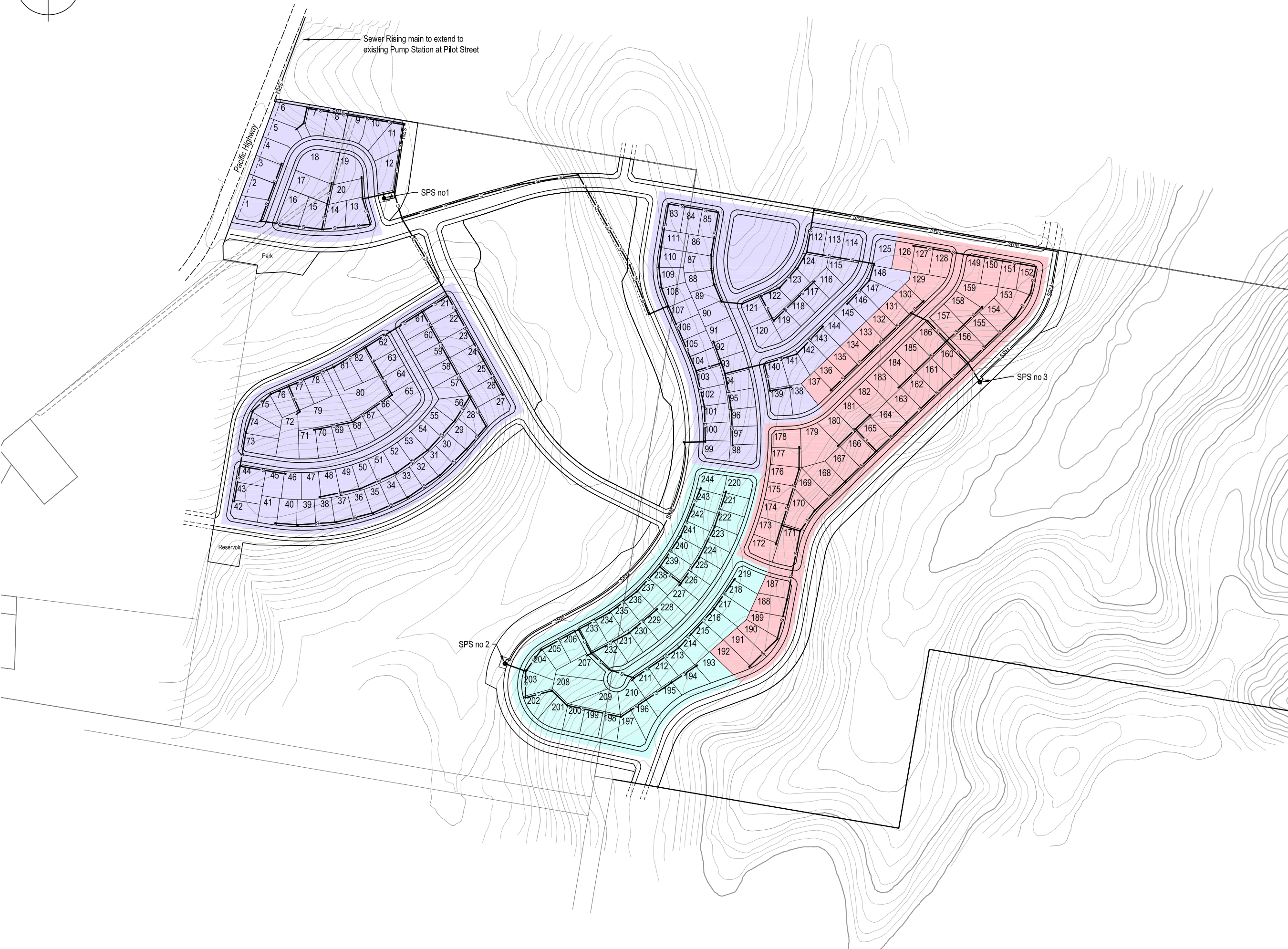
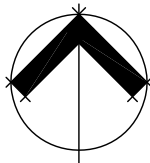
Drawing Title

Proposed Subdivision
Water Reticulation Plan

1499-1061

Drawing Number Revision

1499/13 A



- LEGEND
- Existing contours at 1 m intervals
 - Existing property boundary
 - Existing easement
 - Proposed lot boundary
 - Proposed road centreline
 - Proposed gravity sewer main
 - Proposed sewerage rising main
 - Proposed easement
 - SPS no 1
 - Proposed sewage pumping station
 - Catchment area for SPS no 1
 - Catchment area for SPS no 2
 - Catchment area for SPS no 3

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Rev	Description	Date	Des.	App.	Chk.
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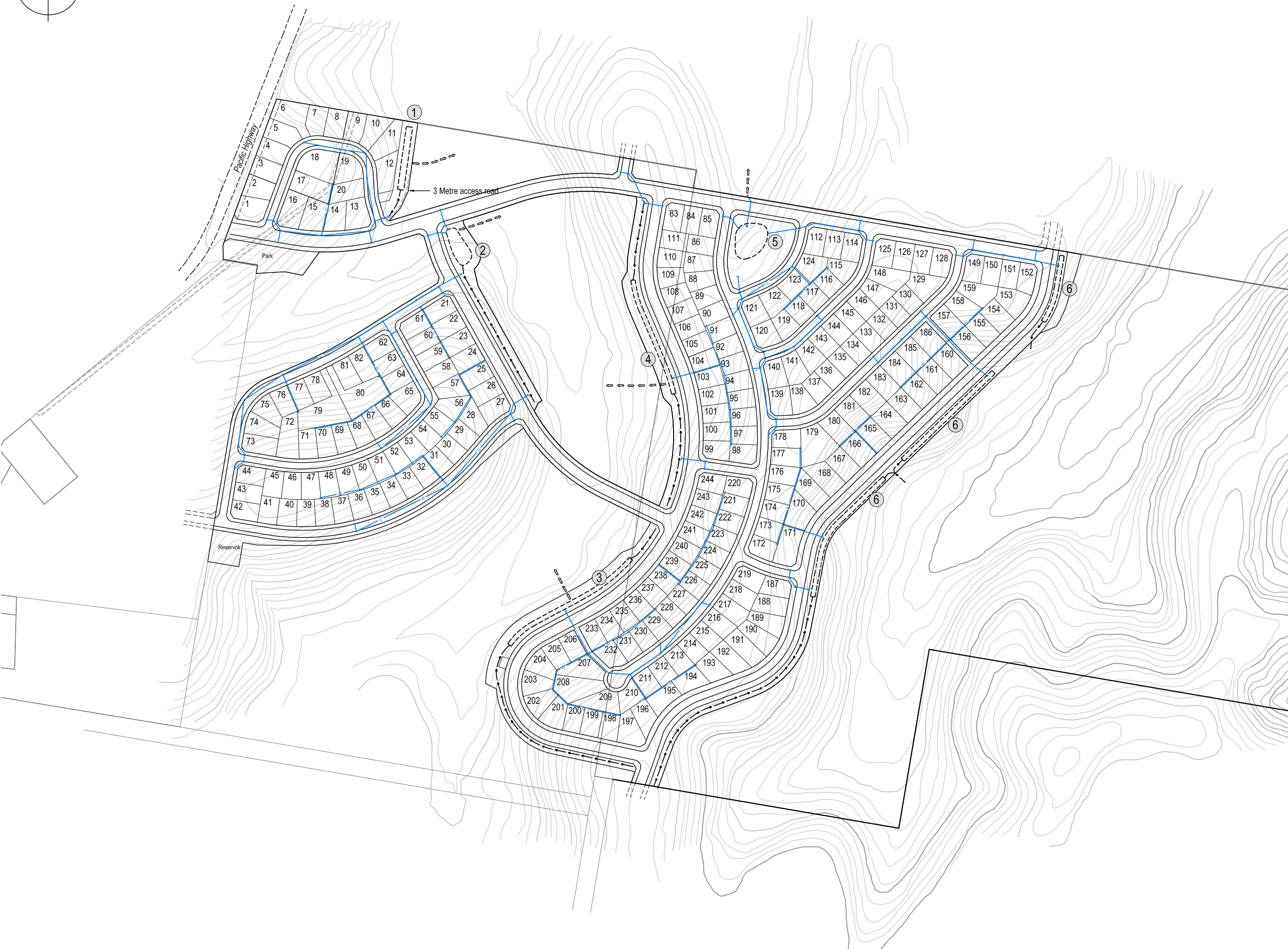
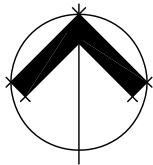
Project Title
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Designed	TRE	Drawn	TRE	Checked	
Approved		Date	Aug 2015		
XREFs					
Scale					
metres 0 20 40 60 80 100					

Drawing Title
Proposed Subdivision
Sewerage Reticulation Plan

Drawing Number
1499/14

Revision
A



- LEGEND
- Existing contours at 1 m intervals
 - Existing easement
 - Proposed lot boundary
 - Proposed road centreline
 - IAD Proposed interlot drainage
 - D Proposed stormwater drainage pipe
 - Proposed stormwater pit / headwall
 - Proposed stormwater bioretention
 - Proposed stormwater swale
 - 1 Bioretention system identifier
 - Path of outflow from bioretention system

A	Layout Design Updated	21/08/2015	TVE	SDW	RE
Rev	Description	Date	Des.	App.	Chk.
Amendments					

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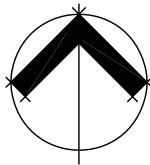
Project Title
South Urunga Residential Subdivision

Client Lismore Diocese, Bellingen Parish					
Designed	TRE	Drawn	TRE	Checked	RC
Approved		Date	Aug 2015		
XREFs					
Scale					
metres 0 20 40 60 80 100					

Drawing Title
**Proposed Subdivision
Stormwater Management Plan**

Drawing Number
1499/15

Revision
A



LEGEND

Existing property boundary

Existing easement

Proposed lot boundary

B1

C

Road Classification - refer Drawing No 1499/17 for typical road sections.



A	Layout Design Updated	21/08/2015	TVE	SDW	RE
Rev	Description	Date	Des.	App.	Chk.
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Client Lismore Diocese, Bellingen Parish					
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Approved		Date	Aug 2015		
XREFs					
Scale					
metres 0 20 40 60 80 100					

Drawing Title
Proposed Road Classification

Drawing Number		Revision
1499/16		A

Appendix B

Revised Bushfire Map



LEGEND

- Revised developmet footprint
- Asset Protection Zones



0 150

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South Urunga Residential Subdivision
1499-1062

Revised Bushfire Map

Appendix B

Appendix C

Hollow Bearing Tree Data

South Urunga Hollow-bearing Tree Data

Tree Number: 1

Lat/Long: S30° 30'39.5" - E153° 00'15.7" **Within Development Footprint:** No (>60 m away)

Species: Stag **DBH (cm):** 150 cm **Approximate Tree Height (m):** 15m

Total Number of Hollows: 4

Hollow Attributes:

<i>Hollow Number</i>	<i>Location on Tree (trunk, inner branch, outer limb)</i>	<i>Height From the Ground</i>	<i>Approximate Opening Diameter</i>	<i>Hollow Angle From Vertical</i>
1	Trunk	15 m	10 cm but crumbling	10 ⁰
2	Main Fork	13 m	5 -10 cm Crumbling	20 ⁰
3	Lower Branch	11 m	25 cm crumbling	50 ⁰
4	Trunk	12 m	15 cm Crumbling	40 ⁰

Photo:



Tree Number: 2

Lat/Long: S30⁰ 30'54.7" - E153⁰ 00'12.7" **Within Development Footprint:** No (>20 m away)

Species: Stag

DBH (cm): 60 cm

Tree Height (m): 15m

Total Number of Hollows: 3

Hollow Attributes:

<i>Hollow Number</i>	<i>Location on Tree (trunk, inner branch, outer limb)</i>	<i>Height From the Ground</i>	<i>Approximate Opening Diameter</i>	<i>Hollow Angle From Vertical</i>
1	Lower Limb	13.5 m	20 cm	70 ⁰
2	Main Fork (1)	13.6 m	10 cm	40 ⁰
3	Main Fork (2)	11 m	7 cm	20 ⁰

Photo:



Tree Number: 3

Lat/Long: S30° 30'53.7" - E153° 00'14.5" **Within Development Footprint:** No (>20 m away)

Species: Tallowood

DBH (cm): 52 cm

Tree Height (m): 20 m

Total Number of Hollows: 6 (most hollows are developing)

Hollow Attributes:

<i>Hollow Number</i>	<i>Location on Tree (trunk, inner branch, outer limb)</i>	<i>Height From the Ground</i>	<i>Approximate Opening Diameter</i>	<i>Hollow Angle From Vertical</i>
1	Trunk	10 m	5 cm	20 ⁰
2	Lower Branch	12 m	4 cm	80 ⁰
3	Lower Branch	13 m	4 cm	20 ⁰
4	Trunk	8 m	2 cm	80 ⁰
5	Trunk	10 m	2 cm	90 ⁰
6	Trunk	11 m	2 cm	85 ⁰

Photo:



Tree Number: 4

Lat/Long: S30° 30' 54.2" - E153° 00' 30.7"
Yes

Within Development Footprint:

Species: Blackbutt

DBH (cm): 183 cm

Tree Height (m): 36 m

Total Number of Hollows: 9 (Hollows are developing)

Hollow Attributes:

<i>Hollow Number</i>	<i>Location on Tree (trunk, inner branch, outer limb)</i>	<i>Height From the Ground</i>	<i>Approximate Opening Diameter</i>	<i>Hollow Angle From Vertical</i>
1	Trunk	2 m	2 cm	45 ⁰
2	Trunk	7 m	2 cm	45 ⁰
3	Trunk	1.5 m	4 cm	45 ⁰
4	Trunk	4 m	5 cm	50 ⁰
5	Trunk	6 m	2 cm	35 ⁰
6	Trunk	2.5 m	3 cm	45 ⁰
7	Trunk	8 m	7 cm	55 ⁰
8	Trunk	10 m	2 cm	55 ⁰
9	Trunk	7.5 m	3 cm	80 ⁰

Photo:



Tree Number: 5

Lat/Long: S30° 30' 36.5" - E153° 00' 35.5"
Yes

Within Development Footprint:

Species: Blackbutt

DBH (cm): 110 cm

Tree Height (m): 38 m

Total Number of Hollows: 4 (hollows are developing)

Hollow Attributes:

<i>Hollow Number</i>	<i>Location on Tree (trunk, inner branch, outer limb)</i>	<i>Height From the Ground</i>	<i>Approximate Opening Diameter</i>	<i>Hollow Angle From Vertical</i>
1	Trunk	10 m	5-10 cm	80 ⁰
2	Lower Limb	14 m	2 cm Developing	50 ⁰
3	Lower Limb	15 m	3 cm Developing	40 ⁰
4	Trunk	5 m	2 cm Developing	90 ⁰

Photo:



Tree Number: 6

Lat/Long: S30° 30' 41.2" - E153° 00' 36.5"
Yes

Within Development Footprint:

Species: Stag

DBH (cm): 60 cm

Tree Height (m): 18m

Total Number of Hollows: 4

Hollow Attributes:

<i>Hollow Number</i>	<i>Location on Tree (trunk, inner branch, outer limb)</i>	<i>Height From the Ground</i>	<i>Approximate Opening Diameter</i>	<i>Hollow Angle From Vertical</i>
1	Upper Trunk	14 m	10 cm	0°
2	Upper Limb	11 m	4 cm	50°
3	Upper Limb	12 m	2 cm	55°
4	Trunk	8 m	5 cm	0°

Photo:



Tree Number: 7

Lat/Long: S30° 30' 40.5" - E153° 00' 35.7"
Yes

Within Development Footprint:

Species: Stag

DBH (cm): 55 cm

Tree Height (m): 15 m

Total Number of Hollows: 5

Hollow Attributes:

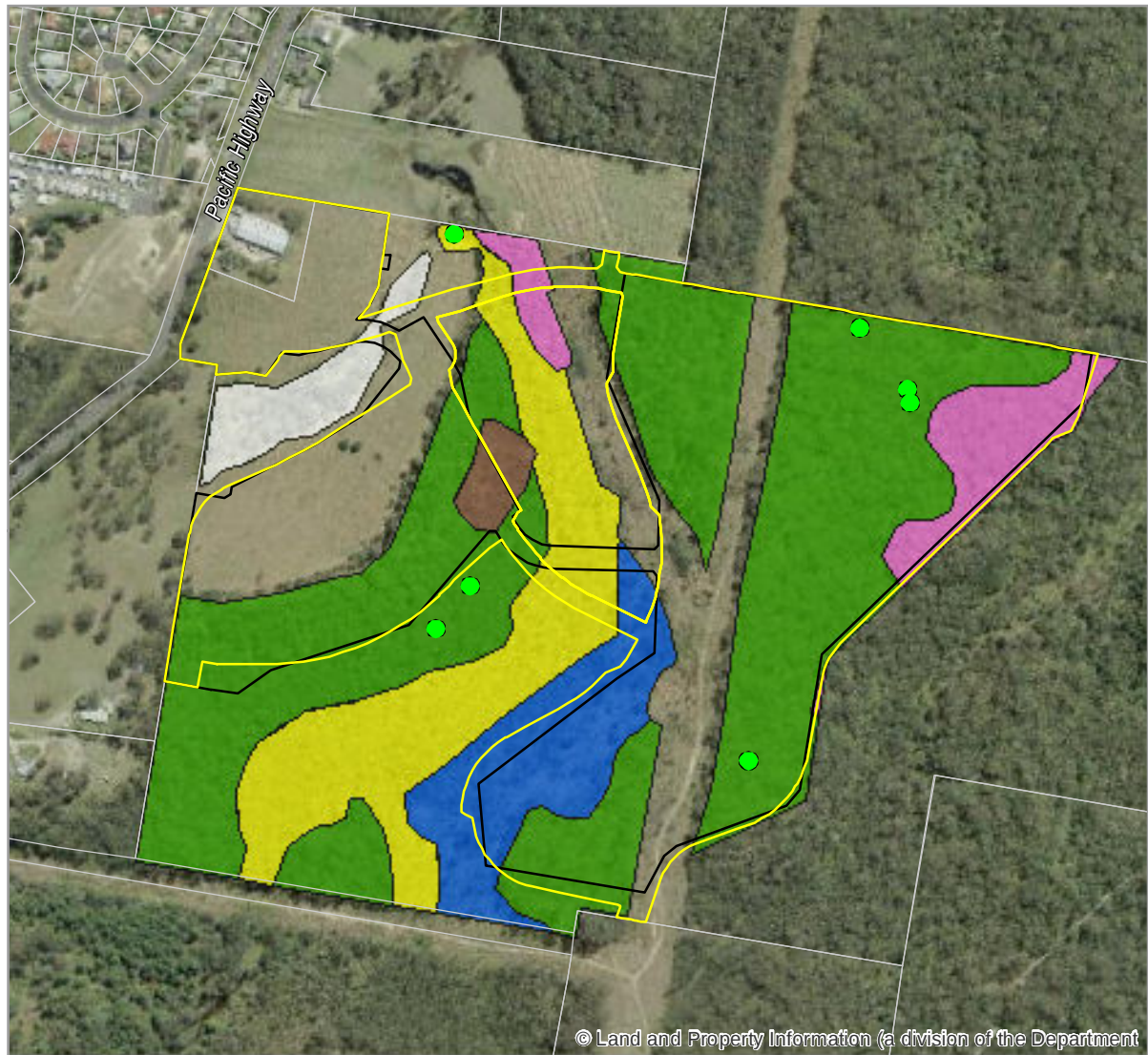
<i>Hollow Number</i>	<i>Location on Tree (trunk, inner branch, outer limb)</i>	<i>Height From the Ground</i>	<i>Approximate Opening Diameter</i>	<i>Hollow Angle From Vertical</i>
1	Right Fork Trunk	7 m	15 cm	15 ⁰
2	Upper Right Fork Trunk	12 m	10 cm	10 ⁰
3	Lower Left Fork Limb	10 m	5 cm	40 ⁰
4	Upper Left Fork Limb	13 m	5 cm	35 ⁰
5	Top of Left Fork Trunk	14 m	12 cm	40 ⁰

Photo:



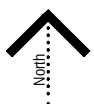
Appendix D

Revised Development Footprint



LEGEND

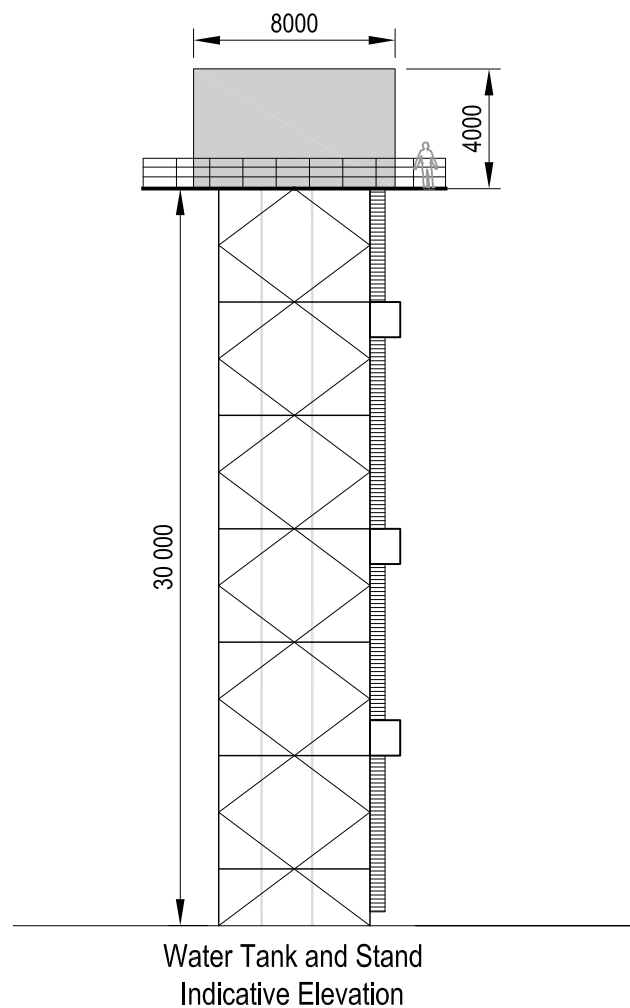
- Revised development footprint
- Original development footprint
- Hollowbearing trees
- Blackbutt Dry Sclerophyll Forest
- Blackbutt Woodland
- Ironbark/Tallowood/Mahogany Dry Sclerophyll Forest
- Mixed Open Woodland
- Swamp Mahogany Woodland
- Swamp Mahogany/Swamp Box Dry Sclerophyll Forest



0 150

Appendix E

Conceptual Water Supply Reservoir Plan



0 NTS

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South Urunga Residential Subdivision
1499-1057

Conceptual Water Supply Reservoir Plan

Appendix E

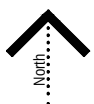
Appendix F

Proposed new route for the Rising Sewer Main



LEGEND

- Revised development footprint
- Preferred sewage rising main route
- Underbore for preferred sewage rising main route
- Alternate sewage rising main
- Underbore for alternate sewage rising main route
- Sewage pump station



0 250

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Proposed New Route for the Sewer Rising Main

Residential Subdivision South Urunga
1499-1058

Appendix F

Appendix G

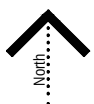
Rehabilitation Areas



LEGEND

- Revised developmet footprint
- Rehabilitate: EEC
- Replant: EEC
- Replant: Fauna
- Replant: Buffer

Rehabilitation Areas



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South Urunga Residential Subdivision
1499-1065

Appendix G

23 November 2015
Ref No: 1499-1068

General Manager
Bellingen Shire Council
PO Box 117
BELLINGEN NSW 2454

Attention: Matthew Hutchings

Dear Matthew,

Development Application 2014/DA-00129 South Urunga Subdivision

I refer to the letter dated 9 November 2015 by NSW Office of Environment and Heritage (OEH) to Council regarding the abovementioned development application. The letter from OEH provides recommendations to Council on the:

- Assessment of ecological impacts specifically the impact on the Glossy Black-cockatoo; and
- Determination and providing biodiversity offset areas to offset the ecological impacts of the development.

The purpose of this letter is to provide our opinion on the recommendations made by OEH.

Impact on the Glossy Black-cockatoo

OEH have stated in the aforementioned letter that it recommends that:

"Given the extensive occurrence and known value of the Allocasuarina's (she-oaks) on site as a Glossy Black foraging resources we reiterate the recommendation contained in our letter dated 9 October 2014 which states *"Council require the applicant to reduce the footprint of the proposed subdivision to avoid areas containing...dense concentrations of she-oaks trees in the north-eastern parts of the development footprint"*. By reducing the development footprint to avoid impacting these resources of high conservation value, this would reduce the fragmentation of Glossy Black-cockatoo foraging habitat by retaining a relatively large contiguous tract of dense and moderately dense she-oaks"

This latest recommendation differs from OEH's original letter of 9 October 2014 which states that OEH strongly recommends that Council requests that applicant undertake additional surveys and ecological assessment on the impacts of the Gloss Black-cockatoo or **alternatively** reduces the footprint of the proposed subdivision to reduce the impact on areas that contain potential nesting sites for the Glossy Black-cockatoo and avoid impacting on dense concentrations of she-oak trees.

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As Council is aware, we chose to undertake the additional survey and assessment work. This work was undertaken by a suitably qualified ecological consultant as was recommended by OEH. The additional survey work and ecological assessment was provided to Council in our correspondence dated 31 August 2015, which determined that the conclusions of the original GeoLINK ecological assessment remain valid. That is, the Proposal is unlikely to result in a significant impact on the local Glossy Black-cockatoo population.

It appears that OEH is choosing ignoring this additional assessment and findings and is now recommending that only the option of reducing the development footprint should be considered by Council. We do not agree with this recommendation from OEH for the following reasons.

- OEH is not taking into consideration the historical context of the development site. The adoption of the Bellingen Shire Growth Management Strategy and Bellingen Shire Local Environmental Plan 2010, both of which underwent rigorous assessment and considerable community consultation, set the development footprint for this site. This involved back zoning much of the subject site to an Environmental Management Zone. We have kept within the confines of this adopted footprint in designing the subdivision and demonstrated that the development will not have a significant impact on Endangered Ecological Communities (EECs) and threatened species.
- OEH requested additional assessment on impacts to the Gloss Black-cockatoo. As outlined above, this has been carried out and has determined that the Proposal is unlikely to result in a significant impact on the local Glossy Black-cockatoo population.
- The proposal will result in the loss of 1.24 hectares of moderately dense she-oak, 3.85 hectares of dense she-oak and 1.71 hectares of very dense she-oak (total 6.26 ha). This loss is shown in **Illustration 1** which is attached to this letter. As can be identified from **Illustration 1**, there is a considerable amount of alternative foraging habitat available within the site and also locally around the site. **Table 1** shows the existing habitat within the locality (i.e. the EcoPro Study area) and on the church site (Lot 2 DP 792596) compared to what is proposed to be removed. It should be noted that the majority of the residual foraging habitat is located within the E3 Environmental Projection zone and therefore will be protected. As can be identified from this information, the Proposal will not result in a significant loss of foraging resources for the local Glossy Black Cockatoo population.
- As Council is aware, from the considerable history of the site, there are a number of constraints (other than ecological) to the development of the land. These include:
 - bushfire implications;
 - flooding and drainage constraints;
 - stormwater quality and quantity;
 - adjoining agricultural land uses;
 - slope;
 - potential contamination of certain parts of the site;
 - access and associated costs of constructing an access to service any development;
 - requirement to augment existing services such as water and sewer; and
 - provision of pedestrian access links back to Urunga.

All of these constraints (including ecology) played an important role in the design of the subdivision to ensure an objective and balanced design outcome. OEH recommendations appear to be focussed only on the ecological constraints of the land.

- We believe that the proposed subdivision design offers significant community benefits as it considers all constraints and opportunities of the site. These benefits include:
 - greater potential to increase protection measures and rehabilitation of the EECs that are located on the site;
 - optimising available land for residential development. There is currently limited developable land in and around Urunga to cater for further population growth so development of the few sites that exist should seek to ensure maximum development potential;
 - creating a more vibrant community through greater critical mass that will increase availability and viability of community facilities and services such as the proposed neighbourhood park and possible public transport connections;

- assist in funding the significant infrastructure costs that will need to be met including construction of new water reservoir, augmentation of the reticulated sewage system and construction of a new intersection;
 - lowering developer contribution fees for individual allotments; and
 - an increased development footprint enables better implementation of urban design principles and facilitates a more permeable and connected layout than the previously proposed subdivision layout.
- The Trustees of the Roman Catholic Church have witnessed the development potential of this land significantly reduced over the years with the adoption of Development Control Plans, declaration of EECs and in recent years the back zoning of over half the land from a residential zone to an environmental management zone under BLEP 2010. The Church has been very accommodating and has worked closely with Council in coming up with the development area/proposal footprint which avoided impacts on EECs and other areas of environmental significance. The recommendation from OEH appears to ignore this historical context and seeks to further decrease lot yield and reduce the viability of the development.

Table 1 Foraging Habitat for Glossy Black-cockatoo

	<i>Very Dense She-Oak</i>	<i>Dense She-Oak</i>	<i>Moderately Dense She-Oak</i>	<i>Total</i>
EcoPro study area	19.4ha	30.3ha	21ha	70.7ha
Currently on site (Lot 2 DP 792596)	6.0 ha	12.1ha	2.8ha	20.9ha
Proposed for removal (within development footprint)	1.17ha	3.85ha	1.24 ha	6.26 ha

BioBanking

We don't understand why OEH is now recommending to Council that biodiversity loss be quantified through the BioBanking Assessment Methodology and that an appropriate offset site be determined in accordance with the OEH policy. OEH's original letter dated, 9 October 2014, makes no such recommendation and it is of concern that it has now changed its position especially at the end of the assessment process for this DA. It needs to be noted that the offset for the development of this land was effectively negotiated between Council and the owner when over half of the land was backed zoned to E3 Environmental Management Zone under BLEP 2010. It has been the position of Council and the owner of the land that the back zoned land would constitute the biodiversity offset for the development footprint. Hence the development application was prepared on this basis. We do not believe that it is acceptable now to require the proponent to undertake a BioBanking Assessment.

The residue lot contains all land that is zoned E2, E3 and all other land containing EEC/buffer to EEC. This land will be protected in perpetuity (as encouraged by OEH in its letter dated 9 October 2014) as it will not be able to be developed because of its zoning or EEC status. Council can also rezone the EEC/buffer that is located in the R1 zone to an environmental protection zone in future if so desires.

Conclusion

The latest recommendations from OEH are inconsistent with its original recommendations. These latest recommendations also do not take into consideration the back zoning of a large section of the subject land under BLEP 2010. GeoLINK has undertaken a comprehensive ecological assessment of the proposal and has provided requested additional survey work and assessment which justifies the development footprint in the context of the required statutory framework. The development will not result in a significant ecological impact and warrants favourable consideration from Council.

We would welcome the opportunity to discuss this matter further with Council in order to have the development application determined as quickly as possible.

Yours sincerely

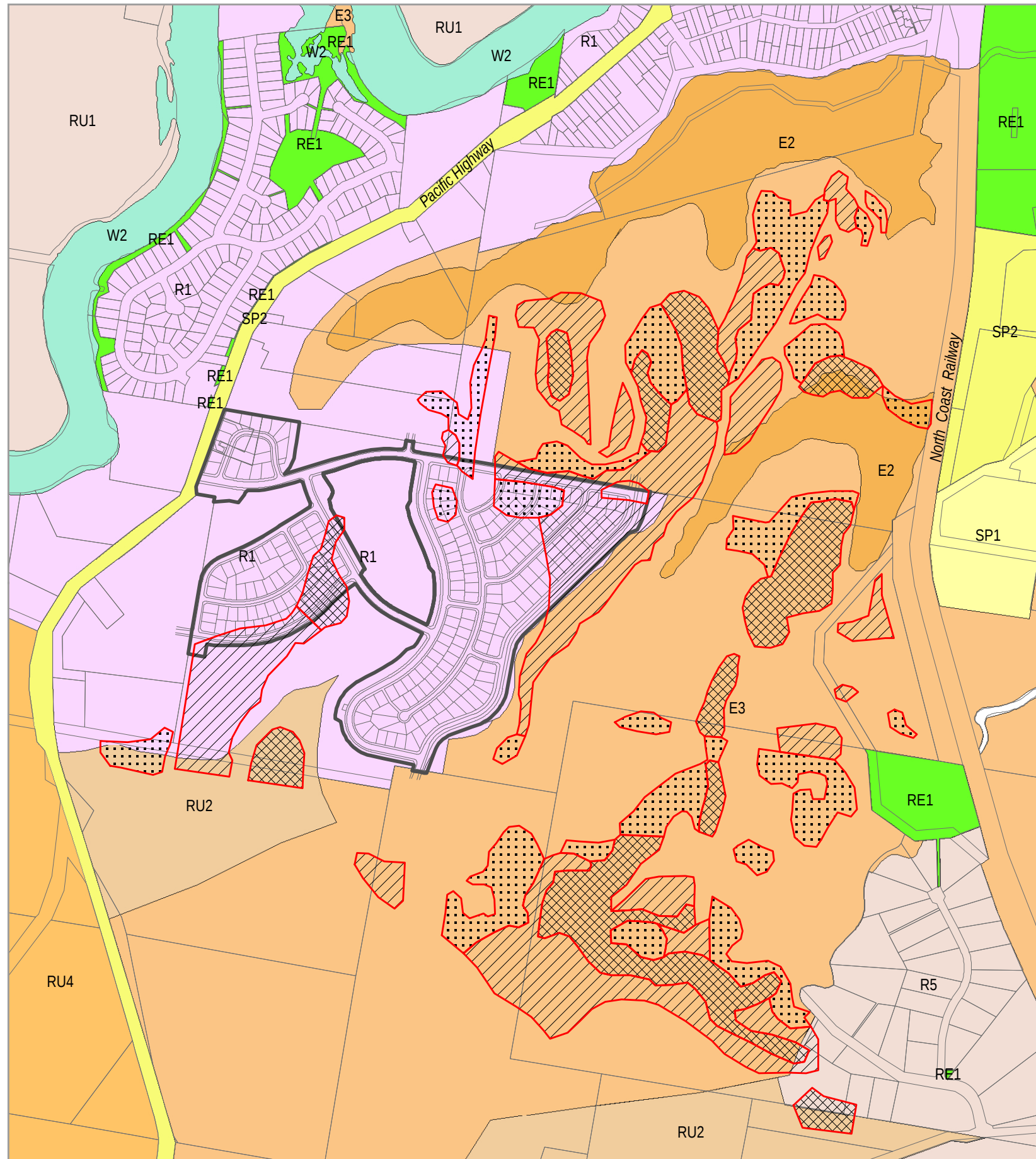
GeoLINK



Simon Waterworth

Director / Town Planner

Copy to: Trustees of the Roman Catholic Church – Bellingham Parish
Attach: Illustration 1 Habitat Features

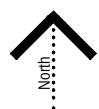


LEGEND

- Revised development footprint
- Very Dense She-Oaks
- Dense She-Oaks
- Moderately Dense She-Oaks
- E2 Environmental Conservation
- E3 Environmental Management
- R1 General Residential
- R5 Large Lot Residential
- RE1 Public Recreation
- RU1 Primary Production
- RU2 Rural Landscape
- RU4 Primary Production Small Lots
- SP1 Special Activities
- SP2 Infrastructure
- W2 Recreational Waterways

NOTE

Vegetation polygons traced from Eco Pro
Figure 6 - Significant Habitat Features



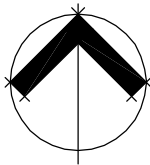
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GeoLINK
environmental management and design

South Urunga Residential Subdivision
1499-1066

Habitat Features

Illustration 1



LEGEND

- Existing property boundary
- Existing easement
- Proposed lot boundary

- TOTAL APZ Method 2 Alternate
- TABLE AS3959 FDI-80

B	Lot Layout Updated	16/12/2015	RE	SDW	RE
A	Layout Design Updated	21/08/2015	TVE	SDW	RE
Rev	Description	Date	Des.	App.	Chk.
Amendments					

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This drawing must not be relied upon for any purpose other than that for which it was prepared or by any person or corporation other than the referred client.



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quality solutions sustainable future

Project Title

South Urunga Residential Subdivision

Client

Lismore Diocese, Bellingen Parish

Designed	TRE	Drawn	TRE	Checked	
Approved		Date	Aug 2015		

XREFs

Scale
metres 0 20 40 60 80 100

Drawing Title

APZ Options

Drawing Number

1499/16

Revision

B



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**Alternate Solution:
Radiant Heat Calculations: 1499 South Urunga
Residential Sub-division Development Proposal**

Client: Geolink

18 December 2015



This report has been prepared by: **Melanie Jackson**
Grad Dip (Bushfire Protection); B.App.Sc (EnvResMgt)
BPAD-Level 3 Accredited Practitioner & Member of the FPA Australia

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‘Prepare—Act—Survive’

In the Event of an Emergency Call:

‘000’

DISCLAIMER

Despite best efforts, there is no guarantee that desirable outcomes are achievable during extreme bushfire weather episodes, which may occasion unpredictable bushfire behaviour and have detrimental consequences to life, property and the environment.

Any representation, statement, opinion, or advice expressed or implied in this report is made in good faith on the basis that Bushfire Risk or its employees are not liable (whether by reason of negligence, lack of care or otherwise) to any person for damage or loss whatsoever that may occur in relation to that person taking or not taking (as the case may be) action in respect of any representation, statement or advice referred to below.

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I. INTRODUCTION

The purpose of this report is to provide additional information in support of the 1499 South Urunga Residential Sub-division Development Application to Council in relating specifically to bushfire as per the current legislative requirements. The land to which this development relates is 1 and 2 DP 792596 8140 Pacific Highway, Urunga.

An additional information request from the NSW Rural Fire Service (RFS Ref. D14/2579); dated 8 December 2015 has requested the following information:

A detailed plan that identifies the location of BAL-29 'contour' consistent with the separation distances evaluated by AS3959-2009. This plan will be used to identify if any required 88B restrictions are required to be placed upon lots to ensure future dwellings can be erected and not exceed the BAL-29 construction criteria.

The requirement for suitable Building Location Envelopes (BLE) must be made available within each lot within the subject site, requiring radiant heat flux to the receiver (future dwelling/s) of up to and including 29kW/m^2 . By calculating the radiant heat flux this will in turn ensure direct flame contact to the receiver is negated and construction of future dwellings is able to meet BAL-29 or lower.

Bushfire Risk has been commissioned by Geolink to conduct an assessment of the radiant heat flux and associated minimum setback requirements as per AS3959-2009. This assessment shall be referred to as an Alternate Solution which requires both Method 1 and Method 2 calculations as described in AS3959-2009. These results aim to satisfy the RFS request in order to properly assess the application.

Having identified site constraints and anomalies between the planning requirements using 'Table A2.5 - Planning for Bushfire Protection' (2006), which in many cases does not directly match the minimum radiant heat flux and associated BAL rating requirements of AS3959-2009, and in some cases the steeper allotments may hinder minimum requirements in relation to appropriate siting, minimum construction level and engineering potential on those lots.

A Bushfire Hazard Assessment Report was conducted by Geolink dated: 3 May 2015. This Alternate Solution shall be presented as an Appendix to this document and shall be read in conjunction with that report, thus presenting suitable setbacks from the hazard in order for Geolink to establish suitable BLEs that meet the requirements.

A BFSEB contained herein documents the process to formulate the alternate solution and demonstrate compliance.

2. BUSHFIRE SAFETY ENGINEERING BRIEF - ALTERNATE SOLUTION

The following BFSEB summarises the process of the analysis undertaken to formulate the alternate solution to achieve compliance as required for the proposed sub-division and potential future building requirements.

1.1 METHODOLOGY

Method 1—Simplified Procedure and Method 2—Complex Procedure for Determining the Bushfire Attack Level as per AS3959–2009 with an FDI-80 was used to determine the minimum setback distances and maximum BAL-29 construction level based on radiant heat flux of up to and including 29kW/m².

The methodology used includes the Newcastle Bushfire Calculator (NBC 2013) programme in order to determine actual radiant heat flux; the results are presented herein (Ref. Appendix A). Data collected by Geolink including slope, vegetation type and maximum radiant heat exposure were programmed into the NBC Calculator, this was cross checked against the APZ (separation distance) calculator to ensure no direct flame may come into contact with future dwellings, where direct flame contact was observed, the APZ was extended to correct for this.

As a qualified bushfire consultant I, Melanie Jackson, have not visited or ground truthed the subject site in person. I have used the site assessment results and data provided by Geolink only and the results are based on their findings.

1.2 RESULTS

Based on the relevant provisions of AS3959–2009, the results indicate the point at which by either Method 1 or Method 2 calculations provided herein (Ref. Table 1), suitable separation distance between the hazard and BLEs in order to meet the requirements for construction level of up to and including BAL-29 and radiant heat flux to the receiver is not expected to exceed 29kW/m².

The results indicate Method 2 calculations in general provide lesser separation distances than those of Method 1 (Ref. Table 1), however in both instances the radiant heat flux is calculated to be less than 29kW/m² and direct flame contact is avoided.

3. CONCLUSION

In relation to the proposed subdivision namely: 1499 South Urunga Sub-division, this assessment makes the determination through the use of method 1 and method 2 calculations as per the methodology described in AS3959-2009, that the proposed minimum APZ distances as mapped herein, provide adequate separation distance between the hazard and BLEs across the subject site.

Radiant heat flux is unlikely to exceed 29kW/m^2 to each BLE and direct flame contact is negated, allowing suitable BLEs across the subject site, which attracts suitable construction requirements of up to and including BAL-29. APZ will be taken up across each allotment, across Council road reserves and parks.

This allows the development to place suitable 88B restrictions on the lots as required to ensure future dwellings can be erected and not exceed BAL-29 construction criteria, using the alternate solution namely the Method 2 - complex procedure (AS3959-2009) to determine radiant heat flux to future dwellings.

As a qualified consultant in Bushfire Risk Assessment as recognised by the NSW Rural Fire Service, this report considers the assessment results accurate and where future dwellings are sited with minimum APZ distances to the BLEs as determined herein concludes radiant heat exposure is unlikely to exceed 29kW/m^2 to potential buildings and direct flame contact is negated; construction levels of up to BAL-29 are achievable within each lot.

Provided the proposed development is carried out in accordance with the recommendations contained herein, suitable BLEs within each allotment are compliant with the provisions of *Planning for Bushfire Protection* (RFS 2006); *Planning for Bush Fire Protection, Addendum: Appendix 3* (RFS 2010) and AS3959-2009 in relation to minimum BAL ratings.

The setbacks provided herein (Ref. Appendix 1; Table 2) in my professional opinion shall satisfy the minimum requirements discussed herein. Consultation with the Commissioner of the NSW Rural Fire Service is required and the consent authority must be satisfied the development conforms to the relevant specifications and requirements.*

* Note: Despite best efforts and due to the unpredictable behaviour, variable nature of bushfires and that the standard has been designed to improve performance of buildings in bushfire prone areas, there can be no guarantee that any one building will withstand a bushfire attack on every occasion and desirable outcomes are not always achievable during extreme bushfire weather episodes.

This Bushfire Hazard Assessment provides the required information to assist Local Council and the Rural Fire Service in determining compliance in accordance with Planning for Bushfire Protection and AS3959-2009. The Local Council is the Final Consent Authority and the construction of the building must comply with the recommendations included in the Council's conditions of consent.

TABLE I: BUSHFIRE ASSESSMENT RESULTS

<i>Proposed new lot number</i>	<i>Direction</i>	<i>Effective Slope (degrees)</i>	<i>Effective Slope Category</i>	<i>Dominant Vegetation Formation</i>	<i>Inner Protection Area (IPA)</i>	<i>Outer Protection Area (OPA)</i>	<i>Total APZ TABLE A2.5 PBP</i>	<i>TABLE 2.4.3 FDI-80 AS3959</i>	<i>TOTAL APZ Method 2 Alternate Solution</i>	<i>IPA Method 2</i>	<i>OPA Method 2</i>
AREA 1 (Lots 1-20)											
6-11	North-east	3.25	>0-5°	Grassland	-	-	10	9	9	-	-
11-13	East	3.09	>0-5°	Forest	15	5	20	27	25	16	9
1, 13-16	South-east	4.24	>0-5°	Forest	15	5	20	27	27	17	10
AREA 2 (Lots 21-82)											
21-22	North-east	6.71	>5-10°	Forest	15	15	30	33	29	19	10
21, 61 - 62	North-west	4.76	>0-5°	Forest	15	5	20	27	27 (27.4)	18	9
23 - 27	North-east	10.3	>10-15°	Forest	20	20	40	42	36 (36.3)	24	12
75	North	6.17	5-10°	Forest	20	20	30	33	29 (29.4)	19	10
76 - 82	North-west	4.01	>0-5°	Forest	15	5	20	27	26 (26.3)	17	9
27 - 33	South-east	8.75	>5-10°	Forest	15	15	30	33	34	22	12
34 - 41	South	7.35	>5-10°	Forest	15	15	30	33	31 (31.2)	20	11
73-74and 42- 44	West	4.97	Upslope/flat	Forest	10	10	20	21	18	11	7
42	South	6.34	>5-10°	Forest	15	15	30	33	30	19	11
AREA 3 (Lots 77-244)											
99-103	West	8.75	>5-10°	Forest	15	15	30	33	34	22	12
104-109	West	4.76	>0-5°	Forest	15	5	20	27	27 (27.4)	18	9
110, 111, 83	South-west	5.08	>5-10°	Forest	15	15	30	33	28	18	10
83	North-west	6.81	>5-10°	Forest	15	15	30	33	30 (30.4)	20	10
83-85	North	1.46	>0-5°	Forest	15	5	20	27	23 (23.2)	15	8
112-114,	North	2.36	>0-5°	Forest	15	5	20	27	24 (24.2)	16	8

Proposed new lot number	Direction	Effective Slope (degrees)	Effective Slope Category	Dominant Vegetation Formation	Inner Protection Area (IPA)	Outer Protection Area (OPA)	Total APZ TABLE A2.5 PBP	TABLE 2.4.3 FDI-80 AS3959	TOTAL APZ Method 2 Alternate Solution	IPA Method 2	OPA Method 2
125-126											
127-128, 149-152	North	7.8	>5-10°	Forest	15	15	30	33	32	21	11
152	North	7.8	>5-10°	Forest	15	15	30	33	32	21	11
152-153	East	10.89	>10-15°	Forest	20	20	40	42	38 (37.5)	25	13
154-156	South-east	8.91	>5-10°	Forest	15	15	30	33	34	22	12
160	South-east	3.01	>0-5°	Forest	15	5	20	27	25	16	9
161-164	South-east	8.53	>5-10°	Forest	15	15	30	33	33 (33.2)	22	11
165-169	South-east	7.85	>5-10°	Forest	15	15	30	33	32	21	11
170	South-east	4.86	>0-5°	Forest	15	5	20	27	28 (27.5)	18	10
171,187-189	East	10.89	>10-15°	Forest	20	20	40	42	38 (37.5)	25	13
190-194	South-east	9.09	>5-10°	Forest	15	15	30	33	34 (34.2)	22	12
195-196	South-east	7.77	>5-10°	Forest	15	15	30	33	32	21	11
197-201	South	2.6	>0-5°	Forest	15	5	20	27	25 (24.5)	16	9
202-203	West	9.46	>5-10°	Forest	15	15	30	42	35	23	12
203—206, 233-237	North-west	4.4	>0-5°	Forest	15	5	20	27	27	17	10
238-244	North-west	8.75	>5-10°	Forest	15	15	30	33	34	22	12

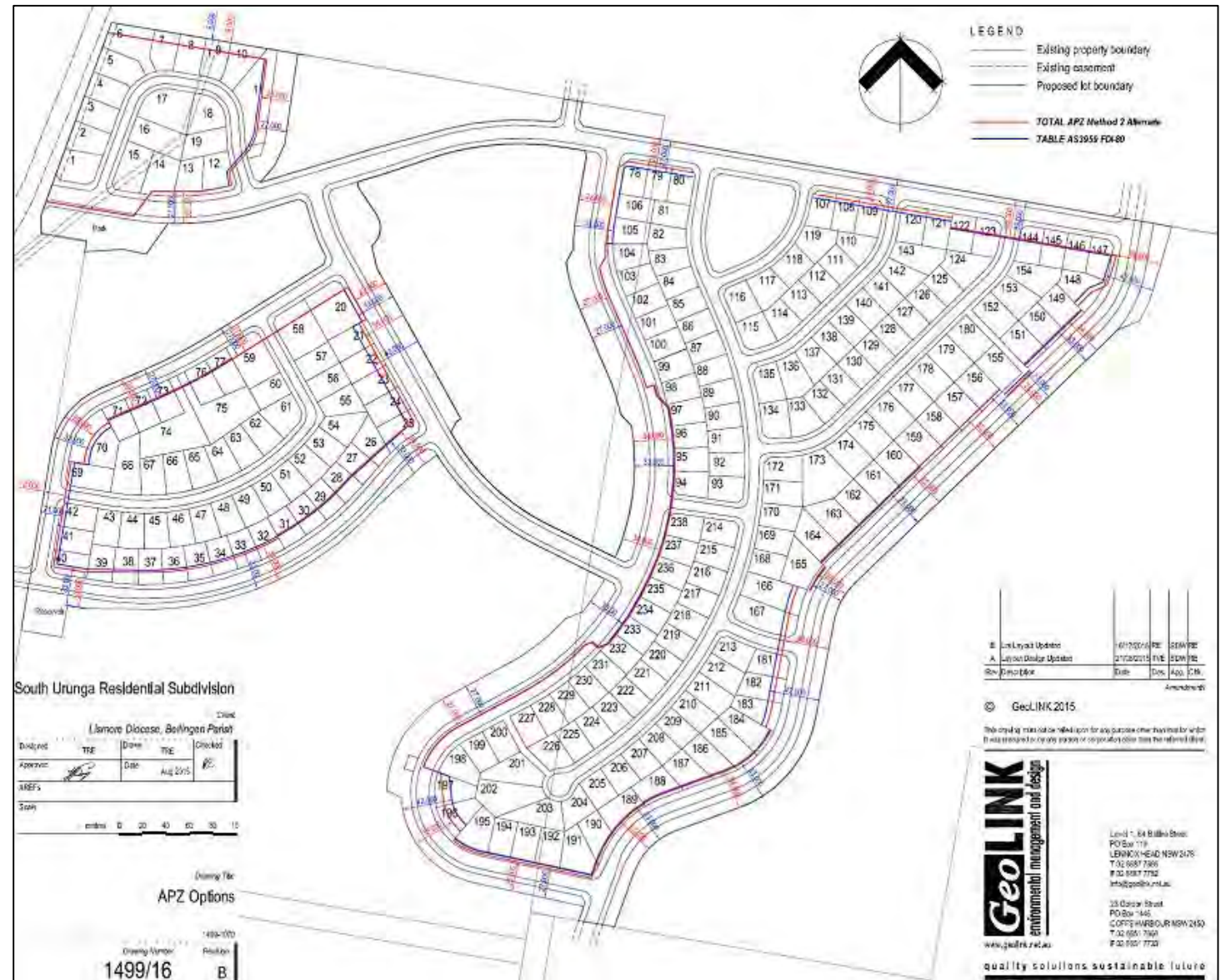
(xx) = actual measurements in brackets before rounding up or down.

The shortest setback distances are highlighted in yellow.

4. APPENDIX A – BAL PLANS

Approved site plans by: Geolink, dated: 16 December 2015.

A full set of final plans shall be provided by the applicant to accompany the DA. All design, APZ and site plans must ensure compliance with the minimum building setback of BAL-29 in relation to this development as proposed and the recommendations contained herein.





5. APPENDIX B – METHOD 2 CALCULATIONS DATA



NBC Bushfire Attack Assessment Report V2.1

AS3959 (2009) Appendix B - Detailed Method 2

Print Date:

10-Dec-15

Assessment Date:

09-Dec-15

Site Street Address: South Urunga Sub-division, Urunga**Assessor:** Mr Admin; admin**Local Government Area:** Coffs Harbour**Alpine Area:**

No

Equations Used

Transmissivity: Fuss and Hammins, 2002

Flame Length: RFS PBP, 2001

Rate of Fire Spread: Noble et al., 1980

Radiant Heat: Drysdale, 1985; Sullivan et al., 2003; Tan et al., 2005

Peak Elevation of Receiver: Tan et al., 2005

Peak Flame Angle: Tan et al., 2005

Run Description: 112-114, 125-126 North

Vegetation Information

Vegetation Type: Forest**Vegetation Group:** Forest and Woodland**Vegetation Slope:** 2.36 Degrees**Vegetation Slope Type:** Downslope**Surface Fuel Load(t/ha):** 25**Overall Fuel Load(t/ha):** 35

Site Information

Site Slope: 0 Degrees**Site Slope Type:** Downslope**Elevation of Receiver(m):** Default**APZ/Separation(m):** 24.2

Fire Inputs

Veg./Flame Width(m): 100**Flame Temp(K)** 1090

Calculation Parameters

Flame Emissivity: 95**Relative Humidity(%):** 25**Heat of Combustion(kJ/kg)** 18600**Ambient Temp(K):** 308**Moisture Factor:** 5**FDI:** 80

Program Outputs

Category of Attack: HIGH**Peak Elevation of Receiver(m):** 9.87**Level of Construction:** BAL 29**Fire Intensity(kW/m):** 51075**Radiant Heat(kW/m2):** 28.95**Flame Angle (degrees):** 61**Flame Length(m):** 22.56**Maximum View Factor:** 0.456**Rate Of Spread (km/h):** 2.82**Inner Protection Area(m):** 16**Transmissivity:** 0.835**Outer Protection Area(m):** 8

Run Description: 154-156 S-East

Vegetation Information

Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	8.91 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35

Site Information

Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	34

Fire Inputs

Veg./Flame Width(m):	100	Flame Temp(K)	1090
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Calculation Parameters

Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80

Program Outputs

Category of Attack:	HIGH	Peak Elevation of Receiver(m):	13.86
Level of Construction:	BAL 29	Fire Intensity(kW/m):	80258
Radiant Heat(kW/m2):	28.76	Flame Angle (degrees):	57
Flame Length(m):	33.05	Maximum View Factor:	0.463
Rate Of Spread (km/h):	4.44	Inner Protection Area(m):	22
Transmissivity:	0.817	Outer Protection Area(m):	12

Run Description: Lot 152 North

Vegetation Information

Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	7.8 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35

Site Information

Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	32

Fire Inputs

Veg./Flame Width(m):	100	Flame Temp(K)	1090
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Calculation Parameters

Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80

Program Outputs

Category of Attack:	HIGH	Peak Elevation of Receiver(m):	13.11
Level of Construction:	BAL 29	Fire Intensity(kW/m):	74341
Radiant Heat(kW/m2):	28.89	Flame Angle (degrees):	58
Flame Length(m):	30.92	Maximum View Factor:	0.463
Rate Of Spread (km/h):	4.11	Inner Protection Area(m):	21
Transmissivity:	0.82	Outer Protection Area(m):	11

Run Description: Lot 160 S-East			
<u>Vegetation Information</u>			
Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	3.01 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35
<u>Site Information</u>			
Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	25
<u>Fire Inputs</u>			
Veg./Flame Width(m):	100	Flame Temp(K)	1090
<u>Calculation Parameters</u>			
Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80
<u>Program Outputs</u>			
Category of Attack:	HIGH	Peak Elevation of Receiver(m):	10.13
Level of Construction:	BAL 29	Fire Intensity(kW/m):	53418
Radiant Heat(kW/m2):	28.97	Flame Angle (degrees):	60
Flame Length(m):	23.4	Maximum View Factor:	0.457
Rate Of Spread (km/h):	2.95	Inner Protection Area(m):	16
Transmissivity:	0.834	Outer Protection Area(m):	9
Run Description: Lot 170 S-East			
<u>Vegetation Information</u>			
Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	4.86 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35
<u>Site Information</u>			
Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	27.5
<u>Fire Inputs</u>			
Veg./Flame Width(m):	100	Flame Temp(K)	1090
<u>Calculation Parameters</u>			
Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80
<u>Program Outputs</u>			
Category of Attack:	HIGH	Peak Elevation of Receiver(m):	11.15
Level of Construction:	BAL 29	Fire Intensity(kW/m):	60691
Radiant Heat(kW/m2):	28.93	Flame Angle (degrees):	59
Flame Length(m):	26.02	Maximum View Factor:	0.459
Rate Of Spread (km/h):	3.36	Inner Protection Area(m):	18
Transmissivity:	0.829	Outer Protection Area(m):	10

Run Description: Lot 74 North			
<u>Vegetation Information</u>			
Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	6.17 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35
<u>Site Information</u>			
Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	29.4
<u>Fire Inputs</u>			
Veg./Flame Width(m):	100	Flame Temp(K)	1090
<u>Calculation Parameters</u>			
Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80
<u>Program Outputs</u>			
Category of Attack:	HIGH	Peak Elevation of Receiver(m):	12.03
Level of Construction:	BAL 29	Fire Intensity(kW/m):	66433
Radiant Heat(kW/m2):	28.93	Flame Angle (degrees):	59
Flame Length(m):	28.08	Maximum View Factor:	0.461
Rate Of Spread (km/h):	3.67	Inner Protection Area(m):	19
Transmissivity:	0.825	Outer Protection Area(m):	10
Run Description: Lot 42 South			
<u>Vegetation Information</u>			
Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	6.34 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35
<u>Site Information</u>			
Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	30
<u>Fire Inputs</u>			
Veg./Flame Width(m):	100	Flame Temp(K)	1090
<u>Calculation Parameters</u>			
Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80
<u>Program Outputs</u>			
Category of Attack:	HIGH	Peak Elevation of Receiver(m):	12.15
Level of Construction:	BAL 29	Fire Intensity(kW/m):	67217
Radiant Heat(kW/m2):	28.51	Flame Angle (degrees):	59
Flame Length(m):	28.36	Maximum View Factor:	0.455
Rate Of Spread (km/h):	3.72	Inner Protection Area(m):	19
Transmissivity:	0.823	Outer Protection Area(m):	11

Run Description: Lot 75 - North	
<u>Vegetation Information</u>	
Vegetation Type: Forest	Vegetation Group: Forest and Woodland
Vegetation Slope: 6.17 Degrees	Vegetation Slope Type: Downslope
Surface Fuel Load(t/ha): 25	Overall Fuel Load(t/ha): 35
<u>Site Information</u>	
Site Slope: 0 Degrees	Site Slope Type: Downslope
Elevation of Receiver(m): Default	APZ/Separation(m): 29.4
<u>Fire Inputs</u>	
Veg./Flame Width(m): 100	Flame Temp(K) 1090
<u>Calculation Parameters</u>	
Flame Emissivity: 95	Relative Humidity(%): 25
Heat of Combustion(kJ/kg) 18600	Ambient Temp(K): 308
Moisture Factor: 5	FDI: 80
<u>Program Outputs</u>	
Category of Attack: HIGH	Peak Elevation of Receiver(m): 12.03
Level of Construction: BAL 29	Fire Intensity(kW/m): 66433
Radiant Heat(kW/m2): 28.93	Flame Angle (degrees): 59
Flame Length(m): 28.08	Maximum View Factor: 0.461
Rate Of Spread (km/h): 3.67	Inner Protection Area(m): 19
Transmissivity: 0.825	Outer Protection Area(m): 10

Run Description: Lots 1, 13 - 16 - S-East	
<u>Vegetation Information</u>	
Vegetation Type: Forest	Vegetation Group: Forest and Woodland
Vegetation Slope: 4.24 Degrees	Vegetation Slope Type: Downslope
Surface Fuel Load(t/ha): 25	Overall Fuel Load(t/ha): 35
<u>Site Information</u>	
Site Slope: 0 Degrees	Site Slope Type: Downslope
Elevation of Receiver(m): Default	APZ/Separation(m): 27
<u>Fire Inputs</u>	
Veg./Flame Width(m): 100	Flame Temp(K) 1090
<u>Calculation Parameters</u>	
Flame Emissivity: 95	Relative Humidity(%): 25
Heat of Combustion(kJ/kg) 18600	Ambient Temp(K): 308
Moisture Factor: 5	FDI: 80
<u>Program Outputs</u>	
Category of Attack: HIGH	Peak Elevation of Receiver(m): 10.87
Level of Construction: BAL 29	Fire Intensity(kW/m): 58150
Radiant Heat(kW/m2): 28.46	Flame Angle (degrees): 60
Flame Length(m): 25.1	Maximum View Factor: 0.452
Rate Of Spread (km/h): 3.22	Inner Protection Area(m): 17
Transmissivity: 0.829	Outer Protection Area(m): 10

Run Description: Lots 104-109 West			
<u>Vegetation Information</u>			
Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	4.76 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35
<u>Site Information</u>			
Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	27.4
<u>Fire Inputs</u>			
Veg./Flame Width(m):	100	Flame Temp(K)	1090
<u>Calculation Parameters</u>			
Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80
<u>Program Outputs</u>			
Category of Attack:	HIGH	Peak Elevation of Receiver(m):	11.2
Level of Construction:	BAL 29	Fire Intensity(kW/m):	60274
Radiant Heat(kW/m2):	28.86	Flame Angle (degrees):	60
Flame Length(m):	25.87	Maximum View Factor:	0.458
Rate Of Spread (km/h):	3.33	Inner Protection Area(m):	18
Transmissivity:	0.828	Outer Protection Area(m):	9

Run Description: Lots 110, 111, 83 S-West			
<u>Vegetation Information</u>			
Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	5.08 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35
<u>Site Information</u>			
Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	28
<u>Fire Inputs</u>			
Veg./Flame Width(m):	100	Flame Temp(K)	1090
<u>Calculation Parameters</u>			
Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80
<u>Program Outputs</u>			
Category of Attack:	HIGH	Peak Elevation of Receiver(m):	11.41
Level of Construction:	BAL 29	Fire Intensity(kW/m):	61620
Radiant Heat(kW/m2):	28.67	Flame Angle (degrees):	60
Flame Length(m):	26.35	Maximum View Factor:	0.456
Rate Of Spread (km/h):	3.41	Inner Protection Area(m):	18
Transmissivity:	0.827	Outer Protection Area(m):	10

Run Description: Lots 127-128, 149-152 North			
<u>Vegetation Information</u>			
Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	7.8 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35
<u>Site Information</u>			
Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	32
<u>Fire Inputs</u>			
Veg./Flame Width(m):	100	Flame Temp(K)	1090
<u>Calculation Parameters</u>			
Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80
<u>Program Outputs</u>			
Category of Attack:	HIGH	Peak Elevation of Receiver(m):	13.11
Level of Construction:	BAL 29	Fire Intensity(kW/m):	74341
Radiant Heat(kW/m2):	28.89	Flame Angle (degrees):	58
Flame Length(m):	30.92	Maximum View Factor:	0.463
Rate Of Spread (km/h):	4.11	Inner Protection Area(m):	21
Transmissivity:	0.82	Outer Protection Area(m):	11
Run Description: Lots 11-13 - East			
<u>Vegetation Information</u>			
Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	3.09 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35
<u>Site Information</u>			
Site Slope:	3.09 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	25
<u>Fire Inputs</u>			
Veg./Flame Width(m):	100	Flame Temp(K)	1090
<u>Calculation Parameters</u>			
Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80
<u>Program Outputs</u>			
Category of Attack:	HIGH	Peak Elevation of Receiver(m):	9.13
Level of Construction:	BAL 29	Fire Intensity(kW/m):	53714
Radiant Heat(kW/m2):	28.39	Flame Angle (degrees):	63
Flame Length(m):	23.51	Maximum View Factor:	0.449
Rate Of Spread (km/h):	2.97	Inner Protection Area(m):	16
Transmissivity:	0.832	Outer Protection Area(m):	9

Run Description: Lots 152-153 East			
<u>Vegetation Information</u>			
Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	10.89 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35
<u>Site Information</u>			
Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	37.5
<u>Fire Inputs</u>			
Veg./Flame Width(m):	100	Flame Temp(K)	1090
<u>Calculation Parameters</u>			
Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80
<u>Program Outputs</u>			
Category of Attack:	HIGH	Peak Elevation of Receiver(m):	15.45
Level of Construction:	BAL 29	Fire Intensity(kW/m):	92007
Radiant Heat(kW/m2):	28.9	Flame Angle (degrees):	56
Flame Length(m):	37.27	Maximum View Factor:	0.468
Rate Of Spread (km/h):	5.09	Inner Protection Area(m):	25
Transmissivity:	0.812	Outer Protection Area(m):	13
Run Description: Lots 161-164 S-East			
<u>Vegetation Information</u>			
Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	8.53 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35
<u>Site Information</u>			
Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	33.2
<u>Fire Inputs</u>			
Veg./Flame Width(m):	100	Flame Temp(K)	1090
<u>Calculation Parameters</u>			
Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80
<u>Program Outputs</u>			
Category of Attack:	HIGH	Peak Elevation of Receiver(m):	13.55
Level of Construction:	BAL 29	Fire Intensity(kW/m):	78181
Radiant Heat(kW/m2):	28.93	Flame Angle (degrees):	57
Flame Length(m):	32.3	Maximum View Factor:	0.465
Rate Of Spread (km/h):	4.32	Inner Protection Area(m):	22
Transmissivity:	0.819	Outer Protection Area(m):	11

Run Description: Lots 165-169 S-East			
<u>Vegetation Information</u>			
Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	7.85 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35
<u>Site Information</u>			
Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	32
<u>Fire Inputs</u>			
Veg./Flame Width(m):	100	Flame Temp(K)	1090
<u>Calculation Parameters</u>			
Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80
<u>Program Outputs</u>			
Category of Attack:	HIGH	Peak Elevation of Receiver(m):	13.15
Level of Construction:	BAL 29	Fire Intensity(kW/m):	74598
Radiant Heat(kW/m2):	28.98	Flame Angle (degrees):	58
Flame Length(m):	31.01	Maximum View Factor:	0.465
Rate Of Spread (km/h):	4.13	Inner Protection Area(m):	21
Transmissivity:	0.82	Outer Protection Area(m):	11

Run Description: Lots 171, 187-189 East			
<u>Vegetation Information</u>			
Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	10.89 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35
<u>Site Information</u>			
Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	37.5
<u>Fire Inputs</u>			
Veg./Flame Width(m):	100	Flame Temp(K)	1090
<u>Calculation Parameters</u>			
Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80
<u>Program Outputs</u>			
Category of Attack:	HIGH	Peak Elevation of Receiver(m):	15.45
Level of Construction:	BAL 29	Fire Intensity(kW/m):	92007
Radiant Heat(kW/m2):	28.9	Flame Angle (degrees):	56
Flame Length(m):	37.27	Maximum View Factor:	0.468
Rate Of Spread (km/h):	5.09	Inner Protection Area(m):	25
Transmissivity:	0.812	Outer Protection Area(m):	13

Run Description: Lots 190-194 S-East

Vegetation Information

Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	9.09 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35

Site Information

Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	34.2

Fire Inputs

Veg./Flame Width(m):	100	Flame Temp(K)	1090
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Calculation Parameters

Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80

Program Outputs

Category of Attack:	HIGH	Peak Elevation of Receiver(m):	14.01
Level of Construction:	BAL 29	Fire Intensity(kW/m):	81261
Radiant Heat(kW/m2):	28.89	Flame Angle (degrees):	57
Flame Length(m):	33.41	Maximum View Factor:	0.465
Rate Of Spread (km/h):	4.49	Inner Protection Area(m):	22
Transmissivity:	0.817	Outer Protection Area(m):	12

Run Description: Lots 195-196 S-East

Vegetation Information

Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	7.77 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35

Site Information

Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	32

Fire Inputs

Veg./Flame Width(m):	100	Flame Temp(K)	1090
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Calculation Parameters

Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80

Program Outputs

Category of Attack:	HIGH	Peak Elevation of Receiver(m):	13.09
Level of Construction:	BAL 29	Fire Intensity(kW/m):	74187
Radiant Heat(kW/m2):	28.83	Flame Angle (degrees):	58
Flame Length(m):	30.87	Maximum View Factor:	0.462
Rate Of Spread (km/h):	4.1	Inner Protection Area(m):	21
Transmissivity:	0.82	Outer Protection Area(m):	11

Run Description: Lots 197-201 South

Vegetation Information

Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	2.6 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35

Site Information

Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	24.5

Fire Inputs

Veg./Flame Width(m):	100	Flame Temp(K)	1090
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Calculation Parameters

Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80

Program Outputs

Category of Attack:	HIGH	Peak Elevation of Receiver(m):	9.9
Level of Construction:	BAL 29	Fire Intensity(kW/m):	51928
Radiant Heat(kW/m2):	28.96	Flame Angle (degrees):	60
Flame Length(m):	22.87	Maximum View Factor:	0.456
Rate Of Spread (km/h):	2.87	Inner Protection Area(m):	16
Transmissivity:	0.835	Outer Protection Area(m):	9

Run Description: Lots 202-203 West

Vegetation Information

Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	9.46 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35

Site Information

Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	35

Fire Inputs

Veg./Flame Width(m):	100	Flame Temp(K)	1090
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Calculation Parameters

Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80

Program Outputs

Category of Attack:	HIGH	Peak Elevation of Receiver(m):	14.33
Level of Construction:	BAL 29	Fire Intensity(kW/m):	83363
Radiant Heat(kW/m2):	28.73	Flame Angle (degrees):	57
Flame Length(m):	34.16	Maximum View Factor:	0.463
Rate Of Spread (km/h):	4.61	Inner Protection Area(m):	23
Transmissivity:	0.815	Outer Protection Area(m):	12

Run Description: Lots 203-206, 233-237 N-West

Vegetation Information

Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	4.4 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35

Site Information

Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	27

Fire Inputs

Veg./Flame Width(m):	100	Flame Temp(K)	1090
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Calculation Parameters

Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80

Program Outputs

Category of Attack:	HIGH	Peak Elevation of Receiver(m):	10.97
Level of Construction:	BAL 29	Fire Intensity(kW/m):	58795
Radiant Heat(kW/m2):	28.74	Flame Angle (degrees):	60
Flame Length(m):	25.33	Maximum View Factor:	0.456
Rate Of Spread (km/h):	3.25	Inner Protection Area(m):	17
Transmissivity:	0.829	Outer Protection Area(m):	10

Run Description: Lots 21 - 22 N-East

Vegetation Information

Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	6.71 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35

Site Information

Site Slope:	6.71 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	29

Fire Inputs

Veg./Flame Width(m):	100	Flame Temp(K)	1090
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Calculation Parameters

Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80

Program Outputs

Category of Attack:	HIGH	Peak Elevation of Receiver(m):	9.58
Level of Construction:	BAL 29	Fire Intensity(kW/m):	68955
Radiant Heat(kW/m2):	28.8	Flame Angle (degrees):	64
Flame Length(m):	28.99	Maximum View Factor:	0.46
Rate Of Spread (km/h):	3.81	Inner Protection Area(m):	19
Transmissivity:	0.824	Outer Protection Area(m):	10

Run Description: Lots 21, 61-62 N-West

Vegetation Information

Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	4.76 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35

Site Information

Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	27.4

Fire Inputs

Veg./Flame Width(m):	100	Flame Temp(K)	1090
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Calculation Parameters

Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80

Program Outputs

Category of Attack:	HIGH	Peak Elevation of Receiver(m):	11.2
Level of Construction:	BAL 29	Fire Intensity(kW/m):	60274
Radiant Heat(kW/m2):	28.86	Flame Angle (degrees):	60
Flame Length(m):	25.87	Maximum View Factor:	0.458
Rate Of Spread (km/h):	3.33	Inner Protection Area(m):	18
Transmissivity:	0.828	Outer Protection Area(m):	9

Run Description: Lots 23-27 N-East

Vegetation Information

Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	10.3 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35

Site Information

Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	36.3

Fire Inputs

Veg./Flame Width(m):	100	Flame Temp(K)	1090
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Calculation Parameters

Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80

Program Outputs

Category of Attack:	HIGH	Peak Elevation of Receiver(m):	14.9
Level of Construction:	BAL 29	Fire Intensity(kW/m):	88337
Radiant Heat(kW/m2):	28.99	Flame Angle (degrees):	56
Flame Length(m):	35.95	Maximum View Factor:	0.468
Rate Of Spread (km/h):	4.88	Inner Protection Area(m):	24
Transmissivity:	0.814	Outer Protection Area(m):	12

Run Description: Lots 238-244 N-West

Vegetation Information

Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	8.75 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35

Site Information

Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	34

Fire Inputs

Veg./Flame Width(m):	100	Flame Temp(K)	1090
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Calculation Parameters

Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80

Program Outputs

Category of Attack:	HIGH	Peak Elevation of Receiver(m):	13.88
Level of Construction:	BAL 29	Fire Intensity(kW/m):	79377
Radiant Heat(kW/m2):	28.44	Flame Angle (degrees):	58
Flame Length(m):	32.73	Maximum View Factor:	0.458
Rate Of Spread (km/h):	4.39	Inner Protection Area(m):	22
Transmissivity:	0.816	Outer Protection Area(m):	12

Run Description: Lots 27-33 S-East

Vegetation Information

Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	8.75 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35

Site Information

Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	34

Fire Inputs

Veg./Flame Width(m):	100	Flame Temp(K)	1090
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Calculation Parameters

Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80

Program Outputs

Category of Attack:	HIGH	Peak Elevation of Receiver(m):	13.88
Level of Construction:	BAL 29	Fire Intensity(kW/m):	79377
Radiant Heat(kW/m2):	28.44	Flame Angle (degrees):	58
Flame Length(m):	32.73	Maximum View Factor:	0.458
Rate Of Spread (km/h):	4.39	Inner Protection Area(m):	22
Transmissivity:	0.816	Outer Protection Area(m):	12

Run Description: Lots 34-41 South

Vegetation Information

Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	7.35 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35

Site Information

Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	31.2

Fire Inputs

Veg./Flame Width(m):	100	Flame Temp(K)	1090
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Calculation Parameters

Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80

Program Outputs

Category of Attack:	HIGH	Peak Elevation of Receiver(m):	12.77
Level of Construction:	BAL 29	Fire Intensity(kW/m):	72068
Radiant Heat(kW/m2):	28.97	Flame Angle (degrees):	58
Flame Length(m):	30.1	Maximum View Factor:	0.464
Rate Of Spread (km/h):	3.99	Inner Protection Area(m):	20
Transmissivity:	0.822	Outer Protection Area(m):	11

Run Description: Lots 6-11 N-East

Vegetation Information

Vegetation Type:	Grassland	Vegetation Group:	Grassland
Vegetation Slope:	3.25 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	4.5	Overall Fuel Load(t/ha):	4.5

Site Information

Site Slope:	3.25 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	9

Fire Inputs

Veg./Flame Width(m):	100	Flame Temp(K)	1090
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Calculation Parameters

Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	110

Program Outputs

Category of Attack:	HIGH	Peak Elevation of Receiver(m):	3.06
Level of Construction:	BAL 29	Fire Intensity(kW/m):	41605
Radiant Heat(kW/m2):	27.73	Flame Angle (degrees):	68
Flame Length(m):	7.69	Maximum View Factor:	0.418
Rate Of Spread (km/h):	17.89	Inner Protection Area(m):	9
Transmissivity:	0.873	Outer Protection Area(m):	0

Run Description: Lots 73-74 & 42-44 West			
<u>Vegetation Information</u>			
Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	4.97 Degrees	Vegetation Slope Type:	Upslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35
<u>Site Information</u>			
Site Slope:	4.97 Degrees	Site Slope Type:	Upslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	18
<u>Fire Inputs</u>			
Veg./Flame Width(m):	100	Flame Temp(K)	1090
<u>Calculation Parameters</u>			
Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80
<u>Program Outputs</u>			
Category of Attack:	HIGH	Peak Elevation of Receiver(m):	8.11
Level of Construction:	BAL 29	Fire Intensity(kW/m):	30800
Radiant Heat(kW/m2):	28.14	Flame Angle (degrees):	59
Flame Length(m):	15.27	Maximum View Factor:	0.436
Rate Of Spread (km/h):	1.7	Inner Protection Area(m):	12
Transmissivity:	0.85	Outer Protection Area(m):	6

Run Description: Lots 76-82 N-west			
<u>Vegetation Information</u>			
Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	4.01 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35
<u>Site Information</u>			
Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	26.3
<u>Fire Inputs</u>			
Veg./Flame Width(m):	100	Flame Temp(K)	1090
<u>Calculation Parameters</u>			
Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80
<u>Program Outputs</u>			
Category of Attack:	HIGH	Peak Elevation of Receiver(m):	10.73
Level of Construction:	BAL 29	Fire Intensity(kW/m):	57234
Radiant Heat(kW/m2):	28.97	Flame Angle (degrees):	60
Flame Length(m):	24.77	Maximum View Factor:	0.459
Rate Of Spread (km/h):	3.17	Inner Protection Area(m):	17
Transmissivity:	0.831	Outer Protection Area(m):	9

Run Description: Lots 83

Vegetation Information

Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	6.81 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35

Site Information

Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	30.4

Fire Inputs

Veg./Flame Width(m):	100	Flame Temp(K)	1090
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Calculation Parameters

Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80

Program Outputs

Category of Attack:	HIGH	Peak Elevation of Receiver(m):	12.36
Level of Construction:	BAL 29	Fire Intensity(kW/m):	69432
Radiant Heat(kW/m2):	28.91	Flame Angle (degrees):	58
Flame Length(m):	29.16	Maximum View Factor:	0.462
Rate Of Spread (km/h):	3.84	Inner Protection Area(m):	20
Transmissivity:	0.823	Outer Protection Area(m):	10

Run Description: Lots 83-85 North

Vegetation Information

Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	1.46 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35

Site Information

Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	23.2

Fire Inputs

Veg./Flame Width(m):	100	Flame Temp(K)	1090
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Calculation Parameters

Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80

Program Outputs

Category of Attack:	HIGH	Peak Elevation of Receiver(m):	9.38
Level of Construction:	BAL 29	Fire Intensity(kW/m):	48000
Radiant Heat(kW/m2):	28.86	Flame Angle (degrees):	61
Flame Length(m):	21.45	Maximum View Factor:	0.453
Rate Of Spread (km/h):	2.65	Inner Protection Area(m):	15
Transmissivity:	0.837	Outer Protection Area(m):	8

Run Description: Lots 99-103 West

Vegetation Information

Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	8.75 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	25	Overall Fuel Load(t/ha):	35

Site Information

Site Slope:	0 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	34

Fire Inputs

Veg./Flame Width(m):	100	Flame Temp(K)	1090
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Calculation Parameters

Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	80

Program Outputs

Category of Attack:	HIGH	Peak Elevation of Receiver(m):	13.88
Level of Construction:	BAL 29	Fire Intensity(kW/m):	79377
Radiant Heat(kW/m2):	28.44	Flame Angle (degrees):	58
Flame Length(m):	32.73	Maximum View Factor:	0.458
Rate Of Spread (km/h):	4.39	Inner Protection Area(m):	22
Transmissivity:	0.816	Outer Protection Area(m):	12

REFERENCES

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LEGEND

- Revised developmet footprint
- Asset Protection Zones



0 150

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South Urunga Residential Subdivision
1499-1073

Revised Bushfire Map

Appendix B

SOUTH URUNGA RESIDENTIAL SUBDIVISION ENGINEERING DESIGN

1499 / 10	Cover Sheet
1499 / 11	Existing Site Layout Plan
1499 / 12	Proposed Subdivision Overall Layout Plan
1499 / 13	Proposed Subdivision Water Reticulation Plan
1499 / 14	Proposed Subdivision Sewerage Reticulation Plan
1499 / 15	Proposed Stormwater Management Plan
1499 / 16	Proposed Road Classification



B	Lot Layout Updated	16/12/2015	RE	SDW	RE
A	Layout Design Updated	21/08/2015	TVE	SDW	RE
Rev.	Description	Date	Des.	App.	Chk.
Amendments					

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Client

Lismore Diocese, Bellingen Parish

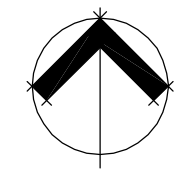
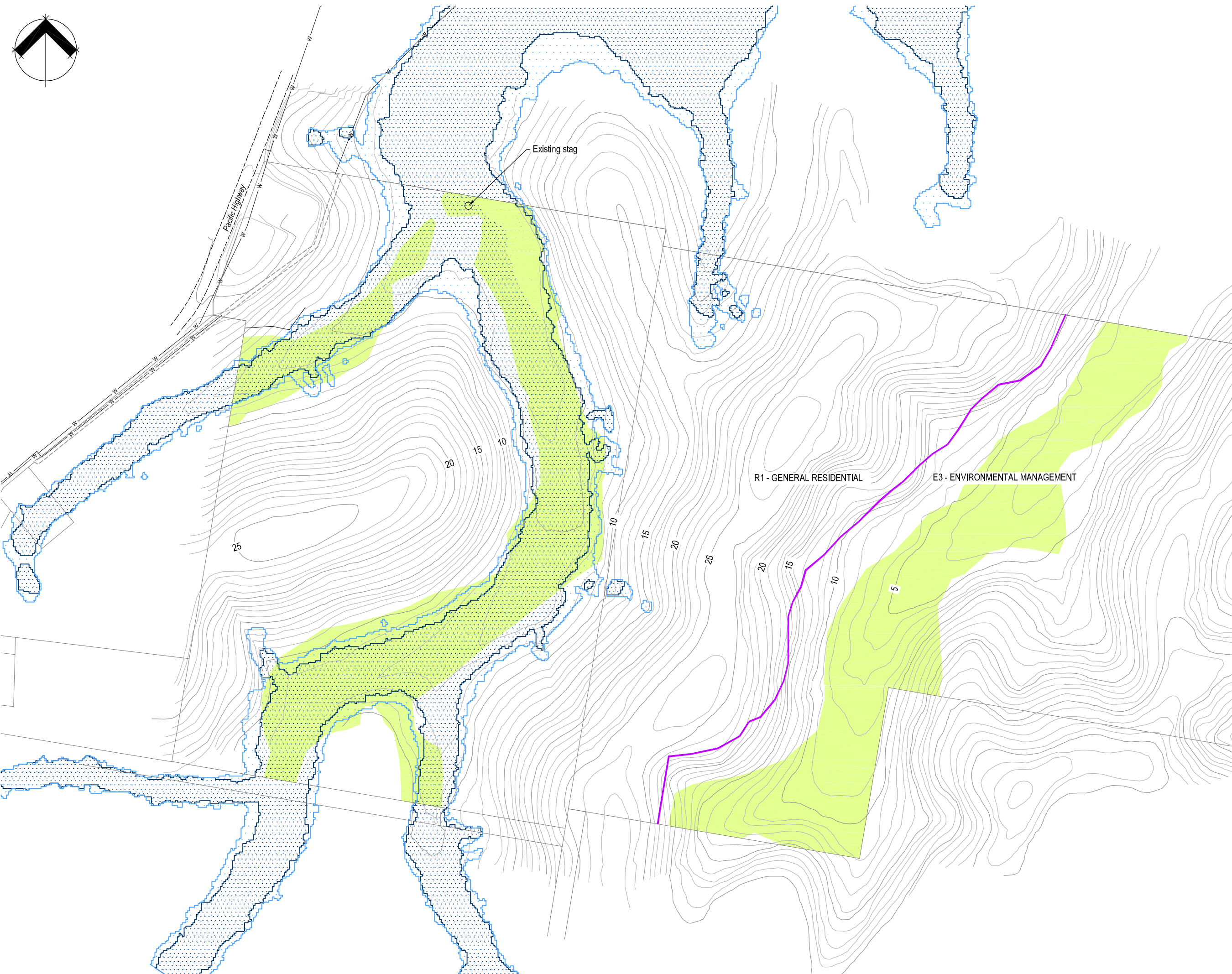
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Approved		Date	Aug 2015	
XREFs				



Drawing Title

Cover Sheet

Drawing Number		Revision
1499/10		B



- LEGEND
- Existing contours at 1 m intervals
 - Existing property boundary
 - Existing easement
 - W Existing water main
 - Q100 flood inundation area
 - PMF inundation area
 - Endangered ecological community
 - LEP zone boundary

B	Lot Layout Updated	16/12/2015	RE	SDW	RE
A	Layout Design Updated	21/08/2015	TVE	SDW	RE
Rev.	Description	Date	Des.	App.	Chk.
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Approved		Date	Aug 2015	
XREFs				
Scale				
metres 0 20 40 60 80 100				

Drawing Title
Existing Site Constraints Plan

Drawing Number
1499/11

Revision
B



- LEGEND
- Existing contours at 1 m intervals
 - Existing property boundary
 - Existing easement
 - Existing water main
 - Proposed lot boundary
 - Proposed road centreline
 - Proposed stormwater bioretention
 - Proposed stormwater swale

Rev	Description	Date	Des.	App.	Chk.	Amendments
B	Lot Layout Updated	16/12/2015	RE	SDW	RE	
A	Layout Design Updated	21/08/2015	TVE	SDW	RE	

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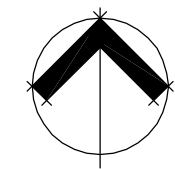
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XREFs					
Scale					
metres 0 20 40 60 80 100					

Drawing Title Proposed Subdivision Revised Layout Plan		Drawing Number 1499/12		Revision B	



- LEGEND
- Existing property boundary
 - Existing easement
 - Existing water main
 - Proposed lot boundary
 - Proposed road centreline
 - Proposed water main
 - Proposed Reservoir feed main
 - Proposed water service under road

B	Lot Layout Updated	16/12/2015	RE	SDW	RE
A	Layout Design Updated	21/08/2015	TVE	SDW	RE
Rev.	Description	Date	Des.	App.	Chk.

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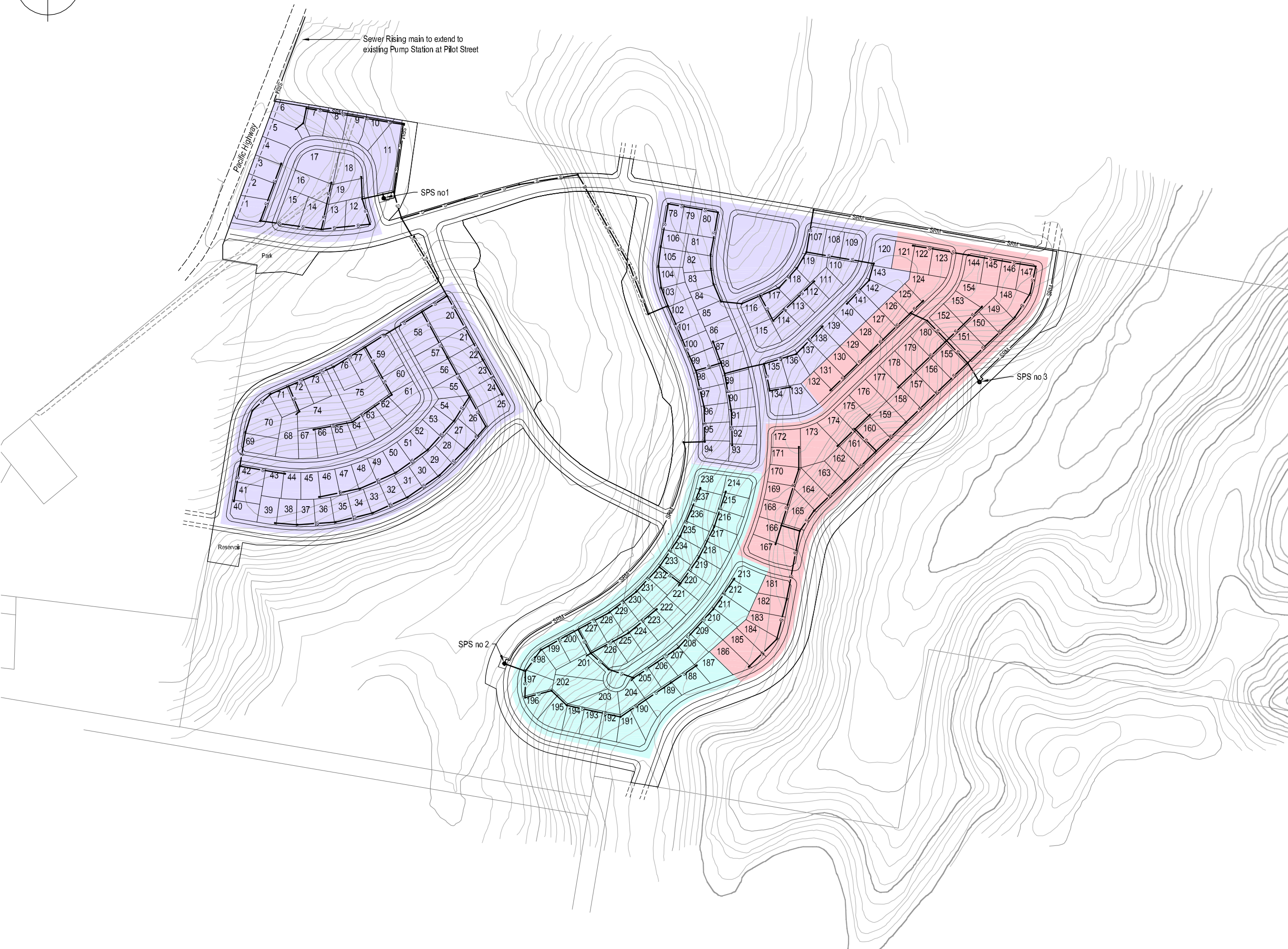
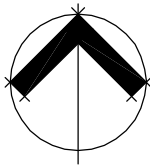
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Approved <i>[Signature]</i>	Date Aug 2015	
XREFs		
Scale metres 0 20 40 60 80 100		

Drawing Title
**Proposed Subdivision
Water Reticulation Plan**

Drawing Number
1499/13

Revision
B



- LEGEND**
- Existing contours at 1 m intervals
 - Existing property boundary
 - Existing easement
 - Proposed lot boundary
 - Proposed road centreline
 - Proposed gravity sewer main
 - Proposed sewerage rising main
 - Proposed easement
 - SPS no 1
 - Proposed sewage pumping station
 - Catchment area for SPS no 1
 - Catchment area for SPS no 2
 - Catchment area for SPS no 3

B	Lot Layout Updated	16/12/2015	RE	SDW	RE
A	Layout Design Updated	21/08/2015	TVE	SDW	RE
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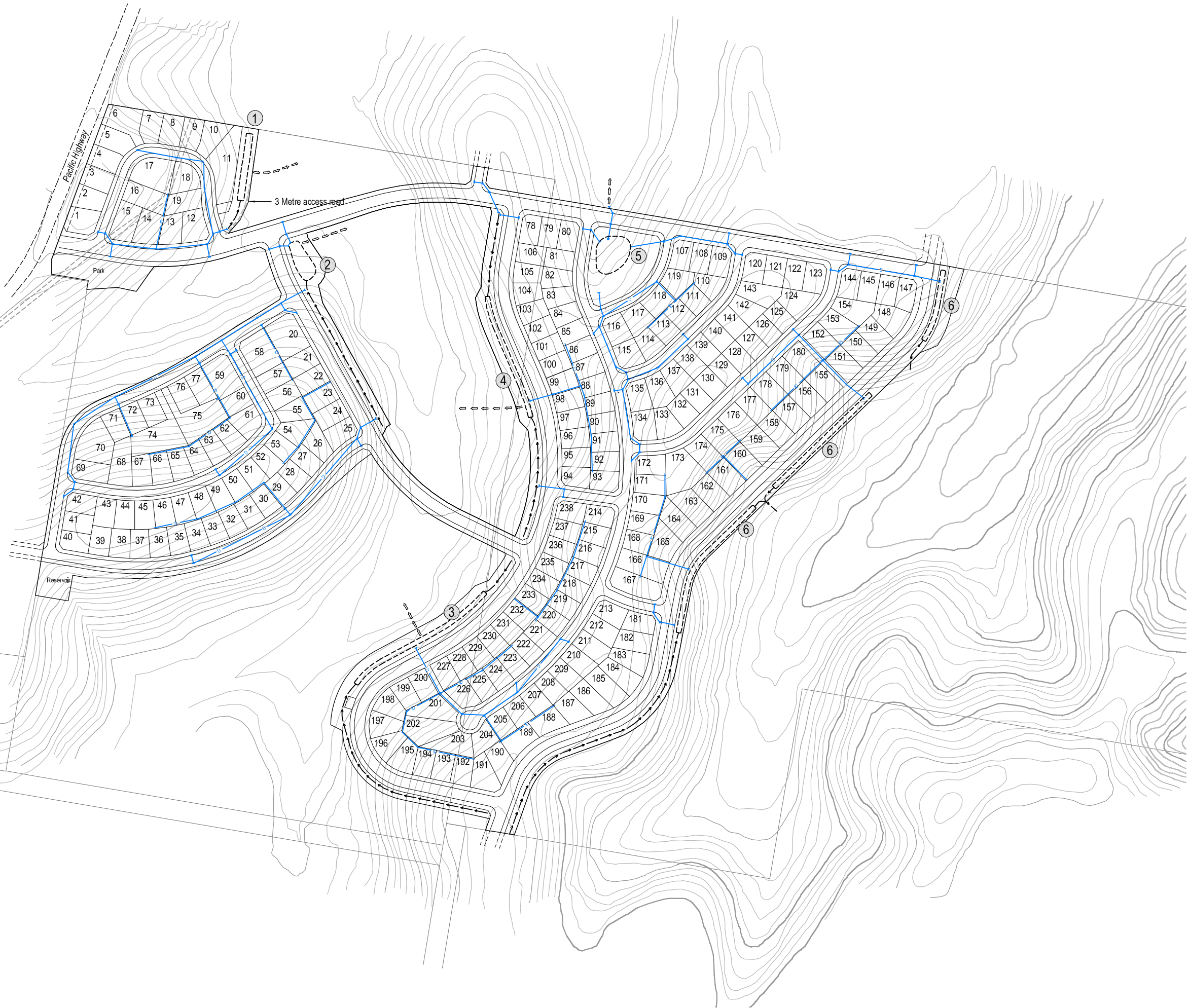
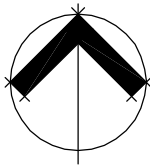
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Client Lismore Diocese, Bellingen Parish				
Designed	TRE	Drawn	TRE	Checked
Approved		Date	Aug 2015	
XREFs				
Scale				
metres 0 20 40 60 80 100				

Drawing Title
**Proposed Subdivision
Sewerage Reticulation Plan**

Drawing Number
1499/14

Revision
B



- LEGEND
- Existing contours at 1 m intervals
 - Existing easement
 - Proposed lot boundary
 - Proposed road centreline
 - IAD Proposed interallotment drainage
 - D Proposed stormwater drainage pipe
 - Proposed stormwater pit / headwall
 - Proposed stormwater bioretention
 - Proposed stormwater swale
 - 1 Bioretention system identifier
 - Path of outflow from bioretention system

A	Layout Design Updated	21/08/2015	TVE	SDW	RE
Rev.	Description	Date	Des.	App.	Chk.
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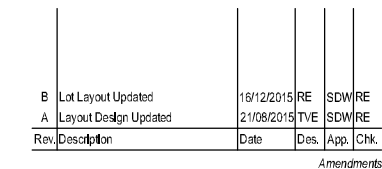
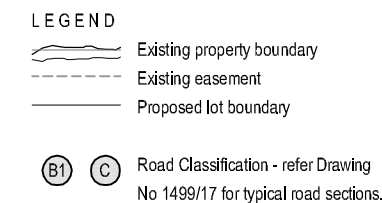
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South Urunga Residential Subdivision

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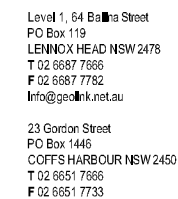
Drawing Title
**Proposed Subdivision
Stormwater Management Plan**

1499-1070

Drawing Number	Revision
1499/15	B



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Project Title
South Urunga Residential Subdivision

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Approved	<i>[Signature]</i>	Date	Aug 2015	<i>RE</i>
XREFs				
Scale				
metres 0 20 40 60 80 100				

Drawing Title

Proposed Road Classification

1499-1070
Drawing Number
1499/16
Revision
B