allen price & scarratts pty ltd
land and development consultants

Our Ref: N25489
Your ref: SSD7169

26 August 2019

NSW Independent Planning Commission
By Email: ipcn@ipcn.nsw.gov.au

Attention: David Way

Dear David,

RE: Mundamia Residential Subdivision - Response to the draft Conditions of Consent proposed by DPIE

Please find attached our submission in response to the draft Conditions of Consent which have been proposed by the Department of Planning, Industry and Environment (DPIE).

We thank the IPC for meeting with us on 6 August and visiting the site on 13 August. We trust that our meeting and the site inspection will assist the IPC in making its final determination.

STRATEGIC PLANNING FRAMEWORK

We note that the Mundamia Urban Release Area was identified by Council in its Nowra-Bomaderry Structure Plan in 2006, which was subsequently endorsed by DPE in 2008. The Mundamia URA was identified in the Nowra Bomaderry Structure Plan 2006 as an area for early release of new greenfield subdivision land. To date, this early release has still not occurred and the economic development of the Shoalhaven LGA has suffered, in part, due to these delays.

Further, the Shoalhaven Growth Management Strategy, 2012 was prepared by Shoalhaven City Council and was endorsed by DPE in 2014 adds further weight to the Nowra-Bomaderry Structure Plan, 2006.

The Shoalhaven LEP2014 which was activated in April 2014 zoned the subject land for residential purposes which provided the legislative framework to develop this site which had been previously identified in Council Strategic Planning work.

Council concluded a site specific DCP Chapter for the site in 2014 and the proposal is generally in accordance with the requirements of the Shoalhaven DCP2014.

PROPOSED MODIFICATIONS TO CONSENT CONDITIONS

The requested changes principally fall into three primary categories being:

1. Changes to proposed bushfire conditions
2. Changes to proposed water quality conditions; and
3. Administrative changes

Each category of conditions are addressed separately below.

We have addressed the various conditions of consent in turn below and provided justification as to why the proposed wording proposed is an improvement to the conditions proposed by DPIE.

BUSHFIRE CONDITIONS

The changes requested below are driven by the following issues:

1. The proposed bushfire protection measures have been prepared by a BPAD Level 3 Certified consultant being Rod Rose from Ecological Australia;
2. The NSW RFS has provided written acceptance to DPIE of its acceptance to the bushfire protection measures proposed by Rod Rose;
3. In addition to the RFS accepted bushfire protection measures, an additional evacuation location in the form of an on-site community refuge is now proposed;
4. DPIE has proposed additional bushfire protection measures above and beyond the requirements of Planning for Bushfire Protection 2006 (PBP2006) that have not been prepared by a BPAD Level 3 Certified consultant and have no justification;

In light of the above, a number of changes are proposed to the bushfire conditions as outlined below. Specific and detailed justification is also provided to assist IPC in making its final determination

Conditions A1(2), A1(3), A1(4), A1(5), A1(6), A1(7)

Proposed Modification:
Relocate these conditions from the "Deferred Commencement Conditions" in Part A of Schedule 2 and insert the same conditions as Operational Consent Conditions in Part C of Schedule 2 that are to be addressed "Prior to the Issue of A Construction Certificate".

Justification:
Satisfying these conditions will not have an impact on the layout of the proposed subdivision and can be satisfied in the normal course of completing the engineering design works leading to a Construction Certificate. It is our view that making these conditions part of the Deferred Commencement Conditions is unnecessary and further delays the timeliness of delivery of housing to the Mundamia URA.

Conditions A1(4) and A1(5)

Proposed Modification:
Combine these conditions into a single condition that reads as follows:
"The Applicant must prepare and submit to the satisfaction of the Consent Authority, a Bushfire Fuel Management Plan. The plan must be prepared by a suitably qualified expert and demonstrate adequate consultation with the RFS and Council. The plan shall outline the ongoing maintenance regime for APZ's, parks, reserves, road reserves and residual lands and include detailed inspection and management regime required for appropriate fuel reduction in accordance with the requirements of the RFS and Planning for Bushfire Protection 2006."

Justification:
The need for a Bushfire Fuel Management Plan as outlined in Condition A1(4) can satisfy the requirements for the separate Vegetation Management Plan as outlined in Condition A1(5). There is no justification for two separate plans that essentially cover the same requirements. A simpler set of conditions can suffice for better long-term management of the site.

Conditions A1(6)

Proposed Modification:
Delete the reference in Condition A1(6) to the Vegetation Management Plan if the IPC decides to combine conditions A1(4) and A1(5) as outlined above.

Justification:
If IPC accepts that conditions A1(4) and A1(5) should be combined then there is no need for a separate reference to a Vegetation Management Plan in Condition A1(6).

Conditions A1(8) and A1(9))

Proposed Modification:
Delete these conditions.

Justification:
A number of these conditions have been incorporated into APS plan ref 25489-11 Rev 20 (see Appendix A). Further, a number of these conditions are unnecessarily conservative, are in addition to the RFS accepted proposal, exceed the accepted standards and have no scientific or legislative justification.

The table below summarizes our position in each sub-condition with further justification outlined below:

APS plan 25489-11 Rev 20 responds to the draft conditions of consent as follows:

Condition	Satisfied or Rejected?	Rationale and Justification
A1(8)(a)	Satisfied by the attached plan	The plan shows all lots having minimum lot sizes that comply with the requirements of Shoalhaven LEP2014;
A1(8)(b)	Satisfied by the attached plan	The plan shows all drainage reserves and associated structures and landscape treatments required to facilitate the implementation for the recharge and stormwater management system approved under Condition C5;
A1(8)(c)	Satisfied by the attached plan	The plan ensures a minimum open space of 6,438m2 of open space in areas that exceed 3,000m2 in each reserve;
A1(8)(d)	This condition is rejected	The plan does **not** provide for the commercial lot. The need for a perimeter road as per Condition A1(9)(b)(i) prevents the commercial lot from being created due to the realignment of the perimeter road. The commercial lot came about during the assessment process when DPIE requested that the subdivision layout be dovetailed into the adjoining Part 3A (MP09_0056) proposed by Council to the west. Whilst the adjoining Part 3A was withdrawn the layout on the subject land was not modified. The creation of the perimeter road and loss of the commercial lot is an improved outcome on the site and is supported;
A1(8)(e)	Satisfied by the attached plan	The plan identifies that a landscape treatment is required along the eastern boundary of the site to prevent vegetation creep with an appropriate note. The detail for this management measure will be outlined as per the proposed modification to Condition C35 as outlined below;
A1(8)(f)	Satisfied by the attached plan	The plan identifies the location of all roundabouts proposed for construction under the Planning Agreement required under Condition C3;
A1(8)(g)	Satisfied by the attached plan	The plan identifies the access road upgrades on or around the site identified in the conditions of consent and the Shoalhaven Contributions Plan 2019;
A1(8)(h)	Satisfied by the attached plan	The plan identifies the SPS is included in Stage 1, along with all necessary public access or initial easements for access and services;
A1(9)(a)(i)	This condition is rejected	The plan does **not** identify all APZ's as per Table A2.4 of Planning for Bushfire Protection 2006 (PBP2006), nor is it required to. Instead it identifies APZ's which satisfy the "Performance Criteria" of PBP2006 and are based upon more accurate site assessment data inputs as outlined in the email from Rod Rose to RFS dated 27/6/16 (see Appendix B). The proposed performance solution has been accepted by RFS as outlined in its letter dated 4/11/16 (see Appendix C). Further justification to the proposed solution is provided below.
A1(9)(a)(ii)	This condition is rejected	The plan does **not** identify a 100m wide temporary APZ adjacent to the western boundary of the subject land as outlined in this condition, nor is it required to. The plan provides APZ's along the western boundary of the subject land that are compliant with the Acceptable Solutions in PBP (as per Table A2.4) and as seen on the site inspection it is conservative in applying APZ based upon forest vegetation when the adjoining vegetation is stunted because of shallow soils and past disturbances. An additional temporary APZ on top of an already compliant APZ is unnecessarily conservative, excessively restrictive and has no scientific or logical justification. As the development also benefits from the Neighbourhood

		Safer Place (NSP), these conditions are even more out of step with the accepted standards. Further justification is provided below.
A1(9)(a)(iii)	Satisfied by the attached plan	The plan identifies that all proposed APZ's are located outside the E2 zone land.
A1(9)(b)(i)	Satisfied by the attached plan	The plan shows an extension of Road 6 to Road 1 along the western boundary of the site. This road realignment has forced the deletion of the 163m2 "commercial lot" which is an improved outcome for the development.
A1(9)(b)(ii)	Satisfied by the attached plan	The plan shows an extension of Road 7 to Road 1 which is proposed to be closed to general access by RFS compliant gates which can be opened to aid in evacuation from the site in the event of an emergency.
A1(9)(b)(iii)	Satisfied by the attached plan	The plan shows the central median on Road 1 being setback from the intersection of Road 1 and Road 7 to allow easier ingress/egress for emergency vehicles;
A1(9)(b)(iv)	Satisfied by the attached plan	The plan shows all internal roads having widths complying with Section 4.1.3(1) of PBP2006. It should be noted the road widths already comply with PBP2006 and RFS requirements. Further, these requirements are repeated in Condition C16(e) and do not need to be included as a deferred commencement condition as well.
A1(9)(b)(v)	This condition is rejected	The plan does **not** show parking restrictions as outlined in the draft condition nor is it required to. The road widths already comply with PBP2006. These are unnecessary and are above and beyond the acceptable solutions within PBP2006. Further justification to the proposed solution is provided below.
A1(9)(b)(vi)	Satisfied by the attached plan	The plan contains a note which requires all roundabouts to be mountable to assist with emergency evacuation and emergency vehicle access;
A1(9)(c)	Satisfied by the attached plan	The plan already shows the proposed location of the NSP. Whilst some of the detail of the NSP including exact size, parking requirements, etc, is to be further detailed in consultation with RFS and SCC in order to satisfy Condition A1(1), it is unnecessary to repeat this requirement here;
A1(9)(d)	This condition is rejected	The plan has **not** been amended to show all perimeter lots having rear laneway access as these are unnecessary to comply with Planning for Bushfire Protection 2006. This condition is excessively conservative, is not founded on bushfire science and will lead to an extremely poor urban design outcome. Further justification is provided below.
A1(9)(e)	This condition is rejected	The plan has **not** been amended to show all medium density lots a minimum of 100m from a bushfire hazard as these building comply with Planning for Bushfire Protection 2006 and there is negligible benefit in such a proposal. All future development on bushfire prone land will need to comply with the required BAL ratings at that time. Medium density development cannot be undertaken unless the site meets BAL29 requirements which is the case for all lots in a modern subdivision. Further justification is provided below.

Further Justification to the Rejected Bushfire Conditions

PBP2006 is called up by the Rural Fires Act 1995 as the document to guide the design of residential subdivisions in bushfire prone areas. It is also the document upon which RFS assesses the feasibility of the proposals ability to obtain a Bushfire Safety Authority at subdivision stage.

Section 1.2.2 of PBP2006 contains an explanation of how the bushfire protection measures (BPMs) in PBP2006 can be satisfied.

An extract of Section 1.2.2 of PBP2006 has been included below:

> *"This version of Planning for Bush Fire Protection (PBP) introduces a performance based approach, and identifies objectives and detailed performance criteria to satisfy desired outcomes.*

(a) Performance Criteria for the Bush Fire Protection Measures

Performance criteria are the outcomes to be met for satisfying the BPMs.

The performance criteria can be satisfied in one of two different ways:
• use of the acceptable solutions; OR
• demonstrating another solution satisfying the specific objectives and performance criteria.

These performance criteria can be found in the Tables in Chapter 4 (Performance Based Controls).

Performance criteria allow applicants, consent authority and to the RFS to be flexible and innovative in responding development opportunities and constraints. In order to reach an acceptable siting and design solution, the criteria have been developed taking into account the range of circumstances across the State and recognising that no two sites or proposals are the same.

They also allow applicants, councils and the RFS to consider a broad range of issues and information, including community expectations, environmental protection and the application of new technologies.

(b) Acceptable Solutions

PBP has identified some acceptable solutions which will satisfy the performance criteria. Any variation from the acceptable solutions will require detailed justification to demonstrate how the performance criteria can be met through another method(s).

Figure 1.2 illustrates the relationship between the various components within PBP.

(c) Proposing Alternative Solutions

Submissions proposing variations to acceptable solutions must provide substantiated evidence that the specific objectives and performance criteria can be met."

Rod Rose from ELA is a practitioner who is accredited through Fire Protection Association Australia's Bushfire Planning and Design Accreditation Scheme (BPAD). This is the only bushfire accreditation system operating in NSW and is endorsed and supported by the RFS.

Rod has been assessed and annually re-certified as competent as a BPAD Level 3 practitioner as listed on the BPAD register: https://connect.fpaa.com.au/Connect/Registers/BPAD_register.aspx

BPAD Level 3 Practitioners are recognised as practitioners who are skilled, experienced and qualified to develop *"alternative design solutions (excluding construction provisions) in accordance with local regulatory requirements."*

It is our understanding from a review of the BPAD register that the consultant used by DPIE to assist them with their bushfire assessment and proposed additional bushfire solutions is not registered by FPAA at any level on the BPAD register. Assessment of performance solutions (a fundamental approach to the bushfire design of the proposal) can only be reliably undertaken by a BPAD Level 3 bushfire consultant. The performance solutions used, rely on bushfire models that ONLY consultants who are BPAD Level 3 qualified have access to. It is therefore impossible for the DPIE engaged consultant to have been able to assess the RFS endorsed performance solutions.

Rod Rose has developed bushfire solutions for the proposal which were accepted by RFS in its letter dated 4/11/16 (see Appendix C). Since the time of the RFS' approval, the additional bushfire protection measure of the Neighbourhood Safer Place (NSP) has since been introduced into the proposal in response to access concerns raised by DPIE. The effect of this additional inclusion has only increased the bushfire resilience and safety for the development by providing an internal community refuge location that is positioned on land that is exposed to less than the radiant heat threshold of 2kW/m2 under catastrophic fire danger rating conditions. The NSP provides a standard of refuge sought by alternate egress roads and avoids the need for potentially risky evacuation under adverse fire threat conditions. This on-site community refuge capacity is only possible on large developments where the footprint enables a NSP sufficiently separated from the hazard to meet the stringent NSP design standards.

Email correspondence dated 27/6/16 (see Appendix B) between Rod Rose and RFS provided the additional information supporting the APZ performance solution. This additional information was followed by RFS agreeing to the development proposal as per their letter of 4/11/16 (see Appendix C). It must be restated that this RFS approval was granted without the benefit of the now proposed NSP being part of the proposal.

With respect to the requested deletion of Condition A1(9)(a)(i):

Section 4.1.3 Asset Protection Zones of PBP2006 outlines the requirements for APZ's on residential subdivisions. The Performance Criteria is achieved where *"radiant heat levels at any point on a proposed building will not exceed 29kW/m2"*. The Acceptable Solution for this proposal would be to have APZ's that align with the requirements of Table A2.4. This is the approach that DPIE has taken despite RFS approving the performance based solution proposed by Rod Rose.

Rod Rose developed APZ widths from a performance based solution using detailed bushfire modelling and slope analysis. This analysis was provided to RFS during 2016 and is attached as Appendix B. RFS approved this approach after its detailed assessment of Rod's analysis as outlined in its letter dated 4/11/16 which is attached in Appendix C.

DPIE's reversion to the Acceptable Solution for all APZs is an inappropriate application of PBP2006 and ignores the detailed assessment and investigation of the Performance Solution undertaken by the RFS. Performance Solutions must be prepared by and subsequently assessment by persons with the skills, credentials and resources (models) to assess them. In the private sector this is a BPAD Level 3 practitioner.

With respect to the requested deletion of Condition A1(9)(a)(ii):

As outlined above, *Section 4.1.3 Asset Protection Zones* of PBP2006 outlines the requirements for APZ's on residential subdivisions. The requirement to quarantine the 100m of land adjacent to the western boundary of the site again ignores the APZ widths that are compliant with the Acceptable Solutions in PBP2006. As seen on the site inspection, APZ's have been conservatively applied based upon forest vegetation to the west, when the adjoining vegetation is actually stunted because of shallow soils and past disturbances.

An additional temporary APZ on top of an already compliant APZ is unnecessarily conservative and has no scientific or logical justification and has been suggested by persons who are apparently not qualified to make or justify such Performance Solutions. The additional APZ does not add to the merits of the performance solution.

The proposed 100m wide temporary APZ unnecessarily sterilizes a significant portion of the site without any scientific justification. This action could be interpreted as an attempt to make the proposal economically unviable.

With respect to the requested deletion of Condition A1(9)(a)(iii):

Section 4.1.3 Asset Protection Zones of PBP2006 outlines the requirements for APZ's on residential subdivisions

Rod Rose developed APZ widths from a performance based solution using detailed bushfire modelling and slope analysis. This analysis was provided to RFS during 2016 and is attached as Appendix B. RFS approved this approach after its detailed assessment of Rod's analysis as outlined in its letter dated 4/11/16 which is attached in Appendix C.

DPIE's reversion to the Acceptable Solution is an inappropriate application of Planning for Bushfire Protection 2006 and ignores the detailed assessment and investigation of the Performance Solution undertaken by the RFS. Performance Solutions must be prepared by and subsequently assessment by persons with the skills, credentials and resources (models) to assess them. In the private sector this is a BPAD Level 3 practitioner.

With respect to the requested deletion of Condition A1(9)(b)(v):

Section 4.1.3 Access (1) – Public Roads of PBP2006 contains measures that indicate where parking should be restricted based on different road widths. RFS letter dated 4/11/16 provides specific requirements with respect to road widths. Condition C16(e) conditions compliance for the roads with PBP2006 and these requirements do not need to be included as a deferred commencement condition as well as in C16.

In addition, it is proposed to tighten the wording of Condition C16(e) to make it more closely aligned with the RFS letter dated 4/11/16.

The additional parking restrictions proposed by DPIE do not take into account the RFS approval or the fact that the proposal meets the Acceptable Solutions within PBP2006. Performance Solutions (such as that proposed) must be prepared by and subsequently assessment by persons with the skills, credentials and resources (models) to assess them. In the private sector this is a BPAD Level 3 practitioner.

From an urban design and liveability perspective, it is problematic if future residents are unable to park on the street in front of their dwellings, which is what is proposed by DPIE.

With respect to the requested deletion of Condition A1(9)(d):

Section 4.1.3 Access (1) – Public Roads of PBP2006 contains measures that indicate how perimeter roads should be designed and how two alternative egress routes should be provided. Every lot in the proposed subdivision already has two different routes of egress from each lot to a safe place being either Nowra or the NSP. The need for a third evacuation route along a rear lane from the perimeter lots is a Performance Solution. Performance Solutions should only be prepared by persons with the skills, credentials and resources (models) to assess them. In the private sector this is a BPAD Level 3 practitioner.

The proposal complies with PBP2006 and has satisfied the RFS as outlined in its letter dated 4/11/16.

Further, the redesign will have a major impact on the street network that has been developed over the last 10 years during the assessment process and provides a poor urban design outcome for the majority of the perimeter lots. The subdivision design will have to be significantly redone.

With respect to the requested deletion of Condition A1(9)(e):

The layout complies with PBP2006 and has obtained RFS approval in its letter dated 4/11/16. The location of the medium density lots has been specifically selected to satisfy both Council's site specific DCP and DPIE requests during the assessment process to be located around the central "hub" as outlined in the DCP in order to achieve a specific urban design outcome.

Moving the higher density lots to the centre of the subject land (not located around the central core of the URA as proposed) would lead to a poor urban design outcome in the long term as development to the west is expected to occur and the site is expected to develop in line with the DCP requirements.

It seems highly unusual that DPIE would seek the relocation of the medium density lots and at the same time seek a quarantining of the 100m wide strip adjacent the western boundary of the site. There is no scientific justification for either measure, let alone both.

The DPIE relocation proposal would appear to be a Performance Solution. As stated previously, Performance Solutions should only be prepared by persons with the skills, credentials and resources (models) to assess them. In the private sector this is a BPAD Level 3 practitioner. The DPIE relocation proposal has not been developed by someone with these requirements.

WATER QUALITY CONDITIONS

The changes requested below with respect to the proposed water quality conditions are driven by a number of key principles. In essence, the conditions have been prepared by DPIE on the assumption that two downstream species being the Nowra Heath Myrtle *(Triplarina nowraensis)* and Spring Tiny Greenhood *(Pterostylis vernalis)* are in existence downstream of the site and are groundwater dependent.

We will demonstrate below the following:

1. The Spring Tiny Greenhood has never been located downstream of the site despite numerous periods of survey effort by numerous ecologists and therefore cannot be protected by any groundwater recharge system;
2. The Nowra Heath Myrtle is not groundwater dependent.

Since draft conditions of consent were provided to us by DPIE in February 2018 requiring additional groundwater monitoring and assessment of vegetation quality, we commissioned Martens and Associates to complete additional groundwater monitoring and Ecological Australia to complete additional vegetation assessment and analysis of the Nowra Heath Myrtle and other species mentioned in the DPIE draft conditions. Copies of various documents are attached and summaries outlined in the next below.

It is also worth noting that the area downstream of the site where the Nowra Heath Myrtle is located is within biobank site BA380 which was created in February 2019. The biobank site is generally consistent with Area B in Appendix 2 of the draft Development Consent. A copy of the signed biobank agreement for the site is attached in Appendix D. The biobank agreement requires ongoing protection and monitoring of the vegetation within the biobank site.

A preliminary assessment of the outcomes of the most recent groundwater monitoring completed by Martens and Associates is attached in its letter dated 9 July 2019 (see Appendix E).

A copy of the conclusions of that report are repeated below *(emphasis added)*:

Site groundwater monitoring is ongoing and this report shall be updated as additional data is developed. Review of the completed groundwater investigations concludes that ***groundwater beneath the site is transient and, in the main, absent****. Where groundwater is present it is either in a very thin veneer over the rock surface, or is very short lived. The most persistent groundwater observed on the site is at MW08, however, this is upslope of MW03 which lies adjacent to the vegetation under consideration. MW03 had groundwater for only 14 days during the monitoring period, meaning the more persistent/frequent groundwater at MW08 is not influencing vegetation.*

Given the limited depth of observed groundwater and the small percentage of the time that groundwater is present beneath the site it is considered most unlikely that the groundwater is critical for water supply for maintenance of the health of the downslope vegetation.

Further to this preliminary assessment of groundwater conditions beneath the site we suggest that a companion document should be prepared by the vegetation consultant to characterise the vegetation condition at the start of the period, at the inspection completed mid period and at the end of the monitoring period. ***Provided that the conclusion from the consultant is that the vegetation's conditions was not different during the monitoring period, with no significant groundwater flows, it would be reasonable to conclude that groundwater at the soil / rock interface is not a dominant control on the continued health of the vegetation under consideration.***

Dr Meredith Henderson from Ecological Australia was also engaged to complete two separate bodies of work being:

1. An assessment of the nature of any groundwater dependency on the species of interest to DPIE in its draft conditions from February 2018 dated 23/5/18. This report is attached as Appendix F;
2. An assessment of the condition of the Nowra Heath Myrtle over the same period that the groundwater monitoring was being undertaken by Martens and Associates. . This report is attached as Appendix G;

Extracts from these reports are included in the text below.

From Appendix F:

30. There is little evidence to support that Nowra Heath Myrtle, the two vegetation types or the moss gardens are groundwater dependent ecosystems. There is some suggestion in the final determination for Pterostylis vernalis that this species is associated at least with some water flow between the shallow soil and the rock surface.

31. Pterostylis vernalis was not found on site, despite about a decade or survey for this species. Both OEH and Council, as well as ecological consultants have not found this species within the lands managed by Jemalong Mundamia Pty Ltd.

32. The link between groundwater and most of the ecological values present within the site has not been established. Monitoring of groundwater could be done through the establishment of short- and long-term bores. However, the consequences of change in the above ground vegetation may not be attributable to any changes in groundwater regimes, should that occur.

From Appendix G:

With respect to the Tiny Spring Greenhood:

Despite many years of intensive searches for this species on the site, neither Council nor the various consultants have detected this species as being present. Surveys have been conducted on the site since 2006 and have occurred during suitable seasons over a 10-year period.

While the species may be associated with the moss gardens it is not present on the site.

With respect to the Nowra Heath Myrtle:

There did not appear to be any negative consequences of below average rainfall on the health of the Nowra Heath Myrtle. The plants sampled were in relatively good health in the October 2018 and June 2019 surveys. There does however appear to have been some damage to the Nowra Heath Myrtle plants, but this is not likely to be related to rainfall or groundwater.

In light of the above, a number of changes are proposed to the water quality conditions as outlined below. Specific and detailed justification is also provided to assist IPC in making its final determination

We note in the transcript of the meeting between DPIE and IPC held on 6 August that DPIE staff suggested the groundwater issues were “a complicated technical issue” (Line 46 page P-13). It is our view that this is not the case. A suitable stormwater management regime was developed by Martens in 2015. It is our position that this proposed stormwater management regime is still suitable for the site today. Further, Council’s own site specific DCP Chapter NB1, requires a stormwater management regime in accordance with the Martens proposal.

Condition C4

Proposed Modification:
Delete this condition.

Justification:
Condition C4 requires a revised Hydrogeological Report to be prepared to protect the Nowra Heath Myrtle and Spring Tiny Greenhood, which have been assumed by DPIE to be Groundwater Dependent Ecosystems. It is the findings of Dr Meredith Henderson at ELA that the species of interest are either;

1. Not present on the site (with respect to the Spring Tiny Greenhood); and
2. Not dependent upon groundwater for survival (with respect to the Nowra Heath Myrtle).

Further, the condition also requires assessment of the Kunzea Shrubland which is not a threatened species and is located in the biobank site which will be subject to ongoing monitoring.

The condition is excessively complex for the impact that is expected.

Condition C5

Proposed Modification:
Delete this condition.

Justification:
This condition seeks a final recharge and stormwater management system to be developed to respond to the recommendations of the revised hydrogeological report developed in accordance with Condition C4 in order to protect the Nowra Heath Myrtle (Triplarina nowraensis) and Spring Tiny Greenhood (Pterostylis vernalis).

As outlined above, the species being protected are either:

1. Not present or;
2. Not groundwater dependent.

Therefore this condition requires significant amounts of work that does not need to be completed.

A stormwater management regime (Martens and Associates, 2015) was previously already developed by as part of the DA documentation, and at the request of DPIE during the assessment process. Further, Council's site specific DCP Chapter (Chapter N2) already contains a stormwater management regime for the Mundamia URA that the proposed development complies with. This matter was raised continually with DPIE staff but is is worth noting that this issue is not contained within DPIE's assessment report.

A link to the DCP Chapter NB1 is attached below:
http://dcp2014.shoalhaven.nsw.gov.au/content/mundamia-urban-release-area

Refer to Section 4.5 of the DCP Chapter and the supporting diagrams which require the use of roadside swale drains other stormwater treatment measures which are as per the Martens 2015 solution provided to DPIE.

Condition C6

Proposed Modification:
Delete this condition.

Justification:
This condition requires a detailed monitoring program to be developed and implemented *"to quantify the offsite impact of the development on groundwater dependent species (Nowra Heath Myrtle, Spring Tiny Greenhood Orchid, the Swamp paperbark community and small moss gardens".*

It is our contention that the monitoring completed to date and as outlined in Appendix E already satisfies this condition and the conclusion of this work is that the groundwater is not significant to any of the species downstream from the site.

Condition C7

Proposed Modification:
Delete this condition.

Justification:
This condition seeks to confirm that the extensive body of work completed on groundwater and its impact on downstream species as contained in the Martens May 2015 report, Council site specific DCP Chapter NB1, and the subsequent work by both Martens and Ecological Australia is insufficient to mitigate the risk of downstream impacts from this site. Additional monitoring and investigation is not warranted for the reasons outlined above.

Further, changes are proposed to Condition C12 which will tie in the Martens work from 2015 which is in accordsce with the DCP Chapter NB1 requirements.

Condition C8

Proposed Modification:
Delete this condition.

Justification:
This condition seeks a Contingency Strategy to be prepared to identify measures that must be implemented if the development results in a statistically significant reduction in the number of Nowra Heath Myrtle plants or the Spring Tiny Greenhood Orchid habitat or plants, or a reduction in the Swamp Paperbark Community or small moss gardens located within the monitoring area.

The species outlined in the proposed condition are either:

1. Not present at the site; or
2. Not groundwater dependent;
3. Not threatened species/communities;

Further, the area to be monitored is already included in the biobank site and will be monitored on a quarterly basis in accordance with the biobank agreement.

The need for a contingency strategy is unjustified and unnecessary.

ADMINISTRATIVE CHANGES

The changes requested below are generally administrative in nature and will either improve the usability of the Development Consent going forward, decrease the bureaucratic nature of some of the conditions, or are unjustified by DPIE.

Condition C11

Proposed Modification:
Delete this condition.

Justification:
This condition requires a cut and fill plan to be provided to Council for approval prior to the issue of a Construction Certificate.

There is negligible cut and fill proposed on the site as proposed roads will generally be close to existing ground levels and there is no proposal at this stage to cut/fill each proposed lot. There will be negligible information to show on any cut/fill plan.

The need for a separate approval by Council is unnecessarily bureaucratic as an Accredited Certifier will be appointed for all civil works who will certify any minor cut/fill requirements as part of the Construction Certificate documentation.

Condition C12

Proposed Modification:
Modify this condition to read as follows:

"Construction Certificate drawings shall incorporate the recommendations identified in Section 3.5 of the "Preliminary Geotechnical and Constraints Assessment" prepared by Martens and Associates dated November 2008 and the requirements outlined in the "Stormwater Management Assessment" prepared by Martens and Associates dated May 2015."

Justification:

A condition of consent is sufficient to ensure these requirements are included in the proposal. An Accredited Certifier will be responsible to ensure these provisions are met. Additional certification by a third party is unnecessarily bureaucratic.

Condition C15
Proposed Modification:
Modify the first part of this condition (before bullet point a) to read as follows:
"Prior to the issue of each Construction Certificate, engineering design plans and specifications for subdivision works are to be submitted and approved by the Certifier. In addition, the subdivision works must:"

Justification:
The second sentence which requires works in the existing road reserve is not required here as it is repeated in Condition D6.

Condition C16

Proposed Modification:
Modify the first part of this condition (before bullet point a) to read as follows:
"Construction Certificate drawings for road design must be submitted to and approved by the Certifier. The designs must identify the proposed method of pavement containment being either edge strip or kerb and gutter. The road forming works must also comply with the following requirements:"

Justification:
The requested changes seek approval to have only the Certifier approve the drawings not Council and to not specify the proposed kerb and gutter requirements as the proposed stormwater system includes roadside swale drains which do not require kerb and gutter.

Condition C16(e)

Proposed Modification:
Modify this condition as follows:
"(e) the road design requirements outlined in Section 4.1.3 (1) Public Roads of Planning for Bushfire protection 2006"

Justification:
The proposed change simply clarifies the requirements that are to be met in a more specific manner.

Condition C23

Proposed Modification:
Modify this condition so that "Council" is replaced by "the Certifier".

Justification:
The proposed change simply clarifies that an Accredited Certifier is authorised to approve the Construction Certificate drawings and separate approval by Council is not required nor is it justified.

Condition C24

Proposed Modification:
Delete this condition.

Justification:
The requirements of this condition are a repeat of the requirements of Condition C15(c).

Condition C28

Proposed Modification:

Modify this condition so that “Council” is replaced by “the Certifier”.

Justification:
The proposed change simply clarifies that an Accredited Certifier is authorised to approve the Construction Certificate drawings and separate approval by Council is not required nor is it justified.

Condition C30

Proposed Modification:
Modify this condition so that “Council” is replaced by “the Certifier”.

Justification:
The proposed change simply clarifies that an Accredited Certifier is authorised to approve the Construction Certificate drawings and separate approval by Council is not required nor is it justified.

Condition C31

Proposed Modification:
Modify this condition so that “Council” is replaced by “the Certifier”.

Justification:
The proposed change simply clarifies that an Accredited Certifier is authorised to approve the Construction Certificate drawings and separate approval by Council is not required nor is it justified.

Condition C35

Proposed Modification:
Modify the first part of this condition (before bullet point a) so that “Council” is replaced by “the Certifier”.

Justification:
The proposed change simply clarifies that an Accredited Certifier is authorised to approve the Construction Certificate drawings and separate approval by Council is not required nor is it justified.

Condition C35

Proposed Modification:
Add a new bullet point from Condition A1(8)(e) as follows:
“(p) identify the landscape treatment proposed along the eastern boundary to prevent vegetation creep.”

Justification:
This additional clause confirms that the measures to prevent vegetation creep will be incorporated into the proposal.

Condition C36

Proposed Modification:
Modify the condition so that “Council” is replaced by “the Certifier”.

Justification:
The proposed change simply clarifies that an Accredited Certifier is authorised to approve the Construction Certificate drawings and separate approval by Council is not required nor is it justified.

Condition D12

Proposed Modification:
Delete this condition.

Justification:

As outlined earlier in this letter, there are no groundwater dependent ecosystems downstream of the site.

The area subject to this question is already located within a n approved biobank site, is protected by various management actions required to be implemented and is monitored on a quarterly basis in accordsce with the biobank agreement.

The need for additional “sub-plans” for GDE’s that re no present is unnecessarily bureaucratic.

Condition F6(a)

Proposed Modification:
Modify the condition so that the words “Condition A1(10)” are replaced by “APS Plan 25489-11 Rev 20 and the RFS letter dated 4/11/16”.

Justification:
The condition references Condition A1(10) which does not exist. Instead the condition should reference the approved plan which shows the required APZ’s in accordance with the RFS letter of approval.

Condition F7

Proposed Modification:
Modify the condition so that the words “Condition A1(10)” are replaced by “APS Plan 25489-11 Rev 20 and the RFS letter dated 4/11/16”.

Justification:
The condition references Condition A1(10) which does not exist. Instead the condition should reference the approved plan which shows the required APZ’s in accordance with the RFS letter of approval.

Condition F15b

Proposed Modification:
Delete this condition.

Justification:
Both ends of Road 6 are “through roads” and do form part of a potential bushfire evacuation route.

Condition F16

Proposed Modification:
Delete this condition.

Justification:
The area identified already forms part of an approved biobank site. An additional VMP that sits over the top of the biobank agreement is not warranted or justified.

Condition F26(e)(vi)

Proposed Modification:
Delete this condition.

Justification:
The requirement for 6mm glazing is not justified.

Section 4.3 of the Aircraft and Traffic Noise Intrusion Report prepared by Day Design (13 May 2015) (included as Appendix G) which was prepared for and submitted with the proposal indicates with respect to aircraft noise:

“HMAS Albatross ANEF 2014 contours are shown in the attached Appendix B. The subject site

is located approximately 3.8 kilometres outside the 20 ANEF contour as shown in the attached Appendix C.

This location is not considered to be near to the 20 ANEF contour (see Note 1 in Figure 2) in any sense as it is 3.8 km outside the 20 ANEF contour. The location of the site is considered 'acceptable' without the need for building construction to provide protection for aircraft noise.

No further assessment of aircraft noise intrusion is required."

Section 6.0 of the Aircraft and Traffic Noise Intrusion Report prepared by Day Design (13 May 2015) (included as Appendix G) which was prepared for and submitted with the proposal indicates with respect to traffic noise:

"Based on the level of required noise reduction generated by traffic from the proposed subdivisions, the acceptable internal noise limits can be met for any future dwellings using standard construction methods, for example as follows:-

- *Brick veneer or fibre cement composite clad external walls;*
- *A pitched, tiled or sheet metal roof with sarking, one layer of 10 mm standard plasterboard on the underside of timber ceiling joists lined with standard thermal insulation; and*
- *Minimum 4 mm float glass throughout."*

In light of the above findings, DPIE has no justification to require 6mm glass for every dwelling in the subdivision. DPIE's rationale behind this condition is unjustified and could be interpreted to be simply seeking to reduce the affordability of dwellings in the Mundamia URA.

---oooOOOooo---

We apologise for the length of this submission. We do not feel that the issues outlined in this submission were addressed adequately by DPIE staff during the assessment and consultation process. Further, some of the documents attached to this submission were not provided to DPIE staff during the assessment process as we had concerns that this would only further delay the final assessment of the proposal which has now been going for over 10 years.

We trust the IPC assessment will be thorough and we look forward to receiving the IPC's Determination. Further, we look forward to finally being able to deliver some of the much needed housing in the Nowra-Bomaderry area as identified in the 2005 Nowra Bomaderry Structure Plan.

Allen Price & Scarratts Pty Ltd

Matt Philpott
Director

Appendices:
A – APS plan 25489-11 Rev 20 dated 22/8/19
B – Ecological email to RFS dated 27/6/16
C – RFS Acceptance of subdivision proposal dated 4/11/16
D – Biobank Agreement BA380
E – Martens Report on the recent Groundwater Monitoring dated 9/7/19
F – ELA Memorandum dated 23/5/18;
G – ELA Report dated 25/6/19;
H – Day Design Noise Report dated 13/5/15;

allen price & scarratts pty ltd
land and development consultants

Appendix A

Nowra Office: 75 Plunkett Street, Nowra NSW 2541 • PO Box 73, Nowra 2541
Kiama Office: 1/28 Bong Bong Street, Kiama NSW 2533 • PO Box 209, Kiama 2533
tel 02 4421 6544 • **email** consultants@allenprice.com.au

ABN 62 609 045 972
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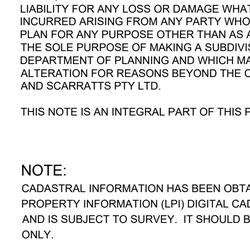
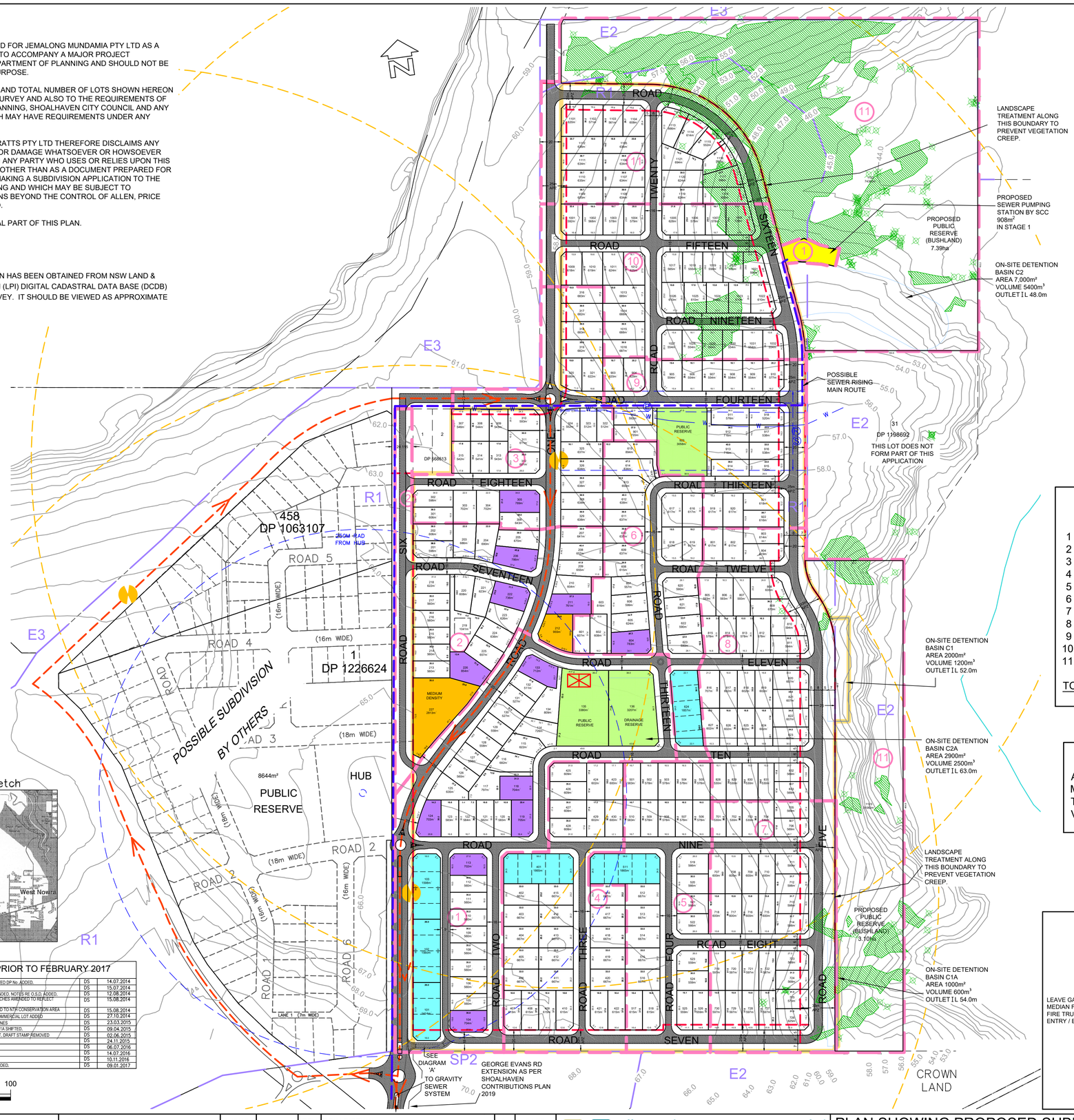


PLAN REVISIONS PRIOR TO FEBRUARY 2017			
1	MINOR AMENDMENTS TO LOT LAYOUT, ALLOCATED DP No. ADDED.	DS	14.07.2014
2	MINOR AMENDMENTS TO LOT LAYOUT.	DS	15.07.2014
3	MINOR AMENDMENTS TO LOT LAYOUT. APZ AMENDED. NOTES RE O.S.D. ADDED.	DS	12.08.2014
4	APZs, DETENTION BASINS & HEATH MYRTLE PATCHES AMENDED TO REFLECT CONSULTANTS STUDIES.	DS	15.08.2014
5	APZs AMENDED, BUFFER REMOVED. NOTE ADDED TO NTH CONSERVATION AREA	DS	15.08.2014
6	MINOR AMENDMENTS TO STAGES, LOT YIELD, COMMERCIAL LOT ADDED	DS	27.10.2014
7	LOT LAYOUT AMENDED TO SUIT REVISED APZ ZONES.	DS	23.03.2015
8	KERB DETAIL ADDED ROAD 5, DET.BASINS C1 & C1A SHIFTED.	DS	09.04.2015
9	DEVELOPABLE AREA MOVED TO DET. BASIN LIMIT. DRAFT STAMP REMOVED	DS	02.06.2015
10	STAGING/LOT NUMBERS AMENDED	DS	24.11.2015
11	LOT LAYOUT REVISED. SHEET AMENDED	DS	06.07.2016
12	STAGE 6 REVISED. ROADS RENUMBERED	DS	14.07.2016
13	STAGE 1 LOTS REVISED. 9m LANE ADDED	DS	10.11.2016
14	TIMING OF DEDICATION OF 3.1ha RESERVE AMENDED.	DS	09.01.2017

0 25 50 75 100

SCALE:- 1:2000



- INTEGRATED HOUSING LOTS
- DUAL OCCUPANCY
- MULTI DWELLING HOUSING
- APZ LINE
- PROPOSED BUS ROUTE SHOWING DIRECTION OF TRAVEL
- PROPOSED BUS STOP
- 500m WALKING DISTANCE FROM PROPOSED BUS STOP
- R1 — ZONING LINE
- DENOTES LOCATION OF NOWRA HEATH MYRTLE BY SLR- FIG. 8
- DENOTES LOCATION OF NOWRA HEATH MYRTLE PATCHES BY SLR FIG. 8
- PROPOSED SEWER RISING MAIN ROUTE BY SCC
- 11 — STAGING
- DEVELOPABLE AREA
- DENOTES EASEMENTS OF DP 1198692 TO BE PROGRESSIVELY EXPUNGED AS WORKS PROGRESS
- DENOTES NEIGHBOURHOOD SAFER PLACE

EASEMENTS CREATED IN DP 1198692

- W — DENOTES EASEMENT FOR WATER OVER EXISTING LINE OF PIPE (APPROX. POSITION) (DP 1198692)
- (R) RIGHT OF WAY 75 WIDE (DP 1198692)
- (S) EASEMENT FOR SUPPLY OF SERVICES 75 WIDE (DP 1198692)
- (E) EASEMENT FOR OVERHEAD POWERLINES 9 WIDE (DP 1198692)

RESIDENTIAL STAGING

1	34 LOTS + P.R. + D.R.
2	27 LOTS
3	29 LOTS
4	30 LOTS
5	26 LOTS
6	24 LOTS
7	30 LOTS
8	33 LOTS
9	22 LOTS + P.R.
10	32 LOTS
11	21 LOTS + 2 x P.R.
TOTAL	308 LOTS + 4 x P.R. + D.R

LOT YIELD

RESIDENTIAL LOTS	288
DUAL OCCUPANCY	12 (24 DWELLINGS)
MULTI DWELLING LOTS	2 (8 DWELLINGS)
INTEGRATED HOUSING LOTS	6 (26 DWELLINGS)
TOTAL	308 (346 DWELLINGS)
PUB. RES.	4
PUB.RES.-BUSHLAND	2

OVERALL SITE AREA	41.39 ha
OVERALL DEV. AREA	30.027 ha
JEMALONG PUBLIC RESERVE	6,437m²
SCC PUBLIC RESERVE (FUTURE)	8,644m²
TOTAL	15,081m²

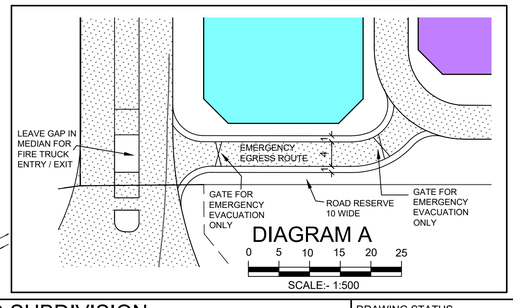
RESERVE AREA REQUIRED

JEMALONG	
346 DWELLINGS x 2.5 People x 12m² =	10,380m²
SCC	
103 LOTS x 2.5 People x 12m² =	3,090m²
TOTAL	13,470m²
PUBLIC RESERVE (CENTRAL)	3,380m²
PUBLIC RESERVE (NORTHERN)	3,058m²
PUBLIC RESERVE (BUSHLAND)-NTH	73,900m²
PUBLIC RESERVE (BUSHLAND)-STH	31,000m²
TOTAL	111,338m² (11.13ha)

JEMALONG DEVELOPMENT AREA PER HECTARE
30.02ha/346 dwellings = 11.52 dwellings per hectare

NOTE

ALL ROUNDABOUTS TO BE MOUNTABLE WHERE REQUIRED TO ASSIST WITH EMERGENCY VEHICLE ACCESS



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COVER OF EXCELLENCE

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RATIO: 1:2000 (AT A1 ORIGINAL)	DATUM:	SURVEY		REV	DESCRIPTION	BY	DATE
	ORIGIN:	DESIGN	MJP	15	PUB. RES. INCREASED. LAYOUT AMENDED	DS	20.02.2017
		DRAWN	DGS	16	SPS & SRM LOCATION & STAGING REVISED.	DS	11.04.2017
		CHECK'D		17	ROAD 10 WIDE ADDED & RESERVES AMENDED	DS	19.07.2017
	DATE OF PLAN: 25 FEB 2014			18	STAGING/LOT NUMBERS AMENDED	DS	01.04.2019
				19	MINOR LOT AMEND. TO SUIT ROAD DESIGN	DS	14.05.2019
				20	NOTES ADDED. COMMERCIAL LOT DELETED. INTEGRATED HOUSING LOTS IDENTIFIED.	DS	21.08.2019

allen price & scarratts pty ltd
land and development consultants
Nowra Branch: 75 Plunkett Street, Nowra NSW 2541
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consultants@allenprice.com.au www.allenprice.com.au

PLAN SHOWING PROPOSED SUBDIVISION OF LOT 30 DP 1198692 (PREVIOUSLY LOT 3 DP 568613 & LOT 384 DP 755952) AT MUNDAMIA GROWTH AREA FOR JEMALONG MUNDAMIA PTY LTD

DRAWING STATUS: PRELIMINARY — NOT TO BE USED FOR CONSTRUCTION PURPOSES

DRAWING NUMBER: 25489-11

SHEET 1 OF 1

REVISION 20

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Appendix B

Nowra Office: 75 Plunkett Street, Nowra NSW 2541 • PO Box 73, Nowra 2541
Kiama Office: 1/28 Bong Bong Street, Kiama NSW 2533 • PO Box 209, Kiama 2533
tel 02 4421 6544 • **email** consultants@allenprice.com.au

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Matt Philpott

From: Rod Rose <rodr@ecoaus.com.au>
Sent: Monday, 27 June 2016 12:39 PM
To: Martha Dotter
Cc: Matt Philpott
Subject: Mundamia
Attachments: rptBushfireAttackReport 19.04.2016.pdf; Slope1.jpg; escarpment is a fire barrier in some locations.jpg; escarpment rock 5.jpg; exposed rock platforms.JPG; more rock platform.JPG; more escaprment rock 4.jpg; more escarpment rock 3.jpg; more escarpment rock.jpg; rock escarpment.jpg; short length to watercourse below escarpment.jpg

Your Refs: D15/2555, DA 15082898296 MD

Dear Martha

As per our discussion on the slope assessment at Mundamia, please find the additional information you required below:

1. **Modelling of the RHF**

We have completed the additional slope analysis requested (i.e. analysis of slopes out to 150 m from the building line). As predicted the highest radiant heat flux resulting from the steeper slopes produces a RHF of 17 kW/m2 well under the 29 kW/m2 achieved with the more gentle slopes nearer the development (see attached modelling report, using the slopes from the nine 50 m transect extensions shown in green in the attached Figure). These results occur because radiant heat decreases exponentially with distance and although steeper slopes may produce higher intensities this is overshadowed in this instance by the increased separation distances.

It is also my expert judgement (as a former FCO within Shoalhaven City and having managed over 1600 bushfires) that the short lengths of steeper slopes beyond 100 m will not result in fire intensities that will carry through any distance of consequence within the APZ. The steeper slopes are often 20 m or so in length and covered in a heavy rock cover on average about 25% of ground surface and >30% of surface within 50 m nearest the building line (see example photographs showing rocky escarpment creating most of the average slope issues), this rock cover and the short length of slope up from the bottom of the watercourse (see final photo) significantly mitigates fire spread and intensity. These site conditions and the exponential decrease in radiant heat with distance means the steeper slopes beyond 100m are NOT the effective slope.

2. **Future BAL management arrangements**

Elizabeth Downing from Shoalhaven City Council included the RFS in an email to Matt Philpott dated 27th April 2016 which stated the following:

> *Council understands that a performance based approach, prepared by Rod Rose, is to be utilised for the proposed major project at Mundamia Urban Release Area, ensuring all lots will have a maximum BAL rating of BAL29. Such solution would be then also be taken into consideration of the assessment of future dwelling applications on the individual lots, as per the proposed restrictions as to user.*
>
> *Please also refer to previous comments provided to DoPE dated 17 September, 2015 with regard to other APZ matters, and other issues.*

It is therefore proposed to:

- to place a restriction as to user on the title of relevant lots with words to the effect that a performance based bushfire solution will be required to meet the BAL29 level; and

- to prepare a report outlining the performance-based bushfire solution for these allotments prior to Subdivision Certificate which will be provided to future lot owners which they can utilise for their DA's if they so choose.

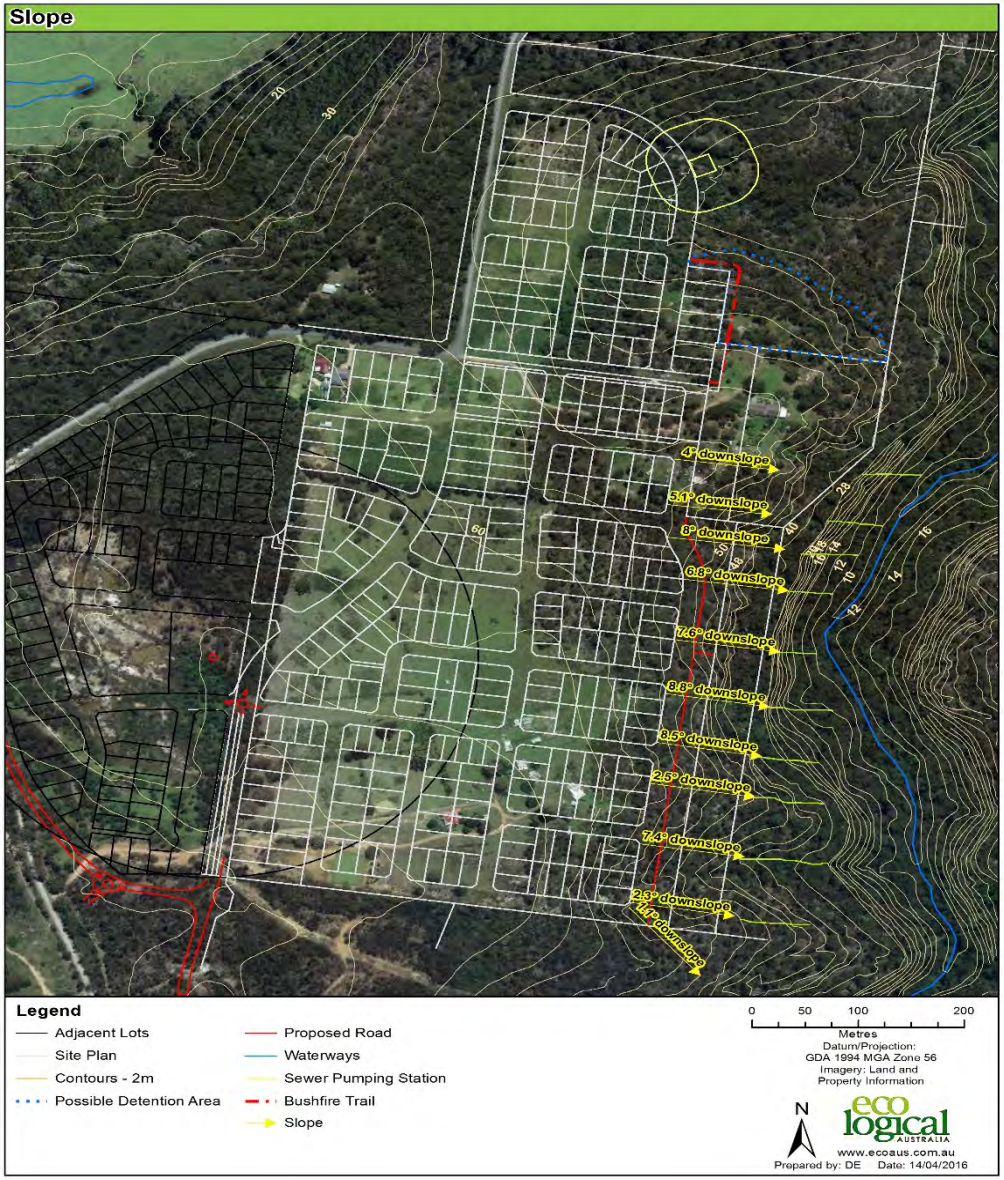
I trust that this meets the further information you require to issue a Bush Fire Safety Authority.

Regards

Rod Rose
Director

Eco Logical Australia P/L

Tel: 02 42012267
Fax: 02 4443 6655
Mob: 0402 054 751
www.ecoaus.com.au



Slope 1

Escarpment is a fire barrier in some locations

Escarpment rock

Exposed rock platform

More escarpment rock 4

More escarpment rock 3

More Escarpment rock

More rock platform

Short length to watercourse below escarpment

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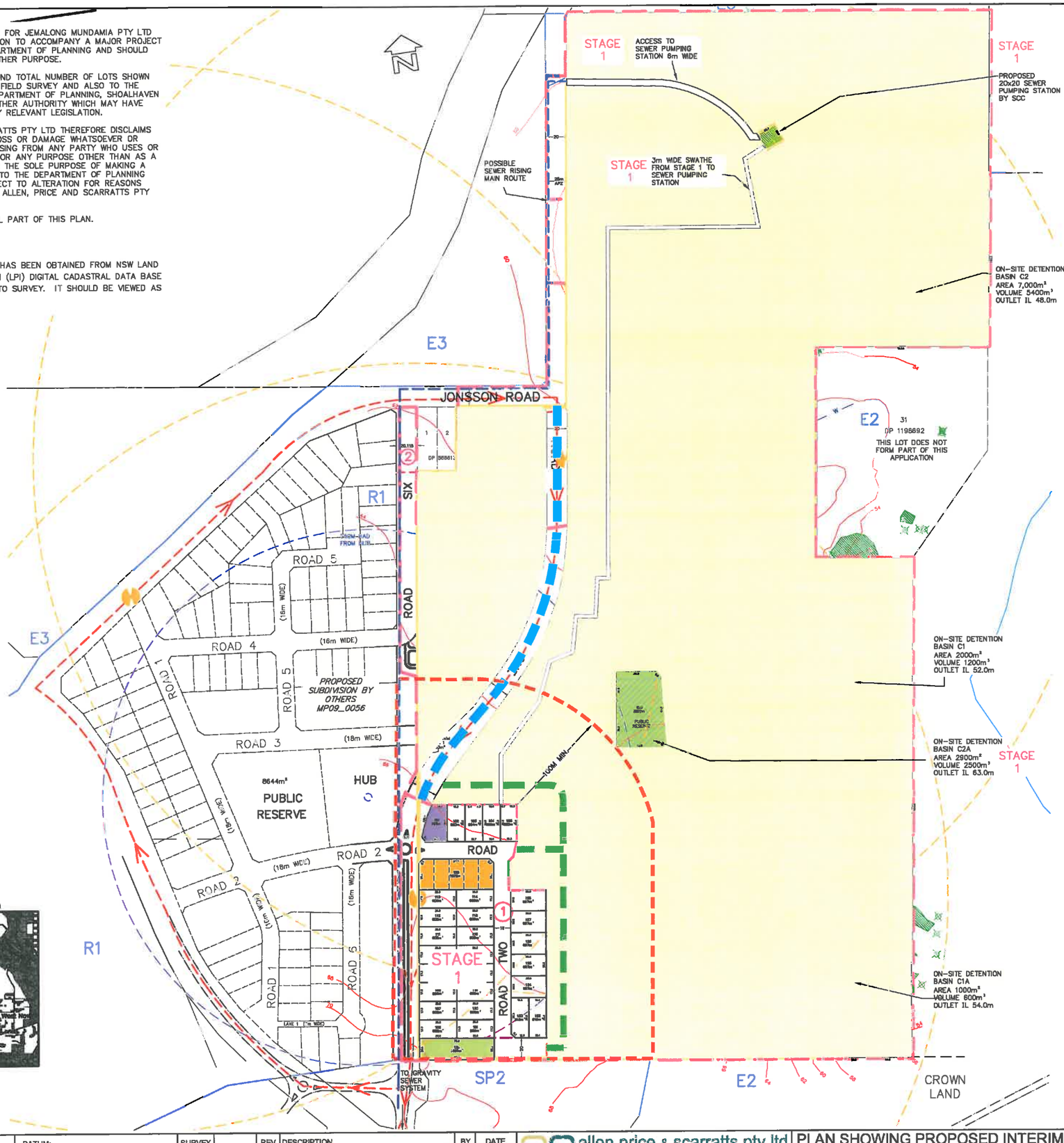

Locality Sketch

0 25 50 75 100
SCALE:- 1:2000

- COMMERCIAL
- DUAL OCCUPANCY
- MULTI DWELLING HOUSING
- APZ LINE
- PROPOSED BUS ROUTE SHOWING DIRECTION OF TRAVEL
- PROPOSED BUS STOP
- 500m WALKING DISTANCE FROM PROPOSED BUS STOP
- R1 — ZONING LINE
- DENOTES LOCATION OF NOWRA HEATH MYRTLE BY SLR– FIG. 8
- DENOTES LOCATION OF NOWRA HEATH MYRTLE PATCHES BY SLR FIG. 8
- PROPOSED SEWER RISING MAIN ROUTE BY SCC
- (11) STAGING
- DEVELOPABLE AREA
- BUSHFIRE TRAIL
- DENOTES EASEMENTS OF DP 1198692 TO BE PROGRESSIVELY EXPUNGED AS WORKS PROGRESS

EASEMENTS CREATED IN DP 1198692

- (W) DENOTES EASEMENT FOR WATER OVER EXISTING LINE OF PIPE (APPROX. POSITION) (DP 1198692)
- (R) RIGHT OF WAY 75 WIDE (DP 1198692)
- (S) EASEMENT FOR SUPPLY OF SERVICES 75 WIDE (DP 1198692)
- (Z) EASEMENT FOR ASSET PROTECTION ZONE 40 WIDE (DP 1198692)
- (E) EASEMENT FOR OVERHEAD POWERLINES 9 WIDE (DP 1198692)
- (T) EASEMENT FOR BUSHFIRE TRAIL 10 WIDE (DP 1198692)

- DENOTES TEMPORARY 100M (MIN) APZ
- DENOTES TEMPORARY BUSHFIRE ALTERNATE ACCESS
- DENOTES TEMPORARY FIRE TRAIL
- DENOTES FUTURE STAGES

RESIDENTIAL STAGING

1	29 LOTS + P.R.
2	35 LOTS
3	28 LOTS
4	33 LOTS
5	26 LOTS
6	31 LOTS + P.R.
7	30 LOTS
8	33 LOTS + P.R.
9	25 LOTS
10	32 LOTS
11	21 LOTS + P.R.
TOTAL	323 LOTS

STAGE 1

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RATIO: 1:2000 (AT A1 ORIGINAL)	DATUM:	SURVEY		REV	DESCRIPTION	BY	DATE
	ORIGIN:	DESIGN	MJP	P1	LOT LAYOUT REVISED	DS	06.07.2016
		DRAWN	DGS				
	DATE OF PLAN: 30 MARCH 2016	CHECK'D					

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Kiama Branch: 5/125 Terralong Street, Kiama NSW 2533
phone:(02) 4421 6644 fax:(02) 4422 1521
consultants@allenprice.com.au www.allenprice.com.au

PLAN SHOWING PROPOSED INTERIM BUSHFIRE MEASURES OVER EACH STAGE OF THE DEVELOPMENT IN PROPOSED SUBDIVISION OF LOT 30 DP 1198692 AT MUNDAMIA GROWTH AREA FOR JEMALONG MUNDAMIA PTY LTD

DRAWING STATUS: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

DRAWING NUMBER 25489-18 | SHEET 1 OF 11 | REVISION P1

M:\Projects\20000\35000s\25489\Drawings\25489-18 BUSHFIRE OFFSETS BY STAGES.dwg

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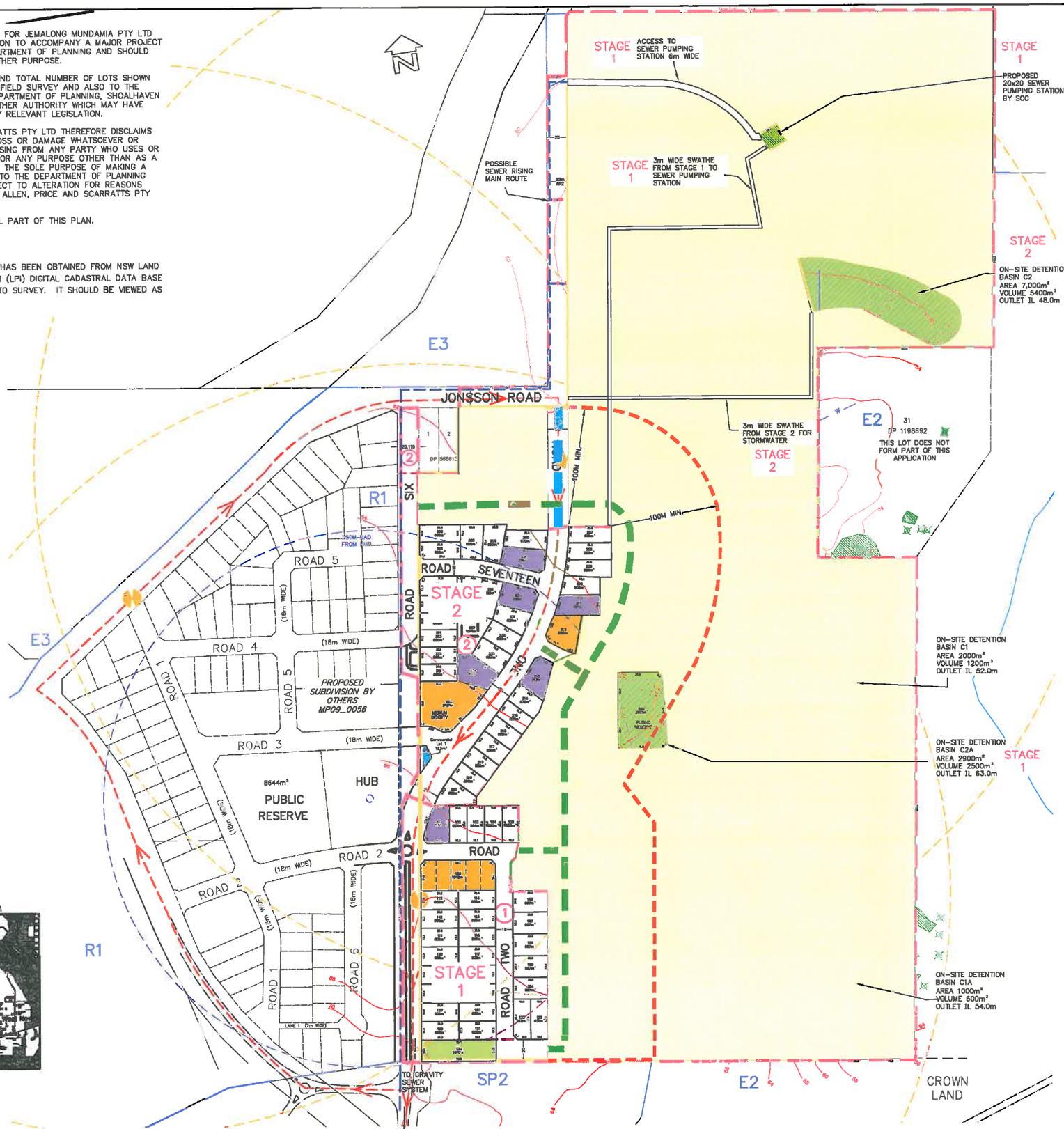

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- (S) EASEMENT FOR SUPPLY OF SERVICES 75 WIDE (DP 1198692)
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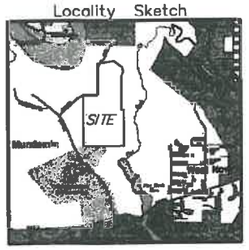
- (E) EASEMENT FOR OVERHEAD POWERLINES 9 WIDE (DP 1198692)
- (T) EASEMENT FOR BUSHFIRE TRAIL 10 WIDE (DP 1198692)

- DENOTES TEMPORARY 100M (MIN) APZ
- DENOTES TEMPORARY BUSHFIRE ALTERNATE ACCESS
- DENOTES TEMPORARY FIRE TRAIL
- DENOTES FUTURE STAGES

RESIDENTIAL STAGING

1	29 LOTS + P.R.
2	35 LOTS
3	28 LOTS
4	33 LOTS
5	26 LOTS
6	31 LOTS + P.R.
7	30 LOTS
8	33 LOTS + P.R.
9	25 LOTS
10	32 LOTS
11	21 LOTS + P.R.
TOTAL	323 LOTS

Locality Sketch



0 25 50 75 100
SCALE:- 1:2000

STAGE 2

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COVER OF EXCELLENCE

RATIO:	DATUM:			REV	DESCRIPTION	BY	DATE
1:2000 (AT A1 ORIGINAL)	ORIGIN:	SURVEY		P1	LOT LAYOUT REVISED	DS	06.07.2016
		DESIGN	MJP				
		DRAWN	DGS				
	DATE OF PLAN: 30 MARCH 2016	CHECK'D					

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land and development consultants
Nowra Branch: 75 Plunkett Street, Nowra NSW 2541
Kiama Branch: 6/126 Terralong Street, Kiama NSW 2533
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consultants@allenprice.com.au www.allenprice.com.au

PLAN SHOWING PROPOSED INTERIM BUSHFIRE MEASURES OVER EACH STAGE OF THE DEVELOPMENT IN PROPOSED SUBDIVISION OF LOT 30 DP 1198692 AT MUNDAMIA GROWTH AREA FOR JEMALONG MUNDAMIA PTY LTD

DRAWING STATUS: PRELIMINARY — NOT TO BE USED FOR CONSTRUCTION PURPOSES

DRAWING NUMBER: 25489-18 | SHEET 2 OF 11 | REVISION P1

M:\Projects\25000\25000s\25489\Drawings\25489-18 BUSHFIRE OFFSETS BY STAGES.dwg

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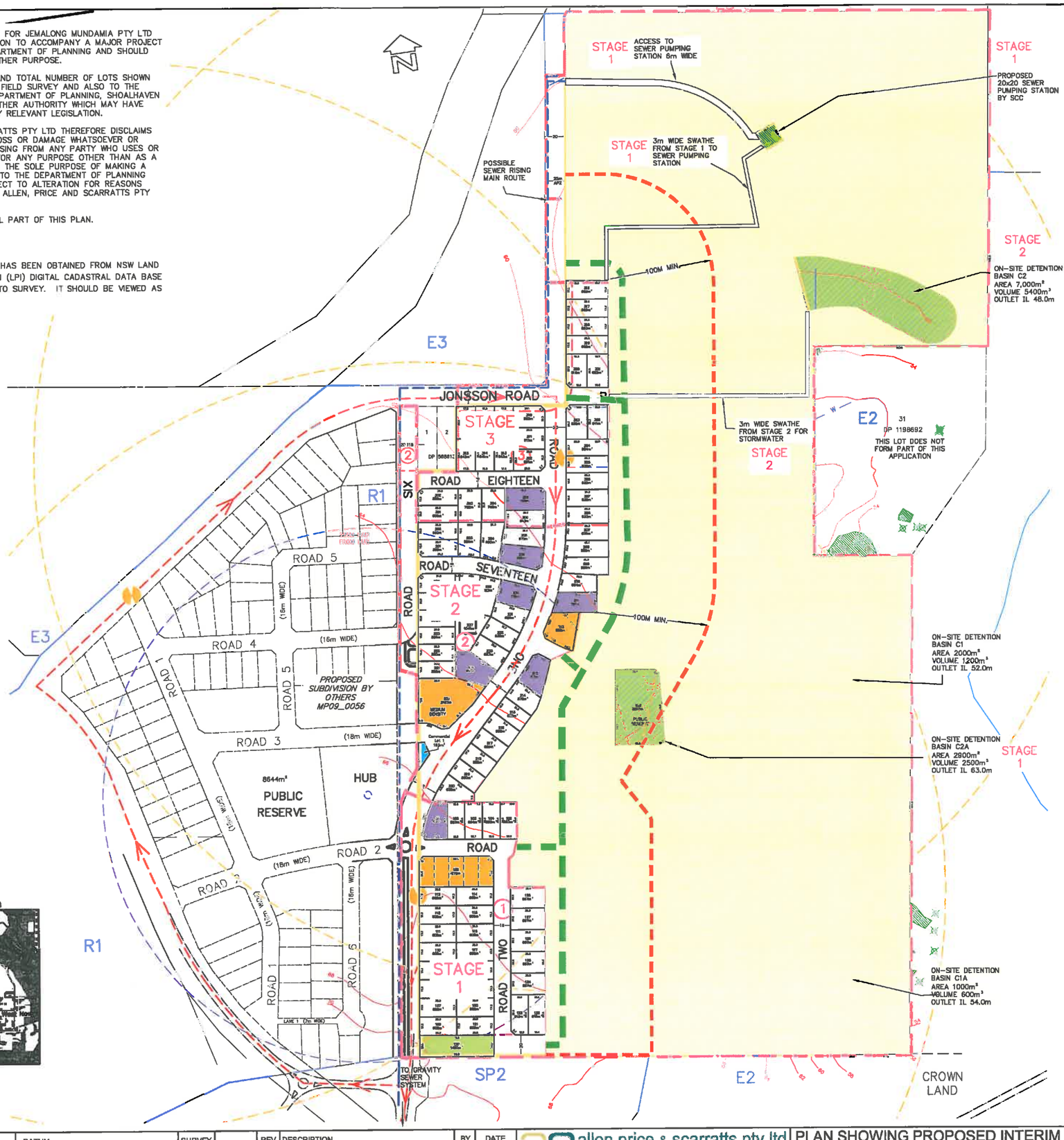
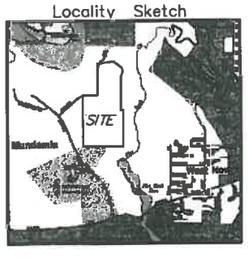


RESIDENTIAL STAGING

1	29 LOTS + P.R.
2	35 LOTS
3	28 LOTS
4	33 LOTS
5	26 LOTS
6	31 LOTS + P.R.
7	30 LOTS
8	33 LOTS + P.R.
9	25 LOTS
10	32 LOTS
11	21 LOTS + P.R.
TOTAL	323 LOTS

Locality Sketch



0 25 50 75 100
SCALE:- 1:2000

STAGE 3

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COVER OF EXCELLENCE

RATIO:	DATUM:			REV	DESCRIPTION	BY	DATE
1:2000 (AT A1 ORIGINAL)	ORIGIN:	SURVEY		P1	LOT LAYOUT REVISED	DS	06.07.2016
		DESIGN	MJP				
		DRAWN	DGS				
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DRAWING NUMBER: 25489-18 | SHEET 3 OF 11 | REVISION P1

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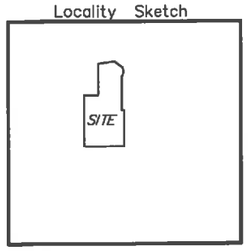
RESIDENTIAL STAGING

1	29 LOTS + P.R.
2	35 LOTS
3	28 LOTS
4	33 LOTS
5	26 LOTS
6	31 LOTS + P.R.
7	30 LOTS
8	33 LOTS + P.R.
9	25 LOTS
10	32 LOTS
11	21 LOTS + P.R.
TOTAL	323 LOTS

Locality Sketch



0 25 50 75 100
SCALE:- 1:2000

STAGE 4

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COVER OF EXCELLENCE

RATIO: 1:2000 (AT A1 ORIGINAL)	DATUM:	SURVEY		REV	DESCRIPTION	BY	DATE
	ORIGIN:	DESIGN	MJP	P1	LOT LAYOUT REVISED	DS	06.07.2016
		DRAWN	DGS				
	DATE OF PLAN: 30 MARCH 2016	CHECK'D					

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PLAN SHOWING PROPOSED INTERIM BUSHFIRE MEASURES OVER EACH STAGE OF THE DEVELOPMENT IN PROPOSED SUBDIVISION OF LOT 30 DP 1198692 AT MUNDAMIA GROWTH AREA FOR JEMALONG MUNDAMIA PTY LTD

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DRAWING NUMBER: 25489-18 | SHEET 4 OF 11 | REVISION P1

N:\Projects\25000\25500s\25548\Drawings\25548-18 BUSHFIRE OFFSETS BY STAGES.dwg

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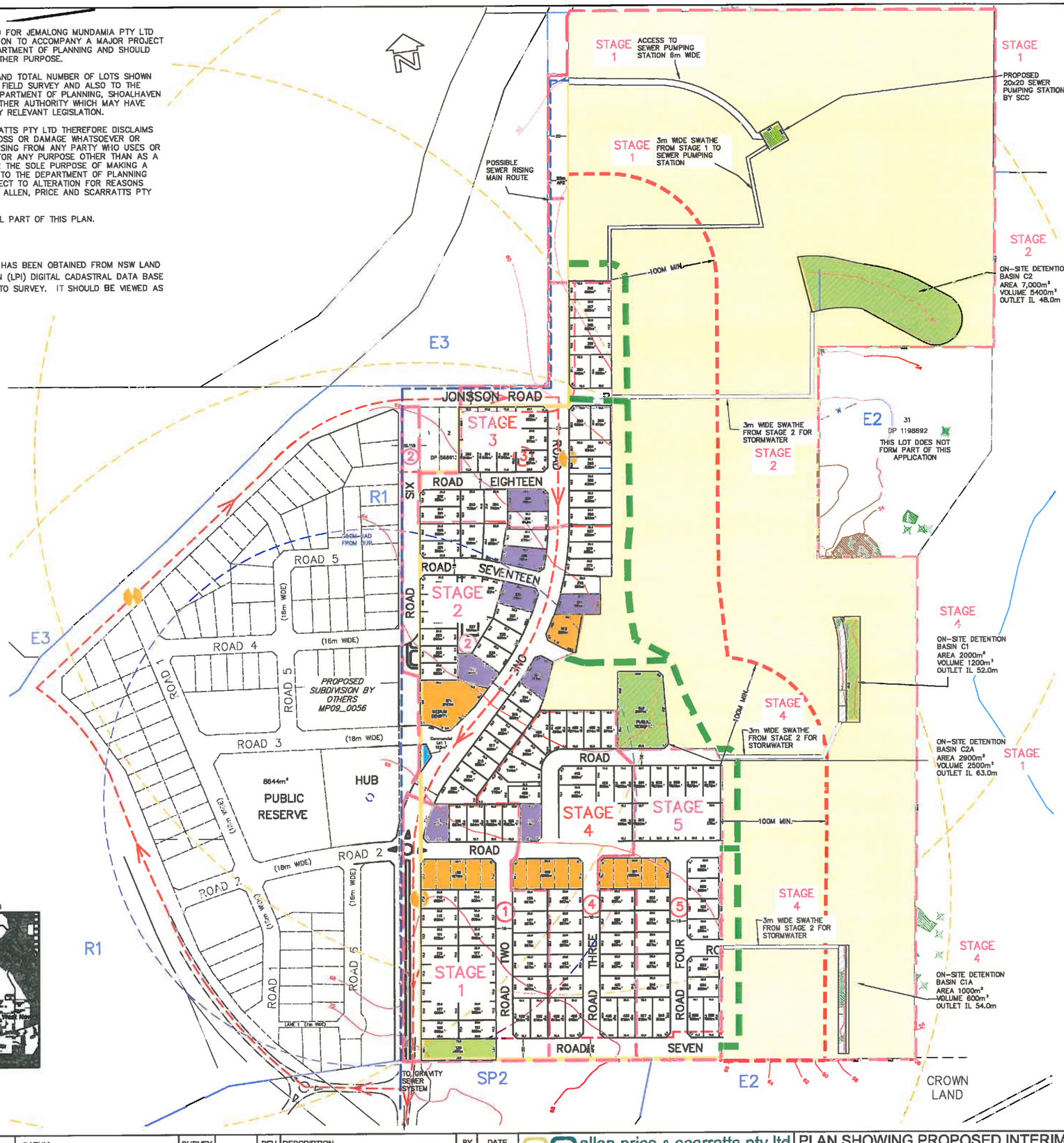

- COMMERCIAL
- DUAL OCCUPANCY
- MULTI DWELLING HOUSING
- APZ LINE
- PROPOSED BUS ROUTE SHOWING DIRECTION OF TRAVEL
- PROPOSED BUS STOP
- 500m WALKING DISTANCE FROM PROPOSED BUS STOP
- R1 — ZONING LINE
- DENOTES LOCATION OF NOWRA HEATH MYRTLE BY SLR– FIG. 8
- DENOTES LOCATION OF NOWRA HEATH MYRTLE PATCHES BY SLR FIG. 8
- PROPOSED SEWER RISING MAIN ROUTE BY SCC
- (11) STAGING
- DEVELOPABLE AREA
- BUSHFIRE TRAIL
- DENOTES EASEMENTS OF DP 1198692 TO BE PROGRESSIVELY EXPUNGED AS WORKS PROGRESS

EASEMENTS CREATED IN DP 1198692

- (W) DENOTES EASEMENT FOR WATER OVER EXISTING LINE OF PIPE (APPROX. POSITION) (DP 1198692)
- (R) RIGHT OF WAY 75 WIDE (DP 1198692)
- (S) EASEMENT FOR SUPPLY OF SERVICES 75 WIDE (DP 1198692)
- (Z) EASEMENT FOR ASSET PROTECTION ZONE 40 WIDE (DP 1198692)
- (E) EASEMENT FOR OVERHEAD POWERLINES 9 WIDE (DP 1198692)
- (T) EASEMENT FOR BUSHFIRE TRAIL 10 WIDE (DP 1198692)

- DENOTES TEMPORARY 100M (MIN) APZ
- DENOTES TEMPORARY BUSHFIRE ALTERNATE ACCESS
- DENOTES TEMPORARY FIRE TRAIL
- DENOTES FUTURE STAGES

RESIDENTIAL STAGING

1	29 LOTS + P.R.
2	35 LOTS
3	28 LOTS
4	33 LOTS
5	26 LOTS
6	31 LOTS + P.R.
7	30 LOTS
8	33 LOTS + P.R.
9	25 LOTS
10	32 LOTS
11	21 LOTS + P.R.
TOTAL	323 LOTS

Locality Sketch

0 25 50 75 100
SCALE:- 1:2000

STAGE 5

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COVER OF EXCELLENCE

RATIO:	DATUM:			REV	DESCRIPTION	BY	DATE
1:2000 (AT A1 ORIGINAL)	ORIGIN:	SURVEY		P1	LOT LAYOUT REVISED	DS	06.07.2016
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		CHECKED					
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DRAWING STATUS: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

DRAWING NUMBER: 25489-18 | SHEET 5 OF 11 | REVISION P1

M:\Projects\25000's\25000s\25489\Drawings\25489-18 BUSHFIRE OFFSETS BY STAGES.dwg

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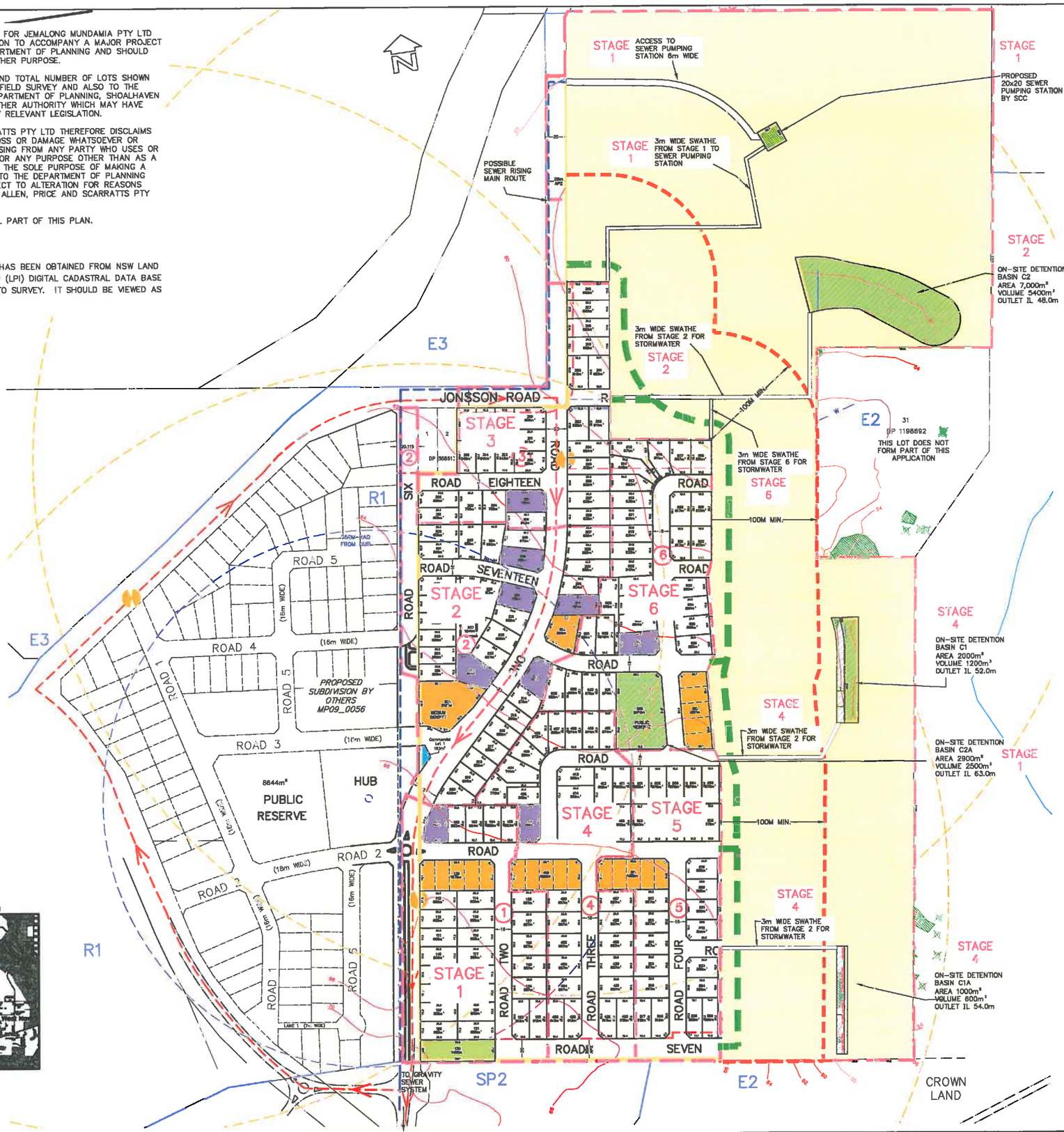

Locality Sketch

COMMERCIAL
DUAL OCCUPANCY
MULTI DWELLING HOUSING
APZ LINE
PROPOSED BUS ROUTE SHOWING DIRECTION OF TRAVEL
PROPOSED BUS STOP
500m WALKING DISTANCE FROM PROPOSED BUS STOP
R1 ZONING LINE
DENOTES LOCATION OF NOWRA HEATH MYRTLE BY SLR– FIG. 8
DENOTES LOCATION OF NOWRA HEATH MYRTLE PATCHES BY SLR FIG. 8
PROPOSED SEWER RISING MAIN ROUTE BY SCC
(11) STAGING
DEVELOPABLE AREA
BUSHFIRE TRAIL
DENOTES EASEMENTS OF DP 1198692 TO BE PROGRESSIVELY EXPUNGED AS WORKS PROGRESS

EASEMENTS CREATED IN DP 1198692

(W) DENOTES EASEMENT FOR WATER OVER EXISTING LINE OF PIPE (APPROX. POSITION) (DP 1198692)
(R) RIGHT OF WAY 75 WIDE (DP 1198692)
(S) EASEMENT FOR SUPPLY OF SERVICES 75 WIDE (DP 1198692)
(Z) EASEMENT FOR ASSET PROTECTION ZONE 40 WIDE (DP 1198692)
(E) EASEMENT FOR OVERHEAD POWERLINES 9 WIDE (DP 1198692)
(T) EASEMENT FOR BUSHFIRE TRAIL 10 WIDE (DP 1198692)

DENOTES TEMPORARY 100M (MIN) APZ
DENOTES TEMPORARY BUSHFIRE ALTERNATE ACCESS
DENOTES TEMPORARY FIRE TRAIL
DENOTES FUTURE STAGES

RESIDENTIAL STAGING

1	29 LOTS + P.R.
2	35 LOTS
3	28 LOTS
4	33 LOTS
5	26 LOTS
6	31 LOTS + P.R.
7	30 LOTS
8	33 LOTS + P.R.
9	25 LOTS
10	32 LOTS
11	21 LOTS + P.R.
TOTAL	323 LOTS

STAGE 6

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COVER OF EXCELLENCE

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DRAWING NUMBER: 25489-18
SHEET 6 OF 11
REVISION: P1

M:\Projects\25000\25000s\25489\Drawings\25489-18 BUSHFIRE OFFSETS BY STAGES.dwg

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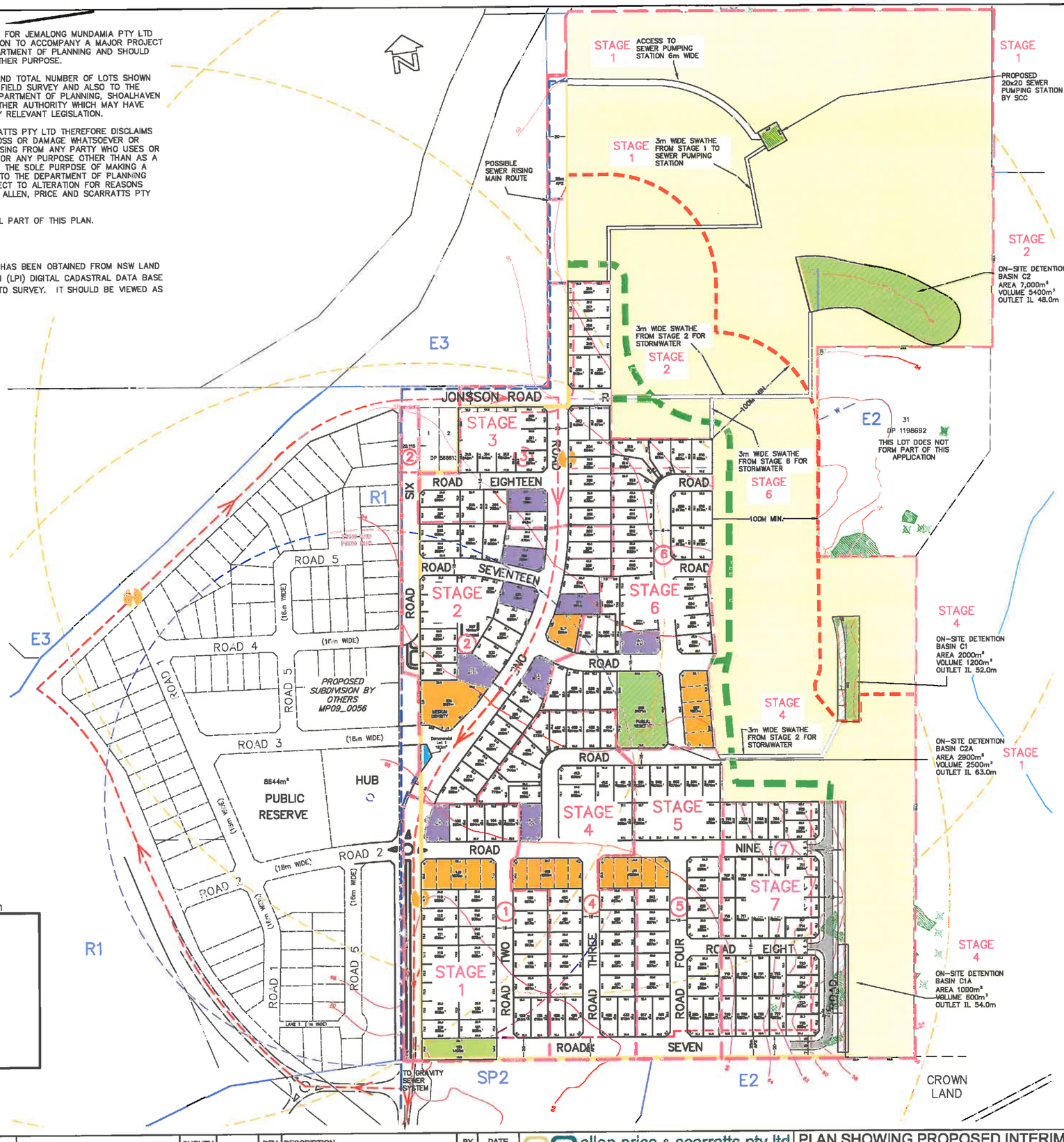

COMMERCIAL
DUAL OCCUPANCY
MULTI DWELLING HOUSING
APZ LINE
PROPOSED BUS ROUTE SHOWING DIRECTION OF TRAVEL
PROPOSED BUS STOP
500m WALKING DISTANCE FROM PROPOSED BUS STOP
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DEVELOPABLE AREA
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DENOTES EASEMENTS OF DP 1198692 TO BE PROGRESSIVELY EXPUNGED AS WORKS PROGRESS

EASEMENTS CREATED IN DP 1198692

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DENOTES TEMPORARY 100M (MIN) APZ
DENOTES TEMPORARY BUSHFIRE ALTERNATE ACCESS
DENOTES TEMPORARY FIRE TRAIL
DENOTES FUTURE STAGES

RESIDENTIAL STAGING

1	29 LOTS + P.R.
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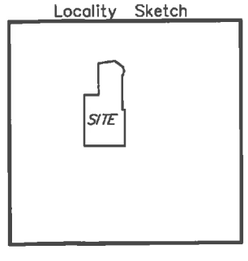
TOTAL	323 LOTS

Locality Sketch



0 25 50 75 100
SCALE:- 1:2000

STAGE 7

COVER OF EXCELLENCE
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RATIO: 1:2000 (AT A1 ORIGINAL)	DATUM:	SURVEY		REV	DESCRIPTION	BY	DATE
	ORIGIN:	DESIGN	MJP	P1	LOT LAYOUT REVISED	DS	06.07.2016
		DRAWN	DGS				
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DRAWING NUMBER 25489-18 | SHEET 7 OF 11 | REVISION P1

M:\Projects\25000\25000s\25489\Drawings\25489-18 BUSHFIRE OFFSETS BY STAGES.dwg

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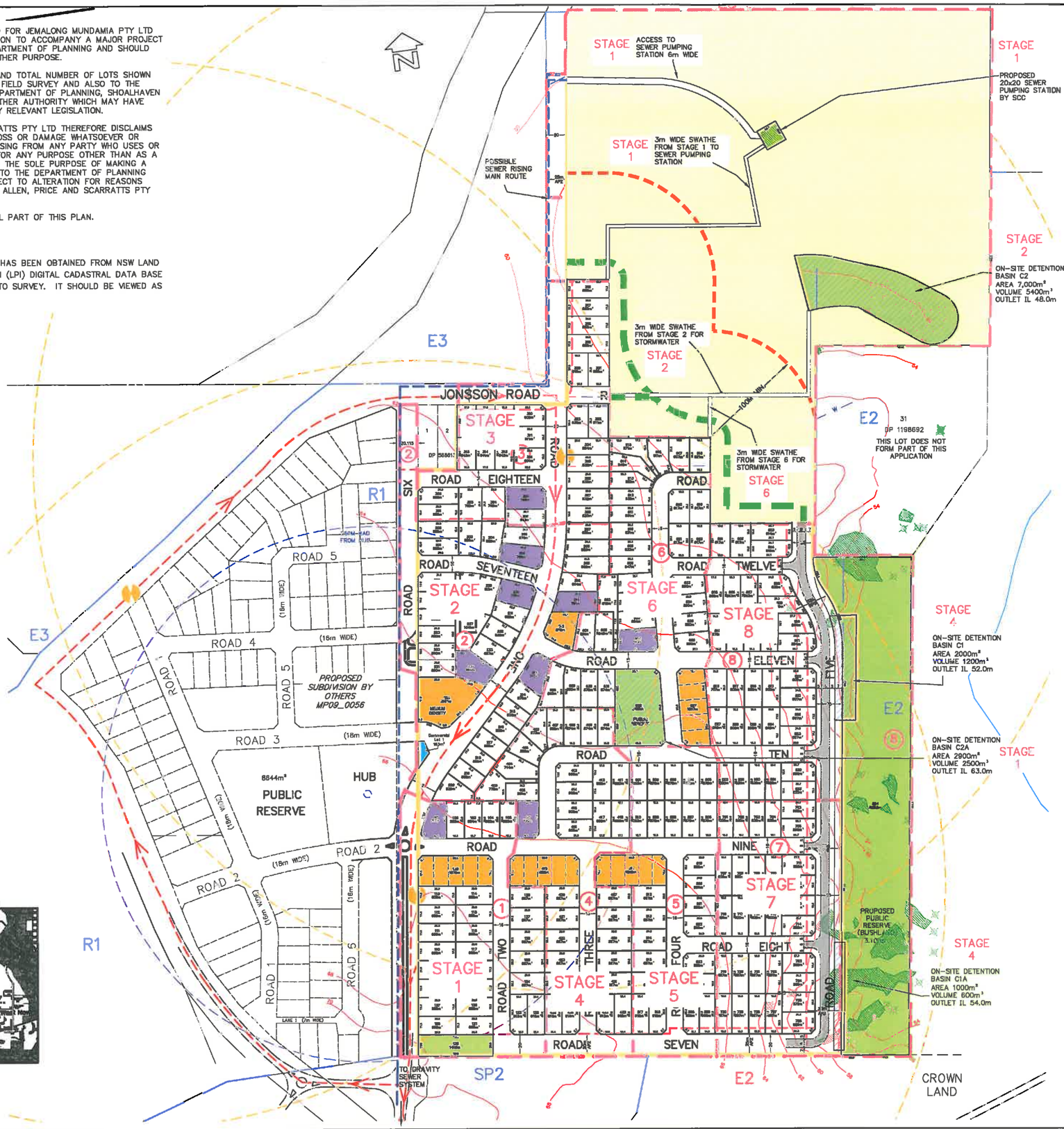

COMMERCIAL
DUAL OCCUPANCY
MULTI DWELLING HOUSING
APZ LINE
PROPOSED BUS ROUTE SHOWING DIRECTION OF TRAVEL
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DENOTES EASEMENTS OF DP 1198692 TO BE PROGRESSIVELY EXPUNGED AS WORKS PROGRESS

EASEMENTS CREATED IN DP 1198692
(W) DENOTES EASEMENT FOR WATER OVER EXISTING LINE OF PIPE (APPROX. POSITION) (DP 1198692)
(R) RIGHT OF WAY 75 WIDE (DP 1198692)
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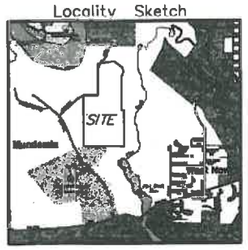
(E) EASEMENT FOR OVERHEAD POWERLINES 9 WIDE (DP 1198692)
(T) EASEMENT FOR BUSHFIRE TRAIL 10 WIDE (DP 1198692)

DENOTES TEMPORARY 100M (MIN) APZ
DENOTES TEMPORARY BUSHFIRE ALTERNATE ACCESS
DENOTES TEMPORARY FIRE TRAIL
DENOTES FUTURE STAGES

RESIDENTIAL STAGING

1	29 LOTS + P.R.
2	35 LOTS
3	28 LOTS
4	33 LOTS
5	26 LOTS
6	31 LOTS + P.R.
7	30 LOTS
8	33 LOTS + P.R.
9	25 LOTS
10	32 LOTS
11	21 LOTS + P.R.
TOTAL	323 LOTS

Locality Sketch



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STAGE 8

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COVEN OF EXCELLENCE

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RATIO: 1:2000 (AT A1 ORIGINAL)	DATUM:	SURVEY		REV	DESCRIPTION	BY	DATE
	ORIGIN:	DESIGN	MJP	P1	LOT LAYOUT REVISED	DS	06.07.2016
		DRAWN	DGS				
	DATE OF PLAN: 30 MARCH 2016	CHECK'D					

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Kiama Branch: 5/125 Terralong Street, Kiama NSW 2533
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consultants@allenprice.com.au www.allenprice.com.au

PLAN SHOWING PROPOSED INTERIM BUSHFIRE MEASURES OVER EACH STAGE OF THE DEVELOPMENT IN PROPOSED SUBDIVISION OF LOT 30 DP 1198692 AT MUNDAMIA GROWTH AREA FOR JEMALONG MUNDAMIA PTY LTD

DRAWING STATUS: PRELIMINARY — NOT TO BE USED FOR CONSTRUCTION PURPOSES
DRAWING NUMBER: 25489-18
SHEET 8 OF 11
REVISION: P1

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Locality Sketch

COMMERCIAL
DUAL OCCUPANCY
MULTI DWELLING HOUSING
APZ LINE
PROPOSED BUS ROUTE SHOWING DIRECTION OF TRAVEL
PROPOSED BUS STOP
500m WALKING DISTANCE FROM PROPOSED BUS STOP
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DENOTES LOCATION OF NOWRA HEATH MYRTLE BY SLR– FIG. 8
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PROPOSED SEWER RISING MAIN ROUTE BY SCC
(11) STAGING
DEVELOPABLE AREA
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EASEMENTS CREATED IN DP 1198692

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9	25 LOTS
10	32 LOTS
11	21 LOTS + P.R.
TOTAL	323 LOTS

STAGE 9

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COVER OF EXCELLENCE

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conveyancing@allenprice.com.au www.allenprice.com.au

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SHEET 9 OF 11
REVISION: P1

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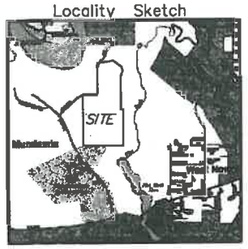
Locality Sketch



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STAGE 10

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COVER OF EXCELLENCE

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SHEET 10 OF 11
REVISION: P1

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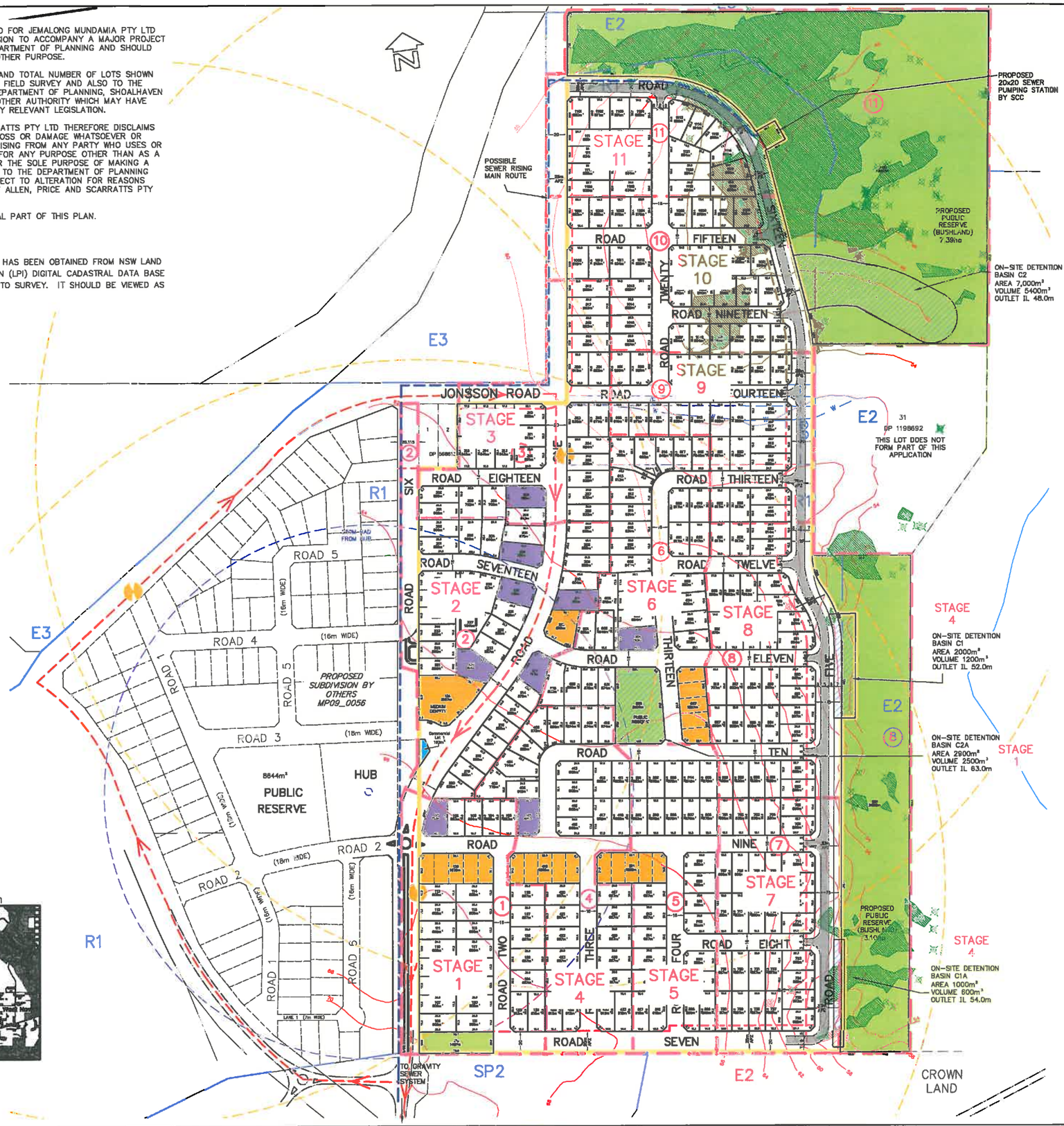

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RESIDENTIAL STAGING

1	29	LOTS + P.R.
2	35	LOTS
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4	33	LOTS
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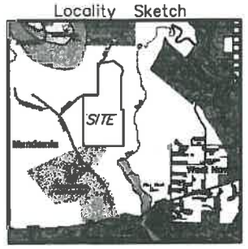
7	30	LOTS
8	33	LOTS + P.R.
9	25	LOTS
10	32	LOTS
11	21	LOTS + P.R.
TOTAL	323	LOTS

Locality Sketch



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STAGE 11

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SHEET 11 OF 11
REVISION: P1

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allen price & scarratts pty ltd
land and development consultants

Appendix C

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Kiama Office: 1/28 Bong Bong Street, Kiama NSW 2533 • PO Box 209, Kiama 2533
tel 02 4421 6544 • **email** consultants@allenprice.com.au

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NSW RURAL FIRE SERVICE

Director General
Department of Planning and Environment
GPO Box 39
Sydney NSW 2001

Your Ref: SSD 7169
Our Ref: D15/2555

ATTENTION: Kate Macdonald

4 November 2016

Dear Jenna

State Significant Development 7169 (transitional Part 3A Development for Preferred Project Report) Lot 30 DP 198692 - George Evans & Jonsson Road, Mundamia, NSW

I refer to your letter received by the NSW Rural Fire Service (RFS) on the 27 August 2015 seeking comment for the above proposal. Following receipt of additional information providing a greater level of detail regarding slope analysis and bush fire behaviour modelling of the steeper slopes to the east, the NSW RFS is satisfied that the slope issues raised in our previous corrospondance dated 10 September 2015, and 30 March 2016 have been resolved and/or may be addressed by way of conditions.

Accordingly, the NSW RFS is of the opinion that the proposal can be supported, subject to the incorporation of the following numbered conditions into any approval:

1. The development proposal is to generally comply with the subdivision layout shown on the plan prepared by Allen Price and Scarratts, titled 'Plan showing proposed subdivision of lot 30 DP1198692' drawing number 25489-11, revision 12, dated 14/7/2016, except it is to be amended as follows:

- Where no perimeter access roads are proposed around the residentially developable perimeter of the subdivision, adequate access for fire fighting vehicles is to be provided in accordance with section 4.1.3 (3) 'Fire Trails' of Planning for Bushfire Protection 2006, as amended from time to time.

2. Asset Protection Zones are to be provided for the development in accordance Figure 2 of the Bushfire Protection Assessment Report prepared by Ecological Australia, titled Asset Protection Zones, dated 21 May 2015, except to be amended as follows:

Postal address
NSW Rural Fire Service
Locked Bag 17
GRANVILLE NSW 2142

Street address
NSW Rural Fire Service
15 Carter Street
LIDCOMBE NSW 2141

T (02) 8741 5555
F (02) 8741 5550
www.rfs.nsw.gov.au

• APZs are to be increased for proposed lots 1101-1104 and 1113-1116 and recalculated for a slope of 0-5 degrees downslope (not upslope as currently provided) to demonstrate that these lots are subject to a radiant heat level not greater than 29kW/m2, as required in Planning for Bush Fire Protection 2006, as amended from time to time.

Asset protection zones are to be created and maintained for the life of the development, as outlined within section 4.1.3 and Appendix 5 of 'Planning for Bush Fire Protection 2006' and the NSW Rural Fire Service's document 'Standards for asset protection zones'.

3. The APZs specified in condition 2 above are largely contained within the perimeter road reserve system and as such, the authority responsible for managing the road reserve will be required to ensure the entirety of the road reserve is to be maintained as an APZs as specified above. Where the APZs are not located within the road reserve, a suitable legal mechanism shall be placed on the land identified as an APZ to ensure the creation and ongoing maintenance of the APZs for the life of the development.

4. Prior to issue of subdivision certificate for each stage of the development, documentation prepared by a suitable qualified bush fire consultant shall be submitted to, and approved by the certifying authority which demonstrates the following requirements have been satisfied, unless prior alternative arrangement have been made with the NSW Rural Fire Service:

a) The entirety of each stage, including a distance out to 100m from the stage boundary, is created as an inner protection area (IPA) as outlined within section 4.1.3 and Appendix 5 of 'Planning for Bush Fire Protection 2006' and the NSW Rural Fire Service's document 'Standards for asset protection zones', unless this distance exceeds the final APZs as specified in condition 2 of this letter.

b) Where any APZs required for each lot extend outside of the subject lot, a suitable legal mechanism shall be provided to ensure that each lot may create and manage, for the life of the development, the surrounding land as an APZ. This does not apply to land considered to be 'managed land' such as surrounding existing urban development and roads etc. If the surrounding hazard is temporary (i.e to be removed as part of a future stage) then the legal mechanism may be temporarily imposed, until such time that the hazard has been removed and becomes 'managed land'.

c) Each stage is provided with either:

   i. a perimeter road complying with section 4.1.3 (1) of Planning for Bushfire Protection 2006, as amended from time to time; or

   ii. a perimeter fire trail complying with section 4.1.3 (3) of Planning for Bush Fire Protection 2006, as amended from time to time.

d) Each stage is provided with water, electricity and gas services complying with section 4.1.3 of Planning for Bush Fire Protection 2006, as amended from time to time.

e) Public roads for each stage complies with the requirements of section 4.1.3 (1) 'Public roads' of Planning for Bush Fire Protection 2006, as amended from time to time.

f) Property access roads for each stage complies with the requirements of section 4.1.3 (2) 'Property access' of Planning for Bush Fire Protection 2006, as amended from time to time.

5. Prior to issue of subdivision for Stage 1 of the development, a temporary alternate access is to be constructed in accordance with the layout shown in the plan prepared by Allen Price and Scarratts titled 'Plan showing proposed interim bushfire measures over each stage of the development in proposed subdivision of lot 30 DP 1198692', drawing number 25489-18, revision P1, dated 6/7/2016. The alternate access is to be constructed at minimum in accordance with section 4.1.3 (2) Property Access of Planning for Bush Fire Protection 2006, as amended from time to time, and is to be lawfully available to each lot within the subdivision until replaced with public road access.

6. Prior to issue of subdivision for Stage 1 of the development, documentation prepared by a suitable qualified bush fire consultant shall be submitted to, and approved by the certifying authority which provides a schedule of any lots within the subdivision that will require internal setbacks within the subject lot in order to achieve the APZs required in condition 2 of this letter. This is generally all lots adjoining the perimeter road system along the eastern and northern boundaries, and the eastern portion of the southern boundary (between road four and road five). The documentation shall identify which stage of the development each lot is located in.

7. Prior to issue of subdivision for each stage of the development, documentation prepared by a suitable qualified bush fire consultant shall be submitted to, and approved by the certifying authority which demonstrates that any of the lots within the relevant stage as identified in the schedule required by condition 6 above, are provided with a suitable Restriction as to User via S88B of the Conveyancing Act 1919, that requires any future development for habitable structures to be accompanied by a performance-based bushfire solution demonstrating that the habitable structure complies, at maximum, with a Bushfire Attack Level (BAL) of 29 under AS3959 and Addendum Appendix 3 of Planning for Bushfire Protection 2006, as amended from time to time.

8. Future landscaping for individual lots within the subdivision is to comply with the principles of Appendix 5 of 'Planning for Bush Fire Protection 2006', as amended from time to time.

9. Any land within the subdivision which is identified as a public reserve (not including the E2 Environmental Conservation zone reserves located outside of the developable portion of the site to the east) shall be managed as an asset protection zone to ensure that these reserves do not pose a hazard to adjoining lots.

For any enquiries regarding this correspondence or to discuss the matters raised in this letter further please contact Martha Dotter on (02) 4472 0600.

Yours faithfully,

Amanda Moylan

Team Leader Development Assessment and Planning

allen price & scarratts pty ltd
land and development consultants

Appendix D

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tel 02 4421 6544 • **email** consultants@allenprice.com.au

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BioBanking
Biodiversity Banking and Offsets Scheme

BioBanking agreement
ID number: 380

Under the

Threatened Species Conservation Act 1995

for

Jemalong Mundamia Pty Limited

for

Mundamia Biobank

Lot 30 in Deposited Plan number 1198692

NSW GOVERNMENT | Office of Environment & Heritage

Version 1.5 November 2017

BioBanking agreement under Part 7A Division 2 of the *Threatened Species Conservation Act 1995*

This agreement made on the 13th day of February 2019 **between** the Minister for the Environment of the State of New South Wales, being the Minister currently administering the *Threatened Species Conservation Act 1995* (**'the Minister'**, which expression shall where the context admits, be deemed to include his or her successors in office) on the one part and Jemalong Mundamia Pty Limited (ABN: 68 147 695 994) (**'the landowner'**) of Jonsson Rd Mundamia NSW 2540 on the other part.

Background

A The landowner is the owner of that parcel of land being:

Lot 30, Deposited Plan 1198692, Parish of Nowra, County of St Vincent

known as Mundamia biobank (**'the land'**).

B The biobank site that is the subject of this agreement forms part of the land and is shown on the Figure 1 Biobank site boundary; Mundamia biobank dated 31/05/2017. The biobank site covered by this agreement consists of approximately 9.25 hectares.

C The landowner has requested the Minister to enter into a biobanking agreement under clause 14 of the BioBanking Regulation for the purpose of designating the biobank site on the land.

D The Minister and landowner recognise that the landowner will receive biodiversity credits determined in accordance with the BioBanking Assessment Methodology (and set out in Annexure B) relating to the impact or likely impact of the management actions required to be carried out under Clause 3 and Annexure C of this agreement regarding the biodiversity values listed in Annexure B.

E The landowner and the Minister recognise that the biobank site contains the following known Aboriginal objects and/or Aboriginal places as defined by the *National Parks and Wildlife Act 1974*:

None applicable

F The landowner and the Minister recognise that this biobanking agreement is being entered into for the purposes of the BioBanking Scheme established under Part 7A of the Act.

G The landowner agrees to undertake the management actions and implement the management plans to improve the biodiversity values of the biobank site as set out in Annexure C.

H The landowner agrees to undertake monitoring, reporting and record keeping as set out in Annexure D.

I Accordingly, the parties hereby enter into the following biobanking agreement under section 127D of the Act.

J The Minister has delegated the power to enter into this biobanking agreement to the Chief Executive of the Office of Environment and Heritage.

Now this agreement witnesses:

1. Interpretation

1.1 In this agreement, unless the contrary intention appears:

the **'Act'** means the *Threatened Species Conservation Act 1995* and any regulations from time to time in force thereunder

'adaptive management' means a process for improving management where the outcomes of monitoring indicate that minor alterations to the management actions or management plans are required to improve biodiversity values

'agreement' means this biobanking agreement entered into by the Minister and the landowner under section 127D of the Act for this biobank site

'animal' has the same meaning as in section 4 of the Act

'Annexure A' means Annexure A to this agreement entitled 'Maps of the biobank site'

'Annexure B' means Annexure B to this agreement entitled 'BioBanking Agreement Credit Report'

'Annexure C' means Annexure C to this agreement entitled 'Management actions and management plans'

'Annexure D' means Annexure D to this agreement entitled 'Monitoring, reporting and record keeping requirements'

'Annexure E' means Annexure E to this agreement entitled 'Payment schedules'

'annual report' means the annual report to be prepared by the landowner in accordance with item 2 of Annexure D

'authorised officer' means a person appointed under section 156B of the *National Parks and Wildlife Act* 1974

'biobank site' means that part of the land shown as the "biobank site" on the biobank site boundary map

'biobank site boundary map' means the map entitled Figure 1 Biobank site boundary; Mundamia biobank dated 31/05/2017 and included in Annexure A

'Biobanking Agreement Credit Report' means the report contained in Annexure B generated by a BioBanking Assessor for the biobank site using the BioBanking Assessment Methodology and the BioBanking Credit Calculator which includes the number and type of biodiversity credits to be created on the biobank site

'biobanking agreements register' means the register of biobank sites kept by the Chief Executive under Part 7A of the Act

'BioBanking Assessment Methodology' means the rules established under section 127B of the Act

'BioBanking Regulation' means the Threatened Species Conservation (Biodiversity Banking) Regulation 2008

'BioBanking Scheme' means the Biodiversity Banking and Offsets Scheme established under Part 7A of the Act

'BioBanking Trust Fund' means the fund established under Part 7A of the Act to hold funds from the sale of biodiversity credits (the Total Fund Deposit)

'biodiversity credits' means biodiversity credits created under Part 7A of the Act

'biodiversity credits register' means the register of biodiversity credits kept by the Chief Executive under Part 7A of the Act

'biodiversity values' has the same meaning as in section 4A of the Act

'Chief Executive' means the Chief Executive of the Office of Environment and Heritage

'commencement date' means the date this agreement commences under clause 18 of this agreement

'critical habitat' has the same meaning as in section 4 of the Act

'day' means any day including Saturdays, Sundays and public holidays

'development' has the same meaning as in section 127(1) of the Act

'Chief Executive' has the same meaning as in section 4 of the Act

'ecological burn' means a burn to improve biodiversity values carried out as part of the management of fire for conservation

'fee unit' has the same meaning as in the BioBanking Regulation

'first payment date' means the date the balance in the relevant biobank site account is equal to or greater than 80% of the Total Fund Deposit for the first time

'Fund Manager' means the person appointed by the Minister from time to time under Part 7A of the Act as the Fund Manager to manage the BioBanking Trust Fund

GST has the same meaning as given to that term in *A New Tax System (Goods and Services Tax) Act 1999* (Commonwealth) and any other Act or regulation relating to the imposition or administration of the GST

'land' means that parcel or parcels of land which contains the biobank site as described in paragraph A of this agreement

'management action' means the actions to be carried out by the landowner on the biobank site to improve biodiversity values for which biodiversity credits may be created. Such actions are set out in of Annexure C. A reference to a management action includes a reference to refraining from doing anything, whether or not that thing was being done beforehand

'management of fire for conservation' means the controlled application of fire under specified environmental and weather conditions to a predetermined area and

at the time, intensity and rate of spread required to attain planned improvement of biodiversity values

'management of grazing for conservation' is the implementation of a variable and adaptive stock grazing regime for improving biodiversity values, such as for controlling exotic weeds or vegetation biomass, or enhancing the competitiveness of native perennial species. Typically it involves short periods of intensive grazing between long periods of little or no grazing. Management of grazing for conservation differs with site condition, specific management goals, seasonal conditions and regions

'management payments' means the payments to be made to the landowner in accordance with the payment schedules and the requirements in Annexure E

'management plans' means the management plans to be implemented by the landowner in carrying out the management actions and included in Section 3 and Section 4 of Annexure C (or such other management plans as approved by the Chief Executive in accordance with the provisions of Annexure C)

'management zone' means those areas of the biobank site identified on the map entitled Figure 3 Management zones; Mundamia biobank dated 31/05/2017 and included in Annexure A

'maximum operational surplus' has the same meaning as in clause 33(2) of the BioBanking Regulation

'Minister' means the Minister for the time being administering the Act and where not repugnant to the context includes the servants and agents of the Minister

'native animal' has the same meaning as in section 5 of the NPW Act

'native plant' has the same meaning as in section 5 of the NPW Act

'native vegetation' has the same meaning as in section 6 of the NV Act

'NPW Act' means the *National Parks and Wildlife Act 1974* and any regulations from time to time in force thereunder

'NV Act' means the *Native Vegetation Act 2003* (NSW)

'OEH' means the Office of Environment and Heritage

'ongoing' in relation to the timing of carrying out a management action means commencing on the commencement date or first payment date (as indicated) and continuing in perpetuity, unless specified otherwise

'operational deficit' has the same meaning as in clause 31(2) of the BioBanking Regulation

'operational deficit threshold' has the same meaning as in clause 32(2) of the BioBanking Regulation

'operational surplus' has the same meaning as in clause 31(3) of the BioBanking Regulation

'owner' has the same meaning as in section 127(1) of the Act and includes successors in title referred to in section 127J of the Act

'**party**' means a party to this agreement

'payment schedules' means the tables entitled 'payment schedule' and 'in perpetuity management costs' included in Annexure E

'pesticide' has the same meaning as in section 5 of the *Pesticides Act 1999* which includes herbicides, insecticides, fungicides, baits and rodenticides

'plant' has the same meaning as in section 4 of the Act

'planting schedule' means the schedule at item 6.6 of Section 1, Annexure C

'processing fee' means the processing fee which is to accompany an application to enter into a biobanking agreement as required by clause 14 of the BioBanking Regulation

'**record keeping requirements'** means those record keeping requirements set out in item 3 of Annexure D

'**regrowth'** has the same meaning as in section 9 of the NV Act

'relevant biobank site account' means the biobank site account within the BioBanking Trust Fund kept by the Fund Manager in accordance with clause 30(1) of the BioBanking Regulation

'remnant native vegetation' has the same meaning as in section 9 of the NV Act

'threatened species, populations and ecological communities' and **'threatened species, population or ecological community'** have the same meaning as in the Act

'Total Fund Deposit' has the same meaning as in clause 26(1) of the BioBanking Regulation

'waste' has the same meaning as in the *Protection of the Environment Operations Act 1997*.

1.2 A word or expression that indicates one or more particular genders shall be taken to indicate every other gender. A reference to a word or expression in the singular form includes a reference to the word or expression in the plural form, and vice versa.

1.3 Any reference to an action, or carrying out an action, includes a reference to doing anything or refraining from doing anything.

1.4 Any reference to a person shall be deemed to include a corporate body and vice versa.

1.5 Any covenant or agreement on the part of two or more persons shall be deemed to bind them jointly and severally.

1.6 The schedules and Annexures to this agreement form part of this agreement.

1.7 Any notes included in the agreement do not form part of the agreement.

2. Status of this agreement

The parties agree that this agreement is a biobanking agreement within the meaning of section 127D of the Act.

3. Use of the biobank site

The landowner covenants with the Minister as follows:

General responsibilities

3.1 Except as otherwise permitted by this agreement, the landowner must not carry out any act or omit to carry out any act, or cause or permit any act to be carried out or any act not to be carried out which act or omission may harm biodiversity values on the biobank site, including but not limited to any native animals, native plants, threatened species, populations and ecological communities, and their habitats.

Note: The clearing of native vegetation that is otherwise permissible in accordance with the NV Act (whether it is permissible under a Property Vegetation Plan, routine agricultural management activity (as defined under the NV Act), or is otherwise permitted under Part 3 of that Act) can only be carried out on the biobank site to which this agreement applies if it is also permissible under this agreement. Item 5.1 of the management actions contained in Section 1 of Annexure C of this agreement sets out the limited circumstances in which native vegetation can be cleared on the biobank site. Annexure C of this agreement also contains limited exceptions in relation to when a landowner is not required to comply with the management actions contained in Annexure C.

Cultural heritage

3.2 To avoid any doubt, nothing in this agreement is to be construed as authorising (including, but not limited to, by way of a consent, permit, approval or authorisation of any kind for the purposes of Part 6 of the NPW Act) any person to damage or to cause or permit damage to an Aboriginal object or Aboriginal place in, on or under the biobank site.

Obtaining of consents, permits and authorisations

3.3 The landowner is responsible for obtaining all necessary licences, consents, authorisations, permits or approvals in order to lawfully comply with and carry out its obligations under this agreement or to undertake or enable any other identified matter under clause 3.5 and/or clause 3.6.

Development

3.4 The landowner must not carry out, or cause or permit to be carried out, any development (as defined under clause 1 above) on the biobank site, unless the development:

3.4.1 is permitted or required under Annexure C, or

3.4.2 is identified in the table entitled 'Permissible development on the biobank site' contained in clause 3.5 or identified in the table entitled 'Permissible human activities on the biobank site' contained in clause 3.6.

Permissible development

3.5 The landowner shall be permitted to carry out, or cause or permit to be carried out, the development specified in the following table in the management zone specified in the table.

Permissible development on the biobank site	
Description of development	**Management zone/s**
Any development permitted or required as part of a management action under Annexure C, including but not limited to maintaining existing access tracks on the biobank site, building shed/s to store weed control chemicals or other pesticides on the biobank site, building fences to manage stock on the biobank site and building structures to restore natural water flow regimes.	All zones
Any development within the meaning of section 127(1) of the Act reasonably considered necessary to remove or reduce an imminent risk of serious personal injury or damage to property.	All zones

Permissible human activities

3.6 Notwithstanding clause 3.1, the landowner may carry out or cause or permit to be carried out any human activities specified in the following table, in the management zone specified in the table.

Permissible human activities on the biobank site	
Description of human activities	**Management zone/s**
Any activity or any development permitted or required as part of a management action under Annexure C, including but not limited to mustering stock or feral herbivores including with mechanised vehicles, spraying or mechanically removing weeds, planting tubestock or sowing seeds of native vegetation, using drip torches, thinning native vegetation, disturbing soil temporarily to control erosion, encouraging regeneration, controlling nutrients or restoring natural flow regimes, laying baits, trapping or otherwise controlling vertebrate pests and feral herbivores and overabundant native herbivores.	All zones
Any human activity reasonably considered necessary to remove or reduce an imminent risk of serious personal injury or damage to property.	All zones
Any activity required to undertake permissible development.	All zones

4. Management actions and management plans

4.1 The landowner must carry out or procure the carrying out of the management actions in accordance with the timing, manner and requirements of Annexure C.

4.2 The landowner must:

i. implement or procure the implementation of; and

ii. comply or procure the compliance with

the management plans in accordance with the timing, manner and requirements of Annexure C.

Note: The management actions listed in Annexure C include requirements to take certain action and requirements to refrain from taking certain action.

4.3 Unless otherwise indicated by Annexure C, the landowner must ensure that

i. the management actions to be carried out in accordance with clause 4.1; and

ii. the management plans to be implemented and complied with in accordance with clause 4.2

are carried out in perpetuity, commencing from the date indicated in Annexure C.

4.4 The landowner's obligations under this clause are subject to clause 12.4 of this agreement.

5. Total Fund Deposit

For the purpose of clause 26 of the BioBanking Regulation, the Total Fund Deposit for this biobank site is $355,427.00 excluding GST, determined in accordance with Part 6 of the BioBanking Regulation.

Note: Part 6 of the BioBanking Regulation prescribes the amount that must be deposited in the BioBanking Trust Fund before the first transfer (or retirement without transfer) of each biodiversity credit can be registered. The prescribed amount is the Total Fund Deposit, or proportion thereof if a partial sale of credits is made. The Total Fund Deposit is the present value of the total of all management payments listed under this agreement, as determined by the Chief Executive.

6. Biodiversity credits

6.1 The Chief Executive is permitted under section 127W(4) of the Act, to create (without application by the landowner under section 127W(4) of the Act) the biodiversity credits listed in Annexure B on the commencement date.

6.2 The biodiversity credits listed in Annexure B will be created for the biobank site.

6.3 At the commencement date, the landowner is entitled to receive $139,950.00 excluding GST, to be satisfied in full by the creation of the biodiversity credits listed in Annexure B.

Note: $139,950.00 is a best estimate of the market value of the biodiversity credits at the time of creation. The market value has been estimated by reference to the notional Part B amount as determined by the landowner in the credit pricing spreadsheet or reference to the notional Part B amount for the last traded biodiversity credit of the same or similar type.

The Part B amount is that part of the sale price received by the landowner (or another landowner if reference is made to a previous sale of that biodiversity credit type) after the entire Total Fund Deposit is satisfied and deposited into the BioBanking Trust Fund.

The sale price of each biodiversity credit will be negotiated between the landowner and the buyer and will be affected by supply and demand for each biodiversity credit. The final price at the time of transfer of the biodiversity credit (or retirement or the biodiversity credit without transfer) may not reflect this estimated amount.

The Minister does not warrant that the landowner will be able to sell biodiversity credits for the estimated market value.

7. Monitoring, record keeping and reporting

7.1 The landowner must comply with the monitoring and record keeping requirements as set out in Annexure D.

7.2 The landowner must submit an annual report complying with the requirements set out in Annexure D to the Chief Executive within the timeframe specified in Annexure D.

7.3 The landowner must notify the Chief Executive in writing as soon as practicable after becoming aware of any failure to comply with this agreement or any other incident at the biobank site (or surrounds) which results or may result in a sudden or significant decline of biodiversity values at the biobank site. In particular, the landowner must notify the Chief Executive of:

7.3.1 the nature, location and time of the incident

7.3.2 the impact of the incident on biodiversity values

7.3.3 the measures that have been taken or will be taken in response to the incident

7.3.4 any provision of this agreement which may have been breached

7.3.5 the extent of any damage caused or permitted by the incident

7.3.6 the measures which have been taken or will be taken to prevent a recurrence of the incident.

8. Use of the land by servants, agents, lessees or licensees

The landowner must incorporate all relevant requirements of this agreement in any lease or licence issued for the biobank site, and must at all times ensure that any servant, contractor, consultant, agent, lessee or licensee occupying the biobank site area shall be aware of, and not undertake any act inconsistent with, the landowner's obligations under this agreement.

9. Change of land ownership or subdivision of land

9.1 The landowner must notify the Chief Executive in writing of any change of:

9.1.1 ownership of the biobank site, or any part thereof, within seven (7) days after the change of ownership of the biobank site; or

9.1.2 lessee of the biobank site, or any part thereof, within twenty-eight (28) days after the change of lessee or licensee of the biobank site.

The notice must include the name and address and other relevant contact details of the new landowner, lessee or licensee.

9.2 The landowner must provide a copy of this agreement, including a copy of each management plan and a copy of all records required to be kept under the record keeping requirements, to the transferee before completion of the assignment, transfer, disposal or sale of any interest in the biobank site.

9.3 The landowner must notify the Chief Executive in writing no less than 14 days before the biobank site is subdivided.

9.4 The landowner cannot assign, transfer, dispose of or sell its rights, title or interest in part of the land containing any area of the biobank site unless the landowner and the Minister have first agreed to vary the agreement to apportion the obligations and rights under the agreement in respect of that part of the biobank site that will be assigned, transferred, disposed of or sold.

10. Right to enter biobank site for research and monitoring

10.1 The landowner must permit access to the biobank site at any time to the Minister, the Chief Executive, an authorised officer or an officer of OEH for the purpose of carrying out research or monitoring in relation to the biodiversity values on the biobank site for which biodiversity credits have been created under this agreement, but only where the person has given reasonable notice to the landowner and the landowner's agent, lessee or licensee, of the intention to enter the biobank site for that purpose and the nature of the research or monitoring that will be conducted. In exercising its right of access under this clause, the Minister, the Chief Executive, an authorised officer or an officer of OEH must ensure that such access does not:

10.1.1 result in physical or radio interference which obstructs, interrupts or impedes the use or operation of any telecommunications network and telecommunications service of a lessee or licensee of a part of the land; or

10.1.2 interfere with the electricity supply separate from the landowner's electricity supply to any part of the land occupied by a lessee or licensee.

10.2 The Minister, Chief Executive, an authorised officer or an officer of OEH may make a written request to the landowner to consent to any other person specified in the written request to enter the biobank site for the purpose of carrying out the research or monitoring referred to in clause 10.1, whether or not that person will accompany the Minister, Chief Executive, an authorised officer or an officer of OEH. The landowner will not unreasonably withhold consent.

10.3 Clauses 10.1 and 10.2 do not affect or limit the powers of authorised officers under the NPW Act to enter premises for the purpose of determining whether there has been compliance with, or contravention of, this agreement.

11. Agreement preparation expenses

Each party bears its own costs in connection with the preparation and execution of this agreement.

12. Obligations of the Minister

12.1 Subject to clauses 12.2 and 12.3 and starting from the first payment date, the Minister is required to direct the Fund Manager to make such management payments specified in the payment schedules from the relevant biobank site account to the landowner, at such intervals specified in the payment schedules.

12.2 The Minister may only make such a direction if:

12.2.1 the relevant biobank site account has sufficient funds to cover the management payment, and

12.2.2 the landowner has submitted the annual report for the preceding reporting period in accordance with clause 7.2 and Annexure D of this agreement, and

12.2.3 the Minister has reviewed the annual report for the preceding reporting period and is satisfied that the landowner has complied with their obligations set out in this agreement in the preceding period.

12.3 The landowner acknowledges that the Minister may, with the agreement of the landowner, direct that the management payments should not be made, or should be reduced, for a specified period of time or until further notice if the biobank site account has an operational deficit greater than the operational deficit threshold.

Note: Withholding or lowering payments when funds in the account are below the maximum operational deficit may help to preserve the long-term financial viability of the fund for the landowner.

12.4 If the Minister, with the agreement of the landowner, directs that management payments be reduced or not be made for a specified period of time or until further notice, then:

12.4.1 the Minister may, by written agreement with the landowner, suspend or vary any of the landowner's obligations to carry out management actions under this agreement for the same period of time or some other period, and

12.4.2 despite clause 4 of this agreement, the landowner's obligations to carry out management actions under this agreement are suspended or varied in accordance with the agreement.

The Minister must not agree to any variation or suspension under this clause unless satisfied that the variation or suspension does not have a negative impact on the biodiversity values protected by the agreement.

12.5 The landowner acknowledges that the Minister may, in addition to the management payments, direct additional payments to be paid from the BioBanking Trust Fund to the landowner, but only in circumstances where the biobank site account has an operational surplus, the operational surplus amount exceeds the maximum operational surplus for the biobank site account, and the amount the Minister directs

to be paid does not exceed the difference between the operational surplus amount and the maximum operational surplus.

12.6 All management payments shall be paid into the bank account nominated by the landowner in accordance with the payment schedules.

13. Ownership of the land and registration of this agreement

13.1 The landowner represents and warrants to the Minister that as at the date of this agreement it is:

13.1.1 the legal and beneficial owner of the land; or

13.1.2 legally and beneficially entitled to become the owner of the land and will become the legal and beneficial owner of the land, prior to the date that this agreement is to be registered under clause 13.2 of this agreement.

13.2 As contemplated by section 127I(1) of the Act, the Minister agrees to notify the Registrar General when this agreement has been entered into, varied or terminated so the Registrar General can register the agreement, variation or termination by making an entry concerning the agreement, variation or termination in the relevant folio of the Register kept under the *Real Property Act 1900* (NSW) for the land.

13.3 The fee to register the agreement in accordance with section 127I(1) of the Act will be taken from the processing fee, except as provided by clause 13.4.

13.4 If the landowner elects to identify the exact boundaries of the biobank site on the Deposited Plan for the land, the landowner must bear any additional costs of registration.

14. Variation and termination

14.1 Subject to clause 14.2, this agreement can only be varied or terminated in accordance with the Act.

14.2 The landowner waives any right to request voluntary termination in accordance with subsections 127G(5) and (6) of the Act.

14.3 This clause does not affect the ability of the Minister and the landowner to terminate this agreement by consent under section 127G(2)(a) of the Act (including in the circumstances described in subsection 127G(6) of the Act).

Note: Clause 14.2 ensures that the landowner can obtain Commonwealth Government tax advantages that apply to conservation covenants. Those tax advantages would not be available if the right to request termination of the agreement under subsections 127G (5) and (6) of the Act was available.

Subsections 127(5) and (6) of the Act give landowners the right to request termination of the agreement where credits are not sold within 3 months or after 5 years of entering the agreement. The effect of clause 14.2 is that the landowner gives up that right. This is essential as the tax advantages are only available where the Commonwealth Government has conferred conservation covenant status on biobank sites – and a requirement of this status is that the sites will operate permanently.

15. Indemnity and release

15.1 The landowner agrees to indemnify the protected persons against all expenses, losses, damages and costs that the protected person may sustain or incur as a result, whether directly or indirectly, of carrying out obligations under this agreement.

15.2 The indemnity given by the landowner does not cover any loss or damage that is caused by a negligent act or omission of the protected persons, or any loss or damage that is contributed to by a negligent act or omission of the protected persons to the extent of the protected persons' contribution to that loss or damage.

15.3 The landowner releases to the full extent permitted by law the protected persons from all claims and demands arising out of or in connection with, or as a consequence of, carrying out of obligations by the landowners under this agreement, or in connection with, or as a consequence of, a direction made by the Minister regarding the payment of management payments to the landowner under this agreement.

15.4 The release given by the landowner does not cover any claims and demands in respect of any loss or damage that is caused by a negligent act or omission of the protected persons, or any loss or damage that is contributed to by a negligent act or omission of the protected persons to the extent of the protected persons' contribution to that loss or damage.

15.5 It is immaterial to the obligations of the landowner under this clause that a claim or demand arises out of any act, event or thing that the landowner is authorised or obliged to do under this agreement or that any time waiver or other indulgence has been given to the landowner for any such obligation under this agreement.

In clauses 15.1–15.4:

(i) 'protected person' means:

- (a) the Minister
- (b) the Chief Executive
- (c) the employees or officers of the Office of Environment and Heritage
- (d) any other person acting under the direction or control of the Minister or Chief Executive for any purpose with respect to this agreement
- (e) the Crown in right of the State of New South Wales;

(ii) 'claims and demands' means all actions, suits, claims, demands, proceedings, losses, compensation, damages, sums of money, costs, legal costs, charges, and expenses to which the protected persons are or may become liable for in respect of loss or damage to the fixtures of the biobank site, financial or economic loss, loss of opportunity or other consequential loss of the landowner, and injury of any kind to or death of any person claiming through the landowner and however sustained on or outside the biobank site.

16. Dispute resolution

16.1 Where there is a dispute, difference or claim (dispute), the party raising the dispute must notify the other party in writing of the nature of the dispute, including the factual and legal basis of the dispute.

16.2 Within 14 days of the written notice, the Chief Executive and the landowner, or nominated senior representatives of the parties, must confer to attempt to resolve the dispute, and if the dispute cannot be resolved within twenty-one (21) days of the written notice, the Chief Executive and the landowner will refer the matter to mediation.

16.3 The parties will agree on the terms of appointment of the mediator and the terms of the mediation in writing within twenty-eight (28) days, failing which the mediation will be at an end and either party may commence court proceedings in respect of the dispute, difference or claim.

16.4 If the matter has not been resolved within 28 days of the appointment of the mediator, the mediation process will be at an end and either party may commence court proceedings in respect of the dispute, difference or claim.

16.5 Notwithstanding the above clauses, the Minister, the Chief Executive or a person duly authorised by the Chief Executive, may enforce this agreement under the Act, or institute proceedings without first entering into the dispute resolution procedure set out in clauses 16.1, 16.2, 16.3, and 16.4.

16.6 Clause 10.1 of this agreement is not affected by these arrangements for dispute resolution.

17. Governing law

This agreement is governed by the laws of the State of New South Wales and the parties agree to submit to the jurisdiction of the courts of that State.

18. Commencement

This agreement shall have effect from the day it is executed by all parties.

19. Privacy statement

The landowner acknowledges and consents to the information contained in this agreement being made publicly available on the biobanking agreements register and, where biodiversity credits have been registered, on the biobanking credits register maintained by the Chief Executive and made available on the web.

Note: In accordance with the *Privacy and Personal Information Protection Act 1998* and the Act, some of the information contained in this agreement cannot be made available to the public.

20. Exercise of Minister's and Chief Executive's powers

20.1 The landowner acknowledges that the Minister may authorise any officer of OEH to exercise any of the Minister's functions under this agreement on the Minister's behalf.

20.2 The landowner acknowledges that the Chief Executive, may authorise any officer of OEH to do any thing that the Chief Executive authorises for the purposes of this agreement.

21. Notices

21.1 Any notice, consent, information, application or request that must or may be given or made to a party is only given or made if it is in writing and delivered or posted to that party at its address set out below, or faxed to that party at its fax number set out below:

The Minister

Address	Biodiversity Conservation Trust PO Box A290 SYDNEY SOUTH NSW 1232
Fax	(02) 9995 6795
Attention	Manager, Agreements and Technical Services

Landowner

Address	Allen Price and Scarratts Level 8, 17 – 19 Bridge Street SYDNEY NSW 2000
Telephone	(02) 4421 6544
Email	consultants@allenprice.com.au
Attention	Matt Philpott

21.2 The name or title of the nominated officer or the address for the Minister referred to in clause 21.1 above may be updated from time to time by a further written notice being sent to the landowner by an officer of OEH advising of the new officer (or title of an office) and address to which such documents, information or notification may be sent.

21.3 For the avoidance of doubt, this clause does not fetter the Minister or Chief Executive's discretion to give or withhold from giving such notice, consent or permission.

Agreement annexures

Annexure A Maps of biobank site

Annexure B Biobanking Agreement Credit Report

Annexure C Management actions and management plans

Annexure D Monitoring, reporting and record keeping requirements

Annexure E Payment schedules

In witness where of the parties hereto have executed this agreement the day and year first above written.

Signed by

Linda Bell

Acting Director, Conservation Programs Branch, Office of Environment and Heritage, as the Minister's delegate under Section 142A of the *Threatened Species Conservation Act 1995* in the presence of:

Acting Director Signature

Date 13/2/2019

Witness signature

Date 13/2/2019

Witness name Denise Wallace

Witness address 59 Goulburn St, Sydney.

Signed by the landowner/s or director/s

~~Colin Richardson~~ signature

Date COLIN R SUSSMAN

Colin ~~Richardson~~ Sussman - Director

In the presence of

Witness signature

Date 8TH FEBRUARY 2019

Witness name RICHARD PETERSON

Witness address UNIT 2004, 38-42 BRIDGE ST SYDNEY 2000

John Kahlbetzer signature

Date

John Kahlbetzer - Director

In the presence of

Witness signature

Date 8TH FEBRUARY 2019

Witness name RICHARD PETERSON

Witness address UNIT 2004, 38-42 BRIDGE ST. SYDNEY 2000

Seal (if signing under seal):

Annexure A: Maps of biobank site

Figure 1 Biobank site boundary; Mundamia biobank (31/05/2017)

Figure 2 Vegetation zones and plots; Mundamia biobank (31/05/2017)

Figure 3 Management zones; Mundamia biobank (31/05/2017)

Figure 4 Photo points; Mundamia biobank (31/05/2017)

Figure 5 Property management actions; Mundamia biobank (31/05/2017)

Figure 6 Ecological burn units; Mundamia biobank (31/05/2017)

Figure 7 *Triplarina nowraensis* locations; Mundamia biobank (31/05/2017)

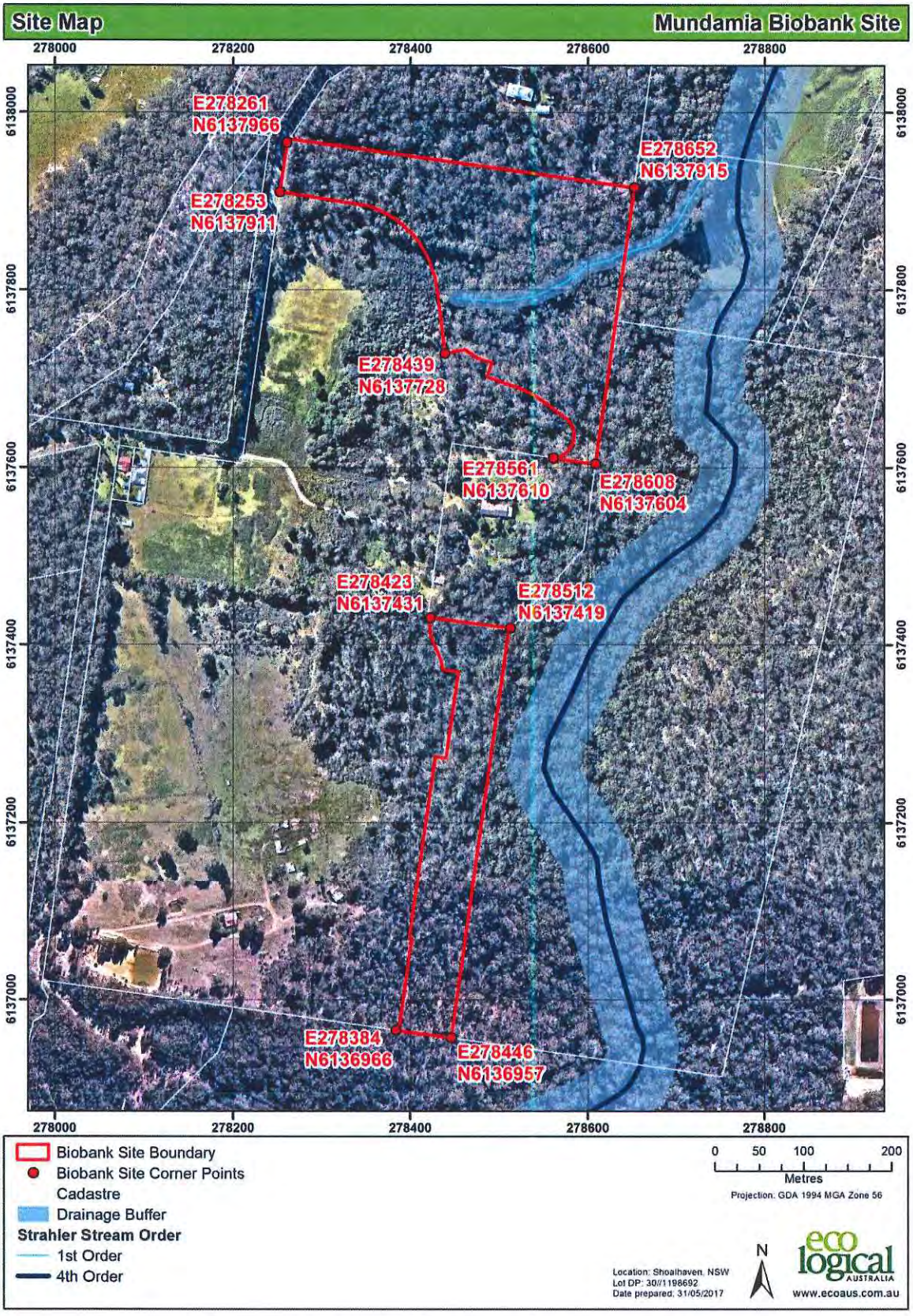

Figure 1 Biobank site boundary; Mundamia biobank (31/05/2017)

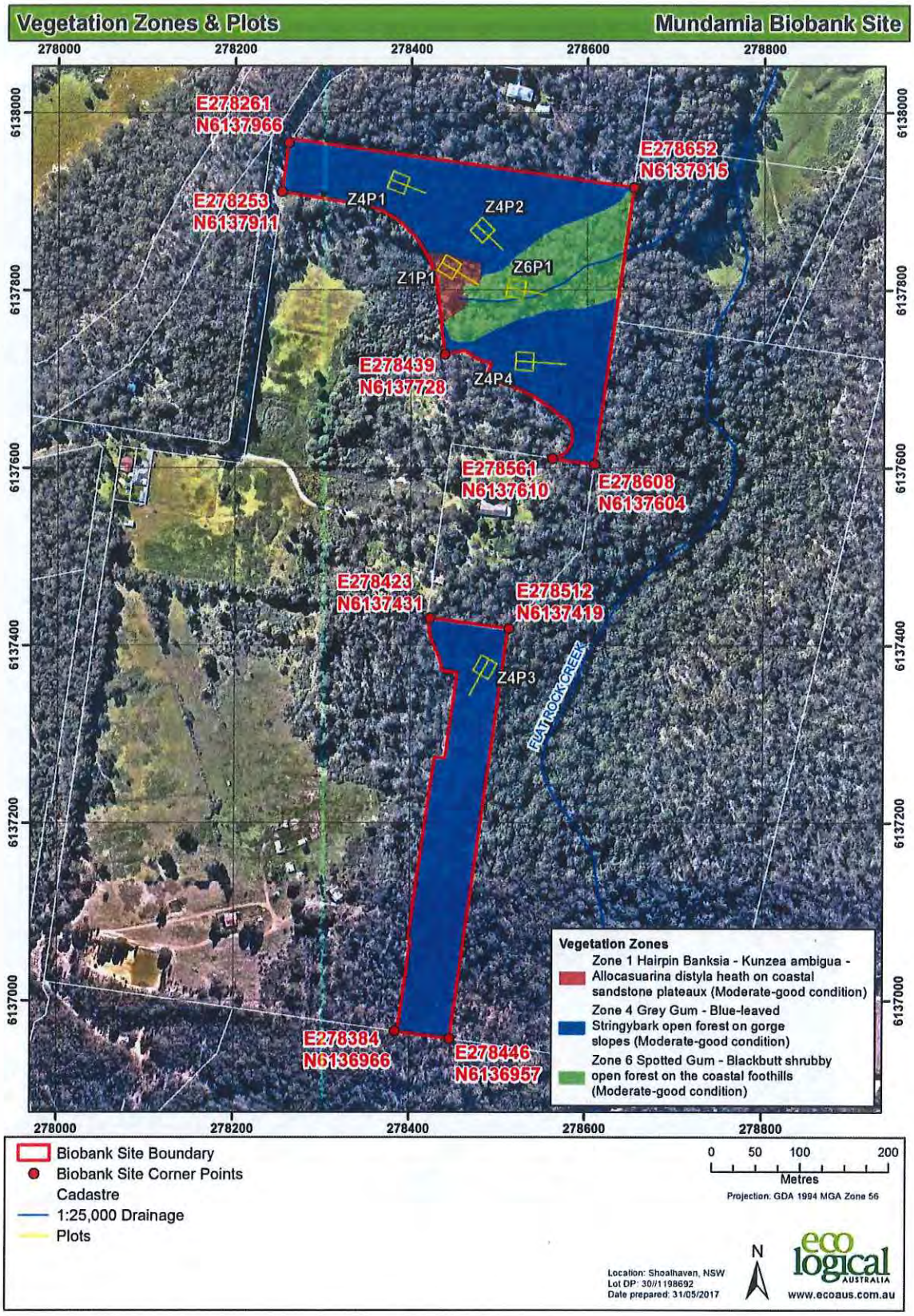

Figure 2 Vegetation zones and plots; Mundamia biobank (31/05/2017)

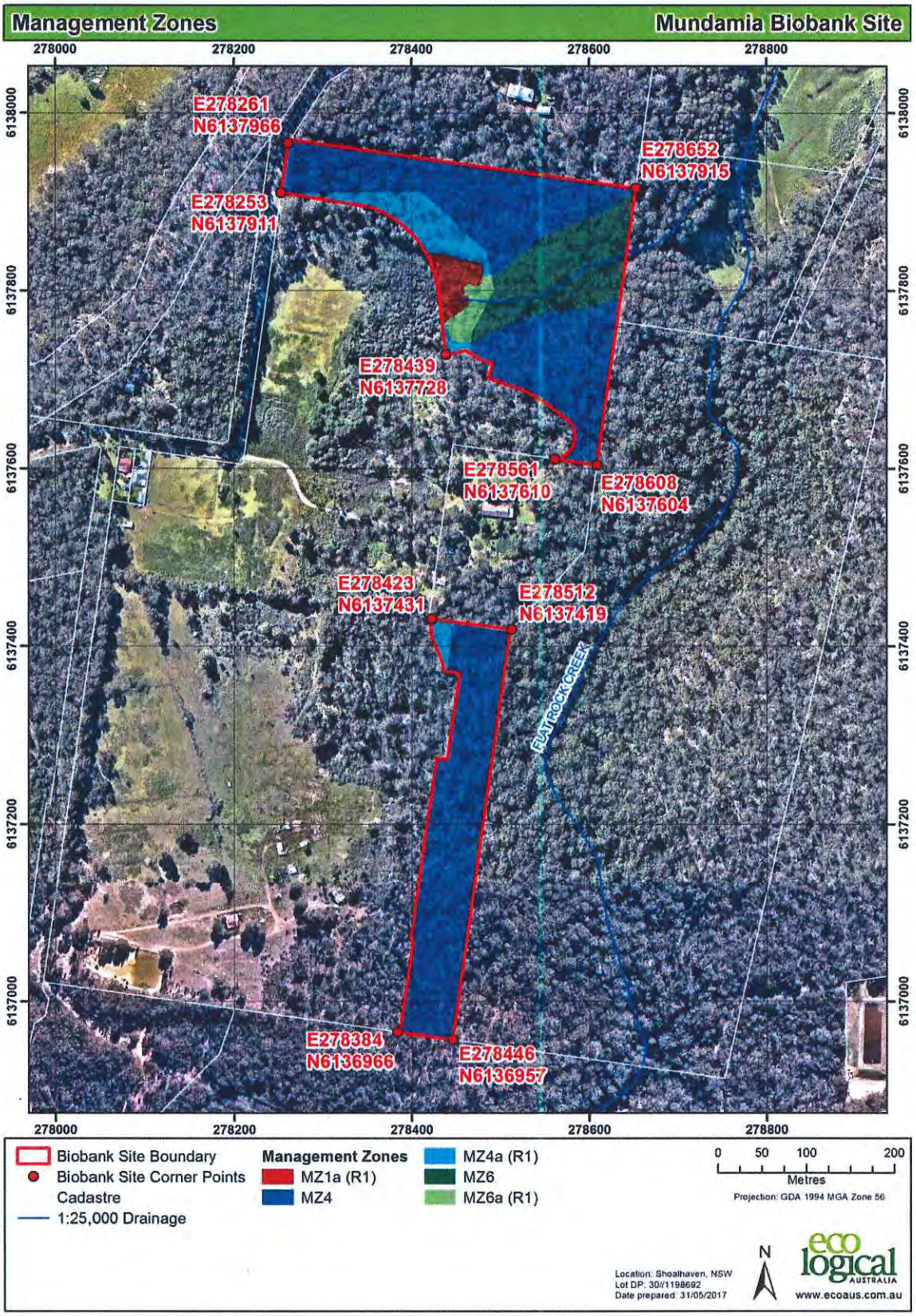

Figure 3 Management zones; Mundamia biobank (31/05/2017)

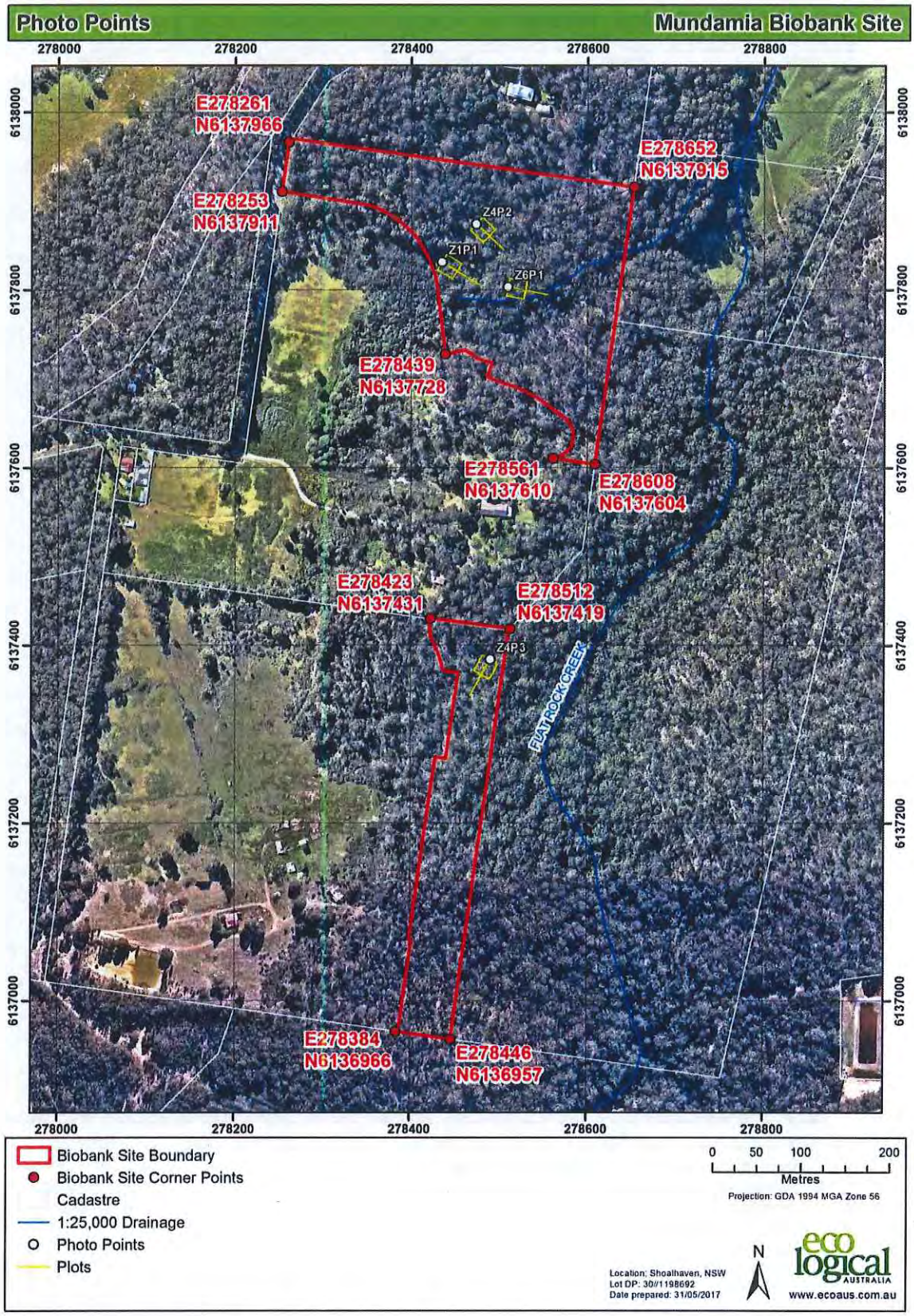

Figure 4 Photo points; Mundamia biobank (31/05/2017)

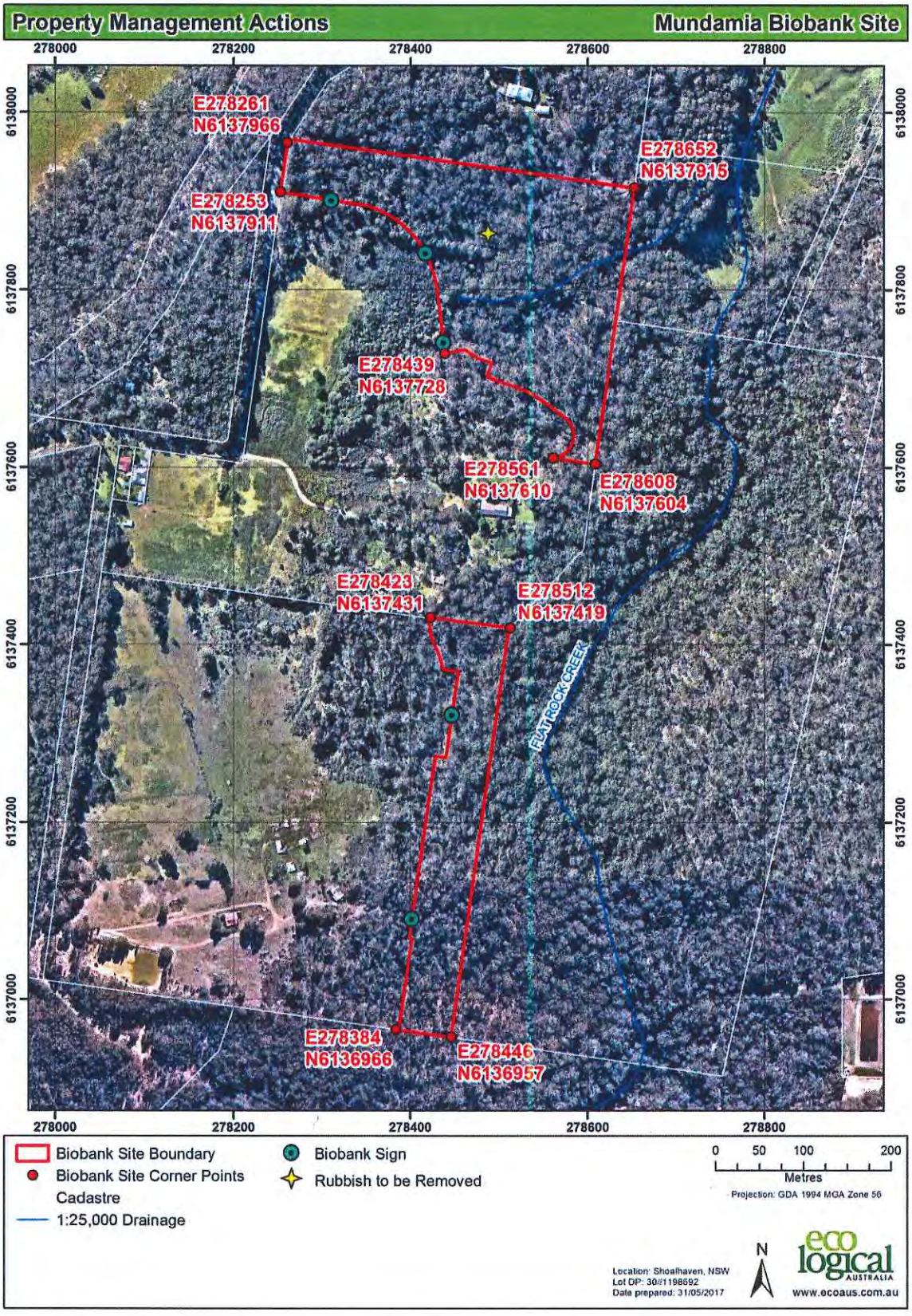

Figure 5 Property management actions; Mundamia biobank (31/05/2017)

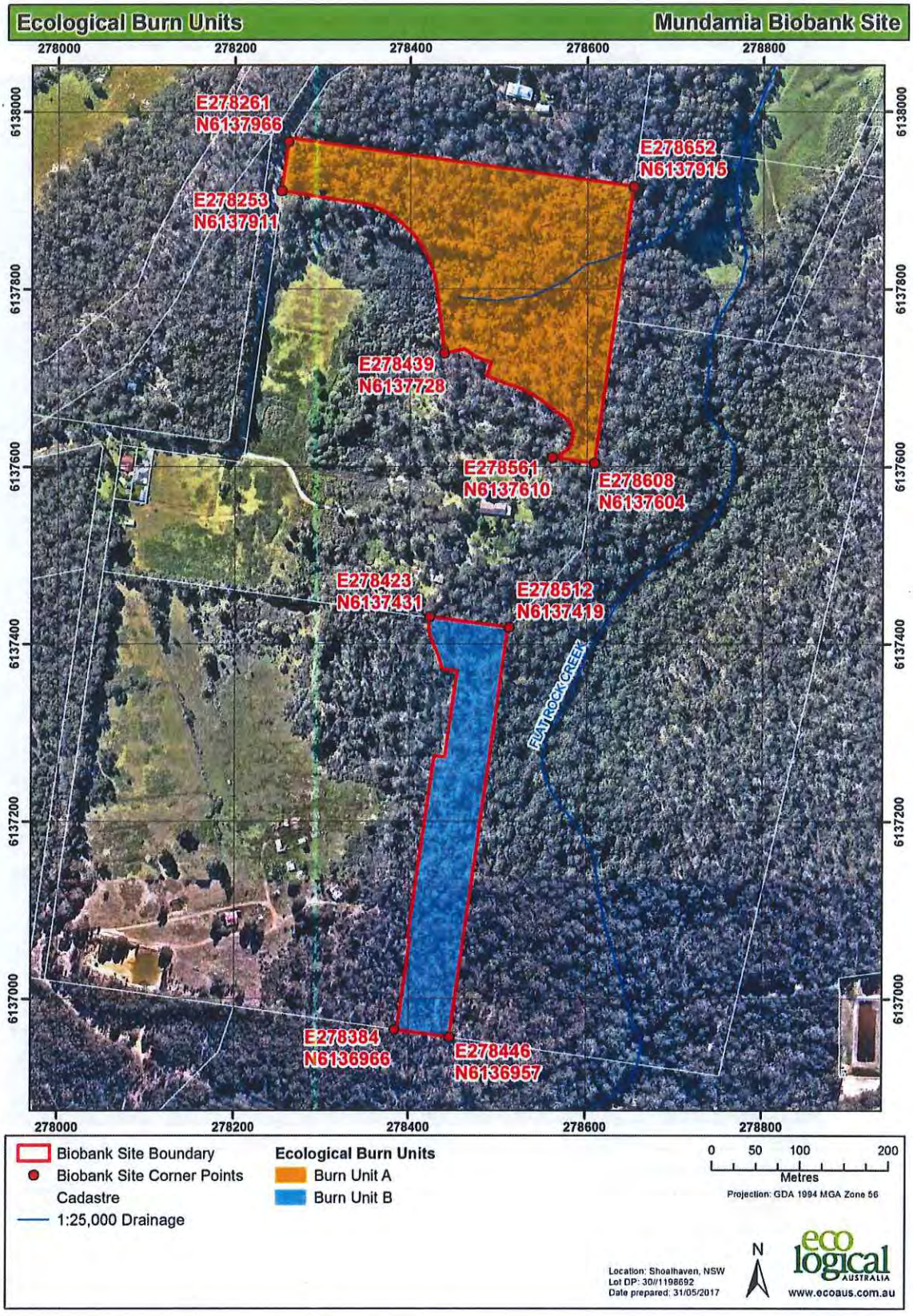

Figure 6 Ecological burn units; Mundamia biobank (31/05/2017)

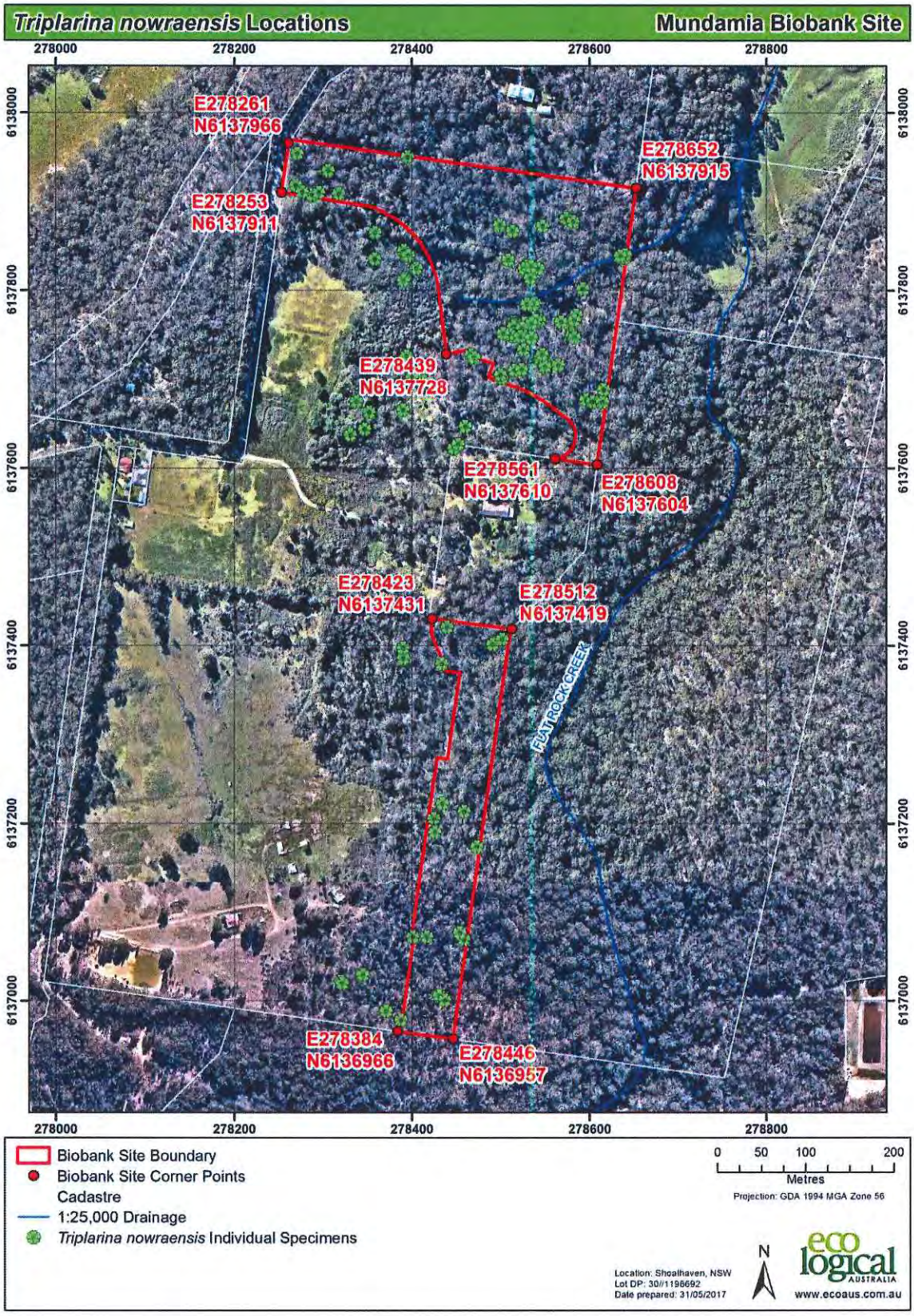

Figure 7 *Triplarina nowraensis* locations; Mundamia biobank (31/05/2017)

Annexure B: Biobanking Agreement Credit Report

BioBanking credit report

This report identifies the number and type of credits required at a BIOBANK SITE

Date of report: 20/11/2018 Time: 1:40:01PM Calculator version: v4.0

Biobank details

Proposal ID:	0155/2017/4393B
Proposal name:	Mundamia Biobank Site
Proposal address:	George Evans Road Mundamia NSW 2540
Proponent name:	Jemalong Mundamia Pty Ltd
Proponent address:	c/- Allen Price Scarrats PO Box 73 Nowra NSW 2541
Proponent phone:	0418222425
Assessor name:	Meredith Henderson
Assessor address:	PO Box 20529 WORLD SQUARE NSW 2002
Assessor phone:	(02) 85368671
Assessor accreditation:	0155

Additional information required for approval:

- ☐ Use of local benchmark
- ☐ Expert report...
- ☐ Request for additional gain in site value

Ecosystem credits summary

Plant Community type	Area (ha)	Credits created
Grey Gum - Blue-leaved Stringybark open forest on gorge slopes, southern Sydney Basin Bioregion and north east South Eastern Highlands Bioregion	7.35	55.00
Hairpin Banksia - Kunzea ambigua - Allocasuarina distyla heath on coastal sandstone plateaux, Sydney Basin Bioregion	0.28	3.00
Spotted Gum - Blackbutt shrubby open forest on the coastal foothills, southern Sydney Basin Bioregion and northern South East Corner Bioregion	1.62	14.00
Total	9.25	72

Credit profiles

1. Spotted Gum - Blackbutt shrubby open forest on the coastal foothills, southern Sydney Basin Bioregion and northern South East Corner Bioregion, (SR641)

Number of ecosystem credits created	14
IBRA sub-region	Ettrema

2. Grey Gum - Blue-leaved Stringybark open forest on gorge slopes, southern Sydney Basin Bioregion and north east South Eastern Highlands Bioregion, (SR549)

Number of ecosystem credits created	55
IBRA sub-region	Ettrema

3. Hairpin Banksia - Kunzea ambigua - Allocasuarina distyla heath on coastal sandstone plateaux, Sydney Basin Bioregion, (SR556)

Number of ecosystem credits created	3
IBRA sub-region	Ettrema

Species credits summary

Common name	Scientific name	Extent of impact Ha or individuals	Number of species credits created
Nowra Heath Myrtle	Triplarina nowraensis	1,083.00	7,689

Additional management actions

Additional management actions are required for:

Vegetation type or threatened species	Management action details
Grey Gum - Blue-leaved Stringybark open forest on gorge slopes, southern Sydney Basin Bioregion and north east South Eastern Highlands Bioregion	Exclude miscellaneous feral species
Grey Gum - Blue-leaved Stringybark open forest on gorge slopes, southern Sydney Basin Bioregion and north east South Eastern Highlands Bioregion	Feral and/or over-abundant native herbivore control
Grey Gum - Blue-leaved Stringybark open forest on gorge slopes, southern Sydney Basin Bioregion and north east South Eastern Highlands Bioregion	Fox control
Grey Gum - Blue-leaved Stringybark open forest on gorge slopes, southern Sydney Basin Bioregion and north east South Eastern Highlands Bioregion	Slashing
Hairpin Banksia - Kunzea ambigua - Allocasuarina distyla heath on coastal sandstone plateaux, Sydney Basin Bioregion	Control of feral pigs
Hairpin Banksia - Kunzea ambigua - Allocasuarina distyla heath on coastal sandstone plateaux, Sydney Basin Bioregion	Exclude commercial apiaries
Hairpin Banksia - Kunzea ambigua - Allocasuarina distyla heath on coastal sandstone plateaux, Sydney Basin Bioregion	Exclude miscellaneous feral species
Hairpin Banksia - Kunzea ambigua - Allocasuarina distyla heath on coastal sandstone plateaux, Sydney Basin Bioregion	Feral and/or over-abundant native herbivore control
Hairpin Banksia - Kunzea ambigua - Allocasuarina distyla heath on coastal sandstone plateaux, Sydney Basin Bioregion	Fox control
Spotted Gum - Blackbutt shrubby open forest on the coastal foothills, southern Sydney Basin Bioregion and northern South East Corner Bioregion	Exclude commercial apiaries
Spotted Gum - Blackbutt shrubby open forest on the coastal foothills, southern Sydney Basin Bioregion and northern South East Corner Bioregion	Exclude miscellaneous feral species
Spotted Gum - Blackbutt shrubby open forest on the coastal foothills, southern Sydney Basin Bioregion and northern South East Corner Bioregion	Feral and/or over-abundant native herbivore control
Spotted Gum - Blackbutt shrubby open forest on the coastal foothills, southern Sydney Basin Bioregion and northern South East Corner Bioregion	Fox control

Annexure C: Management actions and management plans

This Annexure C, together with Annexure D, is approved as a property management plan prepared by the landowner under the section 113B of the *Threatened Species Conservation Act 1995.*

A Management actions

A1 The landowner must undertake, or cause to be undertaken, the Management Actions contained in the following tables in this Annexure C:

(i) Section 1: Standard management actions (**'Section 1'**); and

(ii) Section 2: Additional management actions (**'Section 2'**)

in accordance with the conditions specified in Section 1 and Section 2 and within the timeframes (if any) specified in Section 1 and Section 2.

A2 In carrying out the management actions, the landowner must implement and, at all relevant times comply with, the management plans as contained in the following tables in this Annexure C:

(i) Section 3: Standard management plans (**'Section 3'**); and

(ii) Section 4: Additional management plans (**'Section 4'**)

in accordance with the conditions specified in those tables and management plans and within the timeframes (if any) specified in Section 3 and Section 4.

A3 Where a management action requires that something must not be done, the landowner must not do that thing and must not cause, authorise or permit any other person to do that thing.

A4 Notwithstanding A1 and A2 above, the landowner is not required to undertake the management actions so described if the action is inconsistent with anything (act or omission) required or authorised to be done by the landowner by or under any of the following:

I. removal of noxious weeds under the *Noxious Weeds Act 1993*

II. the control of noxious animals under the *Rural Lands Protection Act 1998*

III. an obligation arising under an eradication order or pest control order under Part 11 of the *Rural Lands Protection Act 1998*

IV. a direction under section 37A of the *State Emergency and Rescue Management Act 1989* in relation to a state of emergency or a direction under section 22A of the *State Emergency Service Act 1989*

V. in respect of the *Rural Fires Act 1997*:

(a) an emergency fire fighting act within the meaning of that Act

(b) emergency bushfire hazard reduction work within the meaning of that Act

(c) any notified steps issued to the landowner under section 63 of that Act

(d) any notice by a local authority under section 66 of that Act to undertake specified bushfire hazard reduction work

(e) otherwise as part of any managed bushfire hazard reduction work within the meaning of the *Rural Fires Act 1997* that is carried out in accordance with:

i. a current bushfire hazard reduction certificate that applies to the work

ii. the provisions of any bushfire code applying to the land specified in the certificate.

A5 The landowner may make minor alterations to any management actions as part of adaptive management, where the outcomes of monitoring, including documented observations of the landowner or his/her servant, lessee, agent or licensee/s, indicate that the minor alterations to the management actions are required to improve biodiversity values in accordance with the biobanking agreement. The landowner must document the minor alterations made to the management actions and the reasons for the alterations, and retain a record of the documentation and include it in the annual report.

B Timing for carrying out management actions

B1 An obligation to carry out a management action (or implement and comply with a management plan):

(i) will commence on the commencement date or first payment date (as indicated); and

(ii) must be carried out in perpetuity unless otherwise indicated in Sections 1 to 4 of this Annexure C.

B2 The landowner must ensure that if a timeframe is specified in Sections 1 to 4, that the management action is carried out within that timeframe.

B3 For the avoidance of doubt, an obligation to carry out a management action within a specified timeframe continues until the management action has been carried out even if the time for compliance has passed.

Section 1: Standard management actions

Standard management actions		
Item 1	**Management of grazing for conservation**	**Timing**
1.1	Stock must not be permitted to graze in any area of the biobank site.	Ongoing from commencement date.
1.2	This item is not applicable.	N/A
1.3	This item is not applicable	N/A
1.4	If, at any time, the landowner observes stock in any area of the biobank site, the landowner must take necessary measures to remove the stock from the area immediately.	Ongoing from commencement date.
Item 2	**Weed control**	**Timing**
2.1	The landowner must implement and, at all relevant times, comply with, the integrated weed management plan included in Section 3 (**'the weed management plan'**) (or such updated integrated weed management plan as has been approved by the Chief Executive under item 2.2 below). To allow for adaptive management, minor alterations can be made to the implementation of the weed management plan. Any alterations must be recorded in writing in accordance with Section 3 of this Annexure.	Ongoing from first payment date.
2.2	The weed management plan must be reviewed at intervals of no less than 4 years and no more than 6 years by an appropriately qualified person. The review is to consider the efficacy of the management actions in the plan and consider the effectiveness of the matters contained in the current plan that are outlined in the dot points below. Notification of the date of the review commencement must be provided to the Chief Executive in writing within 14 days of the commencement of the review. The findings of the review must be submitted to the Chief Executive within 3 months of commencing the review. Where the Chief Executive determines from the review that an update of the plan is required, the Chief Executive will notify the landowner in writing that an update of the plan is required. The landowner must update the plan and submit it to the Chief Executive for approval within 3 months of receiving written notification from the Chief Executive that an update of the plan is required. The revised plan must be prepared by an appropriately qualified person and must cover the matters outlined below and any additional matters specified by the Chief Executive in writing: • a description of the target weed/s at the biobank site and their location/s, linked to each management zone where weeds are present • the method/s of weed control in each zone • the frequency of weed control activities at the site, taking into account management practices where weeds are providing	Ongoing from first payment date.

	habitat for native species • the timing of any planting of native plant species required in each management zone to provide alternative habitat for native species affected by weed control activities • methods for monitoring the success of weed control activities • a timetable/measures for inspections to identify new weed species or exotic plant species (including noxious weeds under the *Noxious Weeds Act 1993*) • additional weed control activities to destroy or remove any new weed species that are found on the site • measures for assessing and reporting monitoring results • a diary for recording actions taken in accordance with the weed management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary.	

Item 3	Management of fire for conservation	Timing
3.1	The landowner must implement, and at all relevant times, comply with the fire management plan included in Section 3 (or such updated fire management plan as has been approved by the Chief Executive under item 3.2 below) (**'the fire management plan"**). To allow for adaptive management and weather conditions, minor alterations can be made to the implementation of the fire management plan, and must be recorded in writing in accordance with Section 3 of this Annexure.	Ongoing from commencement date.
3.2	The fire management plan must be reviewed at intervals of no less than 4 years and no more than 6 years by an appropriately qualified person. The review is to consider the efficacy of the management actions in the plan and consider the effectiveness of the matters contained in the current plan that are outlined in the dot points below. Notification of the date of the review commencement must be provided to the Chief Executive in writing within 14 days of the commencement of the review. The findings of the review must be submitted to the Chief Executive within 3 months of commencing the review. Where the Chief Executive determines from the review that an update of the fire management plan is required, the Chief Executive will notify the landowner in writing that an update of the plan is required. The landowner must update the plan and submit it to the Chief Executive for approval within 3 months of receiving written notification from the Chief Executive that an update of the plan is required. The revised plan must be prepared by an appropriately qualified person and cover the matters outlined below and any additional matters specified by the Chief Executive in writing: • the year the last fire went through, the type of fire and the extent of the fire and location, where known • frequency of natural fires in the area of the biobank site, where known • a description of locations and management zones where ecological burns will be conducted and areas that will not be	Ongoing from first payment date.

	burnt • the methods that will be used for ecological burns • the fire frequency intervals recommended for the vegetation types and threatened species present, including any required adjustment to the schedule in the event of a wildfire or activities undertaken under the *Rural Fires Act 1997* to ensure minimum frequency between ecological burns • the fire intensity for the recommended vegetation types • the time of year suitable for ecological burns • the diary for recording actions taken in accordance with the fire management plan and minor alterations to fire management plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary.	
3.3	Fires must not be lit on the biobank site other than for the purpose of ecological burning in accordance with the fire management plan or as permitted as a permissible human activity on the biobank site under item 4 of this Annexure or clause 3.6 of this agreement.	Ongoing from commencement date.
Item 4	**Management of human disturbance**	**Timing**
4.1	Except as permitted under clause 3 of this agreement or item 4.2 (below), human activities that adversely affect biodiversity values on the biobank site, including repeated disturbance of native animals, must not be carried out, or caused or permitted to be carried out, on the biobank site.	Ongoing from commencement date.
4.2	Human activities that may have a negative impact on biodiversity values on the biobank site are permitted if they are listed as permissible activities under clause 3.6 of this agreement or if they are undertaken as part of the management actions or management plans.	Ongoing from commencement date.
4.3	All waste shown on the map entitled *Figure 5 Property management actions; Mundamia biobank*, dated 31/05/2017, must be removed from the biobank site in an appropriate manner.	Commencing from first payment date.
4.4	The landowner must not store, dispose of, or cause or permit to be disposed of, any waste on the biobank site. Note: The storage or disposal of waste on the biobank site may require an approval under the *Protection of the Environment Operations Act* 1997.	Ongoing from commencement date.
4.5	The landowner must take all reasonable steps to remove waste deposited by others on the biobank site, or which is otherwise present on the biobank site.	Ongoing from first payment date.
4.6	Fencing and/or signage must be installed and maintained to deter human disturbance including waste dumping. Signage must be the BioBanking signs available from the OEH. Specific requirements: • Five (5) Biobank signs are required. Indicative locations provided on *Figure 5 Property management actions; Mundamia biobank*, dated 31/05/2017.	Ongoing from first payment date.

Item 5	Retention of regrowth and remnant native vegetation Note: An approval under the *Native Vegetation Act 2003* may be required to carry out thinning or any other removal or damage to native vegetation under this item.	Timing
5.1	Native vegetation (whether remnant native vegetation or regrowth) on the biobank site must not be cut down, felled, thinned, logged, killed, destroyed, poisoned, ringbarked, uprooted, burnt or otherwise removed, except in accordance with item 5.2 below, or if it is required as part of the management actions or it is essential for the carrying out of permissible development under clause 3.5 of this agreement. Note: Native vegetation on the biobank site may be managed to improve biodiversity values by thinning to benchmark stem densities over no more than 80% of each management zone. Benchmark stem densities has the same meaning as defined in the Vegetation Benchmark Database as published by OEH and updated from time to time. An approval under the *Native Vegetation Act 2003* may be required to carry out thinning or any other removal or damage to native vegetation under this item.	Ongoing from commencement date.
5.2	Native vegetation on the biobank site must not be burnt except in accordance with the fire management plan prepared pursuant to item 3 above.	Ongoing from commencement date.
Item 6	**Replanting or supplementary planting where natural regeneration will not be sufficient**	**Timing**
6.1	This item is not applicable.	N/A
6.2	This item is not applicable.	N/A
6.3	This item is not applicable.	N/A
6.4	This item is not applicable.	N/A
6.5	This item is not applicable.	N/A

Item 7	Retention of dead timber	Timing
7.1	Dead timber (whether standing or fallen and including branches and leaf litter) must not be removed from or moved within the biobank site except for the personal (non-commercial) use by the landowner for firewood for one dwelling only or for repair of fencing (not for construction of fencing). Dead timber used for fencing repair must be documented by the landowner in writing and records must be kept in accordance with the record keeping requirements. The landowner must record the approximate amount of dead timber collected from the biobank site for use in fencing, the location that that dead timber was collected from and the date it was collected (month, year). Specific requirements: No dead timber to be used for firewood or repair fencing.	Ongoing from commencement date.
7.2	This item is not applicable.	N/A

Item 8	Erosion control	Timing
8.1	All reasonable steps must be undertaken to prevent, control and remedy erosion on the biobank site. Soil management for preventing and controlling erosion is to be undertaken using best practice management, such as that developed by the Soil Conservation Service, applied as relevant for the biobank site.	N/A
Item 9	**Retention of rocks**	**Timing**
9.1	The landowner must not remove, or cause or permit to be removed, rocks from the biobank site or move, or cause or permit to be moved, rocks within the biobank site.	Ongoing from commencement date.
9.2	Rocks from outside the site may be placed on the biobank site to improve habitat for threatened species. Rocks, once placed on the biobank site, are subject to item 9.1 above. The landowner must make and retain records of the location of the rocks placed on the site and the date the rocks were brought onto the site in accordance with the record keeping requirements.	When required but not required before the first payment date.

Section 2: Additional management actions

Additional management actions		
Item 10	**Control of feral and overabundant native herbivores**	**Timing**
10.1	The landowner must implement, and at all relevant times, comply with the management plan to control feral and overabundant native herbivores included in Section 4 (or such updated management plan as has been approved by the Chief Executive under item 10.2 below) (**'the feral and overabundant native herbivores management plan'**). To allow for adaptive management, minor alterations can be made to the implementation of the feral and overabundant native herbivores management plan, which must be recorded in writing in accordance with Section 3 of this Annexure. Note: A licence under Section 121 of the *National Parks and Wildlife Act 1974* may be required to control overabundant native herbivores.	Ongoing from first payment date.
10.2	The feral and overabundant native herbivores management plan must be reviewed at intervals of no less than 4 years and no more than 6 years. The review is to consider the efficacy of the management actions in the plan and consider the effectiveness of the matters contained in the plan that are outlined in the dot points below. Notification of the date of the review commencement must be provided to the Chief Executive in writing within 14 days of the commencement of the review. The findings of the review must be submitted to the Chief Executive within 3 months of commencing the review. Where the Chief Executive determines from the review that an update of the feral and overabundant native herbivores management plan is required, the Chief Executive will notify the landowner in writing that an update of the plan is required and the landowner must update the plan and submit the amended plan to the Chief Executive for approval within 3 months of receiving written notification from the Chief Executive that an update of the plan is required. The revised plan must cover the matters outlined below and any additional matters specified by the Chief Executive in writing: • a description of the feral or overabundant native herbivore/s • consideration of relevant current OEH and other pest management programs and methods • the method/s for feral and overabundant native herbivore control in each management zone, determined in accordance with best practice management • the frequency and timing of the control actions in each management zone • methods for monitoring the success of the pest control actions • a timetable and measures for inspections to identify new feral or overabundant native herbivores that may adversely affect biodiversity values on the biobank site	Ongoing from first payment date.

	• additional control actions to destroy or remove any new feral and overabundant native herbivore pest species that occur on site • measures for assessing and reporting monitoring results • a diary for recording actions taken in accordance with the feral and overabundant native herbivores management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary.	
Item 11	**Vertebrate pest management – foxes, goats etc**	**Timing**
11.1	The landowner must implement, and at all relevant times, comply with the vertebrate pest management plan included in Section 4 (or such updated vertebrate pest management plan as has been approved by the Chief Executive under item 11.2 below) ('**the vertebrate pest management plan**'). To allow for adaptive management, minor alterations can be made to the implementation of the vertebrate pest management plan, but these must be recorded in writing in accordance with Section 3 of this Annexure.	Ongoing from first payment date.
11.2	The vertebrate pest management plan must be reviewed at intervals of no less than 4 years and no more than 6 years by an appropriately qualified person. The review is to consider the efficacy of the management actions in the plan and consider the effectiveness of the matters contained in the current plan that are outlined in the dot points below. Notification of the review commencement must be provided to the Chief Executive in writing within 14 days of the commencement. The findings of the review must be submitted to the Chief Executive within 3 months of commencing the review. Where the Chief Executive determines from the review that an update of the plan is required, the Chief Executive will notify the landowner in writing that an update of the plan is required. The landowner must update the plan and submit it to the Chief Executive for approval within 3 months of receiving written notification from the Chief Executive that an update of the plan is required. The revised plan must cover the matters outlined below and any additional matters specified by the Chief Executive in writing: • a description of the target fauna species e.g. pigs, foxes or other species such as feral dogs or goats • consideration of relevant current OEH and other pest management programs • the method/s of vertebrate pest control in each management zone determined in accordance with best management practice • the frequency and timing of vertebrate pest control actions in each management zone • methods for monitoring the success of vertebrate pest control actions • a timetable and measures for inspections to identify new vertebrate pest species that may negatively impact on threatened species on the biobank site	Ongoing from first payment date.

	• additional vertebrate pest control actions to destroy or remove any new vertebrate pest species that occur on-site • measures for assessing and reporting monitoring results • a diary for recording actions taken in accordance with the vertebrate pest management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative actions) and reasons for the minor alterations must be recorded in the diary.	
Item 12	**Nutrient control**	**Timing**
12.1	Fertilisers, pesticides and herbicides must not be applied on the biobank site, except where required to undertake the management actions. Use of fertilisers for establishing native vegetation through planting or seeding, use of herbicides for controlling weeds or use of pesticides for controlling vertebrate pests or feral herbivores can be undertaken in accordance with best practice management when required to undertake the management actions.	Ongoing from commencement date.
Item 13	**Control of exotic fish species**	**Timing**
13.1	This item is not applicable to this Biobank site.	N/A
Item 14	**Maintenance or reintroduction of natural flow regimes**	**Timing**
14.1	This item is not applicable to this Biobank site.	N/A
14.2	This item is not applicable to this Biobank site.	N/A
14.3	Artificial structures such as dams or levee banks that impede the natural flow regimes on the biobank site must not be constructed unless approved by the Chief Executive in writing for the purpose of restoring natural flows.	Ongoing from commencement date.

Section 3: Standard management plans

Weed management plan

The weed types, description and location (management zone/s) of weed infestations existing at the commencement date are listed in the weed management plan. The methods of weed control (management actions), monitoring and inspections are also listed.

The landowner must perform the methods of weed control and other weed management activities and monitoring in the weed management plan by the methods described (and in accordance with item 2 of this Annexure) for all weeds. The methods of control will apply to the weeds listed in the table below as well as any other weeds that may be present on the site from time to time.

The template for reporting of monitoring activities and the diary template for weed control management must be filled in to record observations during the implementation of the weed management plan, including any minor variations.

Weed types

Weed	Common name of target weed	Scientific name of target weed	Description of infestation (eg intensity (% cover) & location within zone)	Management zone/s
A	Cobbler's Pegs	*Bidens pilosa*	Localised presence in this zone near to cleared area and rubbish	MZ3, MZ3a
B	Common Centaury	*Centaurium erythraea*	Localised presence in this zone near to cleared area and rubbish	MZ3, MZ3a
C	Tall Fleabane	*Conyza sumatrensis*	Localised presence in this zone near to cleared area and rubbish	MZ3, MZ3a
D	Summer Grass	*Digitaria ciliaris*	Localised presence in this zone near to cleared area and rubbish	MZ3, MZ3a
E	Stinkgrass	*Eragrostis cilianensis*	Localised presence in this zone near to cleared area and rubbish	MZ3, MZ3a
F	Catsear	*Hypochaeris radicata*	Localised presence in this zone near to cleared area and rubbish	MZ3, MZ3a
G	Lantana	*Lantana camara*	Localised presence near waterway in MZ1 and MZ6, near other weed infestation in MZ3	MZ1a, MZ3, MZ3a, MZ6 and MZ6a
H	Fireweed	*Senecio madagascariensis*	Localised presence in this zone near to cleared area and rubbish	MZ3, MZ3a
I	Paddy's Lucerne	*Sida rhombifolia*	Localised presence in this zone near to cleared area and rubbish	MZ3, MZ3a
J	Purpletop	*Verbena bonariensis*	Localised presence in this zone near to cleared area and rubbish	MZ3, MZ3a
K	Veined Verbena	*Verbena rigida*	Localised presence in this zone near to cleared area and rubbish	MZ3, MZ3a

Methods of weed control

Management zone/s	Weed/s	Method of weed control	Frequency
All zones	Grass weeds	1. Primary treatment - Spot-spray with a non-selective herbicide and hand removal. 2. Maintenance - Spot-spray and hand removal as required	1. Years 1-5. Throughout the year but work, especially spraying, should be focused between September and February. 2. Year 6 and beyond. Throughout the year, with spraying focussed on the growing season, approximately September to February.
All zones	Herbaceous weeds	1. Primary treatment - Spot-spray with a non-selective herbicide and hand removal. 2. Secondary treatment - Spot-spray as required 3. Maintenance - Spot-spray and hand removal as required.	1. Years 1-5. Throughout the year but work, especially spraying, should be focused between September and February. 2. Year 6 and beyond. Throughout the year, with spraying focussed on the growing season, approximately September to February.
MZ3 and MZ3a	All weeds	1. Primary treatment - Ground preparation and removal of weeds and rubbish. Spot-spray with a non-selective herbicide and hand removal. 2. Secondary treatment - Spot-spray as required 3. Maintenance - Spot-spray and hand removal as required.	1. Years 1-2. Throughout the year but work, especially spraying, should be focused between September and February. 2. Years 3 to 5. Throughout the year, with spraying focussed on the growing season, approximately September to February. 3. Year 6 and beyond. Throughout the year, with spraying focussed on the growing season, approximately September to February

Native planting required to provide habitat for native species affected by weed control activities

Management zone	**Description of planting required** (reference planting schedule at item 6.6)	Timing
N/A	Not applicable given the rate of weed removal, methods of weed removal (i.e. woody weeds to remain in situ) and the availability of comparable habitat within and surrounding the site. Additionally, weeding will be staged to allow for natural regeneration.	

Monitoring and inspections of existing and new weeds

Management zone/s	Weed/s	Method of monitoring	Date/s required
N/A			

Other weed management activities (where required)
Unless otherwise specified, all herbicide used should be a non-specific herbicide formulated for use around water (e.g. Roundup Biactive®).
All plot markers are to be maintained in the same position If noted to have been damaged or disturbed during weed management or by undertaking any weed management they must be replaced.
Zones are as per *Figure 3 Management zones; Mundamia biobank*, dated 31/05/2017.

Template for reporting of monitoring activities		
Management zone/s	**Date**	**Observations and assessment of monitoring** This table must include the information for each zone (or groups of zones) which is described in the table titled 'monitoring and inspections of existing and new weeds'.

Diary template for weed control management			
Date	**Management zone/s**	**Description and type of activity undertaken** (e.g. weed control, observation)	**Minor variations** (details and reasons)

Fire for conservation management plan

The plan includes information on all known previous fire events in the 'Fire history' table to demonstrate local fire conditions including intensity and frequency.

The ecological fire requirements for each vegetation type or threatened species on the biobank site are listed in the 'Fire requirements for vegetation types and threatened species' table. These are the fire frequency intervals recommended for the vegetation types and threatened species present on the biobank site. They include any requirement adjustments to the schedule in the event of a wildfire or activities undertaken under the *Rural Fires Act (RFA) 1997* to ensure the minimum frequencies between ecological burns.

The landowner must carry out ecological burns for each management zone according to the method and frequency described (as informed by the history and requirements sections and in accordance with Section 3 of this annexure). These actions are set out in the 'Ecological burning actions table'. Monitoring and inspections (set out in the 'Fire management monitoring' table) as described must also be implemented. The landowner must also carry out the actions listed in the 'Other fire management activities' table.

The table titled 'Template of monitoring activities' must be completed to record observations during the implementation of the plan and assessment of monitoring activities. The landowner must also complete the table titled 'Diary template for fire management activities' to record the management actions undertaken or observations made, including any minor variations.

Fire history for previous 20 years (or longer if known)

Year of fire	Hazard reduction, wildfire or ecological burn and extent of fire	Management zone/s
1993?	NPWS mapping for Triplarina reserve to the south shows this area as having been burnt in 1993. However, the Shoalhaven Bushfire Risk Management Plan (NSW RFS 2010), maps the site as having no recent fire history, with no fires mapped.	All

Fire requirements for vegetation types and threatened species

Vegetation type and/or threatened species	Fire frequency required	Time of year for burning	Fire intensity required	Adjustment required due to wildfires or RFA activities
Triplarina nowraensis	No more than 1 in 10 years	Following seed release	Not known; has been observed to resprout following bushfires	Adjust frequency to ensure minimal interval is maintained if a bushfire or hazard reduction burn has occurred
Hairpin Banksia - Kunzea ambigua - Allocasuarina distyla heath on coastal sandstone plateaux, Sydney Basin Bioregion	Avoid inter fire intervals of less than 7 and more than 30 years	Guidance from Triplarina reproductive behaviour	Not known, however fire in this vegetation type is usually intense due to fuel structures	Adjust frequency to ensure minimal interval is maintained if a bushfire or hazard reduction burn has occurred
Grey Gum - Blue-leaved Stringybark open forest on gorge	Avoid inter fire intervals of less than 5 and more than 50 years	Guidance from Triplarina reproductive behaviour	Crown fires should be avoided at the lower end of the	Adjust frequency to ensure minimal interval is maintained if a bushfire or hazard reduction burn has

slopes, southern Sydney Basin Bioregion and north east South Eastern Highlands Bioregion			inter fire interval	occurred
Spotted Gum - Blackbutt shrubby open forest on the coastal foothills, southern Sydney Basin Bioregion and northern South East Corner Bioregion	Avoid inter fire intervals of less than 10 and more than 50 years	Guidance from Triplarina reproductive behaviour	Crown fires should be avoided at the lower end of the inter fire interval	Adjust frequency to ensure minimal interval is maintained if a bushfire or hazard reduction burn has occurred

Ecological burning actions

Management zone/s	**Actions**	**Supervision & extinguishing techniques**	**Time of year for burning**	**Frequency** (years)
MZ1a	Ecological burns should be carried out at an interval of 7 to 30 years with the majority of cycles within 12 to 25 years. Some intervals at the higher end of this range (i.e. greater than 25 years) are desirable.	Suitably experienced organisations such as the Rural Fire Service to be engaged to supervise preparation of burn area, undertake burn and extinguish. Extinguishing techniques as applicable which may include containment lines comprising of natural breaks such as exposed rock, back burned areas or wet lines.	Burns should be guided by the presence of *Triplarina nowraensis* in the zone. If *T. nowraensis* has not seeded or is about to set seed, burns should be delayed.	From first payment date. The whole zone would be one burn unit. Inter fire intervals of between 7 and 30 years. If a bushfire or hazard reduction burn occurs, any subsequent planned burn may only be undertaken in that area after 12 years from the date of the preceding fire.
MZ3, MZ3a, and MZ4 and MZ4a	Ecological burns should be carried out at an interval of 5 to 50 years with the majority of cycles within 20 to 40 years. Some intervals at the higher end of this range (i.e. greater than 30 years) are desirable. Crown fires should not occur at the lower end of this range. MZ4/4a would be divided into two burn	As above	As above	From first payment date. MZ3/3a would be one burn unit. Inter fire intervals of between 5 and 50 years. MZ4/4a would be split into two burn units, north and south. Each burn unit would be burnt between 10 and 20 years, giving an average of between

	units, north and south. One burn unit in MZ4/4a every 10-20 years, subject to seasonal ability to conduct burns and any unplanned fires.			20 and 40 years. If a bushfire or hazard reduction burn occurs, any subsequent planned burn may only be undertaken in that area after 12 years from the date of the preceding fire.
MZ6 and MZ6a	Ecological burns should be carried out at an interval of 10 to 50 years, with most fires at between 20 and 40 years.	As above	As above	From first payment date. MZ6/6a would be one burn unit. The burn unit could be burnt at the same time as MZ4/4a north, given the similar inter-fire interval requirements. However, consideration should be given to the reproductive success of *Triplarina nowraensis*.

Methods for monitoring the outcomes of ecological burns

Management zone/s	Method of monitoring	Date/s required
All zones	Recording the date and intensity of fire, area burnt during fire, any canopy scorched and percentage of leaf litter remaining. Visual monitoring of all zones is required to be undertaken by an appropriately qualified bush regenerator. The monitoring is to provide: • A general description of the vegetation structure and species composition within the zone, • An interpretation of the ecological outcomes of previous fires (either planned or unplanned) within the zone, and • A recommendation on the timing and location for future planned ecological burns within the zone (or for other zones). • Also, a written and photographic report for plots relating to plant species and cover abundance starting 12 months post fire. The results of the monitoring are to be recorded in the 'Template for reporting of monitoring activities'.	After each ecological burn event or other fire event (planned or bushfire).
Triplarina nowraensis	A sub-sample of plants could be tagged with fire resistant tags (e.g. brass livestock tags on 2 mm gauge steel wire) to determine post-fire survival. The population should be assessed for post-fire survival. Consider forming partnership with NSW NPWS or University of Wollongong to collect pre- and post-fire data to inform future management actions for this species.	Before and after each ecological burn and after each bushfire.

Other fire management activities (where required)
All plot markers are to be maintained in the same position. If noted to have been damaged or disturbed during or by undertaking any ecological burns, they must be replaced.
Existing vegetation of the site is as per *Figure 2 Vegetation zones; Mundamia biobank*, dated 31/05/2017.

Template for reporting of monitoring activities

Management zone/s	Date	Observations and assessment of monitoring

Diary template for fire management activities

Date	Management zone/s	Description of activity undertaken or observation made	Minor variations (details and reasons)

Section 4: Additional management plans

Management plan to control feral and overabundant native herbivores

The management plan for feral and overabundant native herbivores includes information on the management requirements for the feral and overabundant native herbivores at the biobank site listed in the 'Feral and overabundant native herbivores' table. The possible methods of control for each species, used by OEH and other pest management programs, are listed and the suitability of each method is described in the 'Methods considered' table.

The landowner must carry out the methods for control for feral and overabundant native herbivores for each management zone according to the method and frequency as described in the 'Methods for control' table. The methods of control applied to the feral or overabundant native herbivores listed in the 'Feral or overabundant native herbivores' table as well as any other feral or overabundant herbivores that may be present on the site from time to time.

Monitoring and inspections of existing and new feral and overabundant herbivores at the biobank site as described in the 'Monitoring and inspections' table must be implemented.

The table titled 'Template for reporting of monitoring activities' must be completed to record observations during the implementation of the plan and assessment of the monitoring activities. The landowners must complete the table titled 'Diary template for feral and overabundant herbivore management' to record the management actions undertaken including any minor variations or observations made.

Feral and overabundant native herbivores

Feral type	Name of feral/overabundant native herbivore	Description of extent	Management zone/s
A	Rabbit (*Oryctolagus cuniculus*)	No evidence recorded, potentially present in all zones.	All zones

Methods considered

Feral type	Name and description of program or method	Describe suitability
A	Pindone poison baits.	Effective means of controlling rabbits and foxes.
A	Warren destruction and burrow fumigation.	Appropriate where active warrens identified.

Methods of control

Management zone/s	Feral type	Method of control	Frequency and timing
All	A	Warren destruction as necessary. Can take place regardless of timing of rabbit control undertaken.	As required.

Monitoring and inspections

Management zone/s	Feral type/s	Method of monitoring	Date/s required

All	All	The monitoring is to comprise a regular walk over of the site (at least once every six months) and a visual estimate of the level of grazing, browsing and/or burrowing impacts. The level of impact is to be recorded as negligible, minimal, moderate or high. The monitoring is to also include recording the number and location of any tracks, traces or sightings of feral or overabundant native herbivores. This information is to be used in the feral or overabundant native herbivore pest management plan to inform the methods of control listed in that plan.	Every six months from Year 1.

Other management activities (where required)

Plot marker posts are to be maintained or replaced where feral or overabundant native herbivores may have interfered with or damaged posts.

Template for reporting of monitoring activities

Management zone/s	**Date**	**Current level of impact on vegetation** This column must record impact as Negligible, Minimal, Moderate or High	**Observations and assessment of monitoring**

Diary template for feral and overabundant herbivore management

Date of activity	**Management zone/s**	**Description and type of activity undertaken** This column must include details of the feral and overabundant herbivores targeted, control techniques applied and numbers controlled.	**Minor variations** (details and reasons)

Vertebrate pest management plan

The management plan for vertebrate pests includes information on the vertebrate pests and their extent existing at the time of the agreement as listed in the 'Vertebrate pests' table. The possible methods of control for each species, used by OEH and other pest management programs are listed and the suitability of each method to the biobank site is described in the 'Methods considered' table.

The landowner must carry out the methods for vertebrate pest control for each management zone according to the method and frequency described in the 'Methods of control' table, The methods of control will apply to the vertebrate pests listed in the 'Vertebrate pests' table as well as any other vertebrate pests that may be present on the site from time to time.

Monitoring and inspections of existing and new vertebrate pests on the biobank site, as described in the 'Monitoring and inspections' table, must be implemented.

The table titled 'Template for reporting of monitoring activities' must be completed to record observations during the implementation of the plan and assessment of monitoring activities. The landowner must also complete the 'Diary template for vertebrate pest management' to record the management actions undertaken, including any minor variations, and observations made.

Vertebrate pests

Pest	Name of vertebrate pest (e.g. pig, fox, goat, dog)	Description of extent	Management zone/s
A	Fox (*Vulpes vulpes)*	No evidence recorded, potentially present in all zones.	All zones

Methods considered

Pest type	Name and description of program or method	Describe suitability
A	Opportunistic shooting. Shooting can be undertaken if significant numbers of animals build up or more opportunistically when target species seen passing through site.	Not suitable or permitted in an urban environment
A	Baiting (in conjunction with broader control programs and den fumigation (as required).	For such a small biobank site, baiting is not considered effective unless undertaken in conjunction with a regional baiting program with NPWS. Baiting at the landscape scale is required to more appropriately manage this vertebrate pest.

Methods of control

Management zone/s	Pest type	Method of control	Frequency and timing
All	A	Opportunistic destruction of breeding dens.	Ongoing/As required
All	A	Baiting (in conjunction with broader control programs, and den fumigation (as required).	Ongoing/As required

Monitoring and inspections of existing and new vertebrate pests			
Management zone/s	**Pest type/s**	**Method of monitoring**	**Date/s required**
All	A	Monitoring of vertebrate pest activity is to comprise regular nocturnal walkovers (at least once every three months) of the site to determine levels of activity. The level of activity is to be recorded as negligible, minimal, moderate or high. Monitoring is also to include the number, date and location of any animals shot, dens destroyed or baits taken. The monitoring will also include recording the number and location of any tracks, traces or sightings of foxes. This information is to be used in the vertebrate pest management plan to inform the methods of control listed in that plan.	Every six months from Year 1.

Other management activities (where required)
Plot marker posts are to be maintained or replaced where vertebrate pests may have interfered or damaged posts.

Template for reporting of monitoring activities			
Management zone/s	**Date**	**Current level of impact on vegetation or threatened fauna species** This column must record impact as Negligible, Minimal, Moderate or High	**Observations and assessment of monitoring**

Diary template for vertebrate pest management			
Date of activity	**Management zone/s**	**Description and type of activity undertaken** This column must include details of the vertebrate pests targeted, control techniques applied and numbers controlled.	**Minor variations** (details and reasons)

Annexure D: Monitoring, reporting and record keeping requirements

This Annexure D, together with Annexure C, is approved as a property management plan prepared by the landowner under the section 113B of the *Threatened Species Conservation Act 1995*.

1 Monitoring requirements

1.1 The landowner must ensure that photographs are taken at photo-points at each of the locations and in the direction identified in the table below titled 'Locations of photo points' within 12 months of the commencement date and then at least every 12 months thereafter.

1.2 The photo points are identified on the map entitled Figure 4 Photo points; Mundamia biobank dated 31/05/2017 in Annexure A of this agreement. The purpose of the photographs is to show changes over time. Photographs should be taken at approximately the same direction, location, height and time of day (during daylight hours) in each reporting period (as defined in item 2.2 of this Annexure D) and retained for the life of this agreement. All photographs must be dated, stating the direction in which they were taken and identified with their locations.

Locations of photo points			
Projected coordinate system: GDA 94 MGA Zone 56			
Photo point reference	Easting	Northing	Direction of photo (magnetic degrees)
Z4P3	278490	6137384	200
Z1P1	278435	6137831	110
Z6P1	278509	6137803	85
Z4P2	278473	6137874	120

1.3 An inspection of the biobank site must be undertaken by, or on behalf of, the landowner in accordance with the table 'Site inspection and monitoring schedule' below, for the purposes specified in column A and at the relevant interval specified in column B. The inspections are to occur at the intervals indicated starting from the commencement date. The inspections are additional to any inspections and monitoring required by Annexure C.

Site inspection and monitoring schedule	
A. Purpose	**B. Interval**
The percentage of ground cover present on the biobank site for the purposes of item 1.1 of Section 1 of Annexure C.	Every 12 months
Number of stock and date/s when stock have entered the management zones on the biobank site.	Every 3 months

Physical condition of fencing and gates to determine whether they are maintained to a standard that can: • control the movement of stock if required under item 1 in Section 1of Annexure C • control human disturbance if required under item 4 in Section 1 of Annexure C • control the movement of feral and overabundant native herbivores if required under item 10 of Section 2 • control vertebrate pests if required under item 11 of Section 2	Every 12 months
Records of any human disturbance on the biobank site. Note: items 4.1 and 4.2 in Section 1 of Annexure C and clause 2 of this agreement place restrictions on human activities on the biobank site.	Every 6 months
Evidence of erosion. Note: item 8 in Section 1 of Annexure C contains requirements for erosion control.	Every 6 months
Evidence of waste. Note: item 4.4 in Section 1 of Annexure C contains requirements for storing and disposing of waste on the biobank site.	Every 6 months

2 Reporting requirements – annual report

2.1 The landowner must complete and submit to the Chief Executive for approval an annual report using the annual reporting template provided in this Annexure or, if the Chief Executive has approved an amended version of the annual reporting template after the date of this agreement, such an amended version of the annual reporting template as has been approved by the Chief Executive from time to time and supplied to the landowner.

2.2 An annual report must be prepared for each reporting period. A reporting period means:

2.2.1 prior to the first payment date, the period of 12 months after the commencement date, and each subsequent period of 12 months

2.2.2 after the first payment date, the period of 12 months after that date, and each subsequent period of 12 months.

The annual report submitted after the first anniversary of the first payment date must also include the period between the last anniversary of commencement date and the first payment date.

2.3 The annual report for the report period must be supplied to the Chief Executive by registered post not later than 30 days after the end of each reporting period.

2.4 If there is a change in land ownership during a reporting period, each landowner must submit the annual report required under items 1.2, 1.3 and 1.4 of this Annexure D for the period for which they were the landowner.

2.5 The annual report must:

2.5.1 contain the results of any monitoring, inspections or surveys required in Annexure C

2.5.2 contain the results of the inspections required to be conducted by item 1.2 of this annexure D, including details of the date, time, location and nature of the inspection, the name of the person conducting the inspection and observations from the inspection

2.5.3 include the photographs taken at the photo points listed in Annexure D

2.5.4 include any other information required in the annual reporting template.

Annual reporting template

Biobank site annual report					
Location details					
Biobanking agreement ID: Reporting date:			Name of landowner/s: Property address:		
Records of management actions undertaken					
Management action	**Required completion time and frequency**	**Action completed (Yes/No)**	**Actual completion date/s**	**Description of actions undertaken** (including where undertaken (including reference to management zones), any variations and the reasons for variation)	**Visual observations and other comments** (including reasons for non-completion)
1 **Management of grazing for conservation**					
2 **Weed control**					
3 **Management of fire for conservation**					
4 **Management of human disturbance**					
5 **Retention of native vegetation**					
6 **Planting or seeding**					
7 **Retention of dead timber**					

8	**Erosion control**					
9	**Retention of rocks**					
10	**Control of feral and overabundant native herbivores**					
11	**Vertebrate pest management**					
12	**Nutrient control**					
13	**Control of exotic fish species**					
14	**Maintenance or reintroduction of natural flow regimes**					

Incident or event that has adverse effect on biodiversity values on biobank site

Incident or event including adverse impacts (e.g. natural events)	**Action taken and proposed recommended actions**

Records submitted with this report

☐ Photographs taken at the photo points set in the biobanking agreement.

☐ Results of the inspections required to be conducted in item 1.3 of Annexure D to the biobanking agreement.

☐ Results of any monitoring, inspections or surveys required in Annexures C and D to the biobanking agreement.

Signature and certification	
I hereby declare that the information supplied in this report is accurate and complies with the reporting requirements under item 2 of the Annexure D to the biobanking agreement. Note: If the land that forms the biobank site is owned by multiple persons, each landowner must sign this annual report.	
Signed	Signed
Date	Date

3 Record keeping requirements

3.1 The following written records and photographs must be created and retained by the landowner:

3.1.1 for a management action required by this agreement (other than a management action requiring the landowner to refrain from an activity), the date and location/s the management action was carried out and a description of the actions that were undertaken

3.1.2 for a management action which is permitted to be carried out only in accordance with the Chief Executive's consent or approval, a copy of that consent or approval

3.1.3 a copy of any management plan (or updated management plan) required by Annexure C of this agreement that has been approved by the Chief Executive, a copy of the Chief Executive's approval of the management plan (or updated management plan) and a copy of any review of a management plan required by Annexure C

3.1.4 the diaries for recording actions undertaken in accordance with the management plans required by this agreement including the details (management zone/s, date, alternative action) of any minor alterations made to the implementation of those management plans and the reasons for the minor alterations

3.1.5 all photographs required by item 1 of this Annexure D and the information that item requires to be recorded on the photographs

3.1.6 for an inspection required by this agreement, the date, time, location and nature of the inspection, the name of the person conducting the inspection and observations from the inspection

3.1.7 the results of monitoring, inspections or surveys required to be conducted by this agreement or any management plan that is required to be implemented under this agreement

3.1.8 a brief description of any climatic, weather, ecological/environmental or unplanned events that have a significant adverse affect on the biodiversity values of the biobank site.

3.2 The landowner must retain a copy of each annual report.

3.3 All records required to be kept by this agreement must be:

3.3.1 in a legible form, or in a form that can readily be reduced to a legible form (this includes photographs taken as part of this agreement);

3.3.2 kept for at least 10 years after the event to which they relate took place, unless specified otherwise; and

Note: item 1.1 of this Annexure D requires the photographs required to be taken under that item to be retained for the life of this agreement.

3.3.3 produced to any authorised officer on request by an authorised officer.

Annexure E: Payment schedule

Note:

If, by participating in the BioBanking Scheme, you are carrying on an 'enterprise', and your annual income for management actions meets or exceed $75,000 (or $150,000 for a non-profit organisation) you are required to register for GST.

'Enterprise' has a broad definition, and includes activities that are in the form of a business, or in the form of a concern in the nature of trade. Item 1 below assumes you are carrying on an enterprise.

If you are not carrying on an enterprise by participating in the BioBanking Scheme, GST will not apply to you – but Capital Gains Tax and income tax may still apply. In this case, do not indicate an ABN in item 1.1 below.

If you do not meet the monetary threshold, but you are carrying on an enterprise by participating in the BioBanking Scheme, you are still entitled to register for GST if you wish and you may indicate a registered ABN in item 1.1 below.

1 Agreement to issue recipient created tax invoices

1.1 The parties acknowledge that, if the landowner is registered for GST, recipient created tax invoices will be issued from the BioBanking Trust Fund (Australian Business Number 83 639 386 285) to the landowner (ABN 68 147 695 994).

1.2 The recipient created tax invoices will be for the supply by the landowner of the landowner's obligation to carry out the management actions as defined in this agreement ('the supplies'). These management actions are specified between the landowner and the Minister administering the Act, pursuant to Part 7A Division 2 of the Act.

1.3 The recipient created tax invoices will be issued on payment of the management payments as specified in item 2 of this Annexure E.

1.4 Under this recipient created tax invoice agreement, the landowner guarantees that the landowner will not issue any tax invoice for the supplies.

1.5 The landowner will notify the BioBanking Trust Fund immediately should the landowner cease to be registered for GST.

1.6 The BioBanking Trust Fund is registered for GST and the Minister will notify the landowner immediately should the fund cease to be registered.

2 Payment timing and amount

2.1 Subject to clause 12 of the agreement, the Minister is to direct the Fund Manager to make the management payments to the landowner in accordance with the payment schedules and the requirements of items 2, 3 and 4 of this Annexure E.

2.2 The first year of the payment timing, as set out in the payment schedules, commences from the first payment date.

2.3 The amount of the scheduled management payment for each year is as set out in the payment schedules.

2.4 Each amount is listed in the present value and is inclusive of GST for GST registered landowners and will be increased in accordance with the formula below:

In respect of indexation by CPI the following applies:

Each amount of the management payment is to be adjusted by movements in the CPI in accordance with the formula below (provided that, at all times, each instalment of the management payment is never less than its nominal dollar value as set out in the payment schedules and as at the date of this agreement).

$$\frac{A \times B}{C}$$

Where:

CPI means the published Consumer Price Index (Sydney - All Groups), or if that index is no longer published, then any other index which, in the reasonable opinion of the Minister, is a similar index

A is the dollar value ($) of the management payment amounts as set out in the Payment Schedules prior to indexation by CPI

B is the most recent June Quarter CPI prior to the date that payment is due to be made

C is the CPI for the June Quarter 2019

2.5 Payment schedules

Payment schedule (including GST)	
Payment timing	**Amount**
At the beginning of the first year	$27,225
At the beginning of the second year	$21,450
At the beginning of the third year	$14,850
At the beginning of the fourth year	$14,850
At the beginning of the fifth year	$18,150
At the beginning of the sixth year	$8,525
At the beginning of the seventh year	$8,250
At the beginning of the eighth year	$8,250
At the beginning of the ninth year	$8,250
At the beginning of the tenth year	$11,550
At the beginning of the eleventh year	$10,725
At the beginning of the twelfth year	$8,250
At the beginning of the thirteenth year	$8,250

At the beginning of the fourteenth year	$8,250
At the beginning of the fifteenth year	$24,750
At the beginning of the sixteenth year	$8,525
At the beginning of the seventeenth year	$8,250
At the beginning of the eighteenth year	$8,250
At the beginning of the nineteenth year	$8,250
At the beginning of the twentieth year	$11,550
At the beginning of each following year	Amount equal to the sum of the in-perpetuity management cost that apply for each following year as determined by the table of in perpetuity costs below.

In perpetuity management costs (on and from the twenty-first year) (excluding GST and subject to rate of return)		
Description of ongoing management action	**Frequency**	**Amount ($)**
Preparation for Ecological burn	The twenty seventh year and every twelve years thereafter	2,000
Implementation of Ecological burns	The twenty seventh year and every twelve years thereafter	10,000
General site weeding in all zones – maintenance for 2 people @ 3 days per annum	The twenty first year and every year thereafter	3,000
Vertebrate Pest Control (rabbits, deer, goats & foxes) – den-warren destruction and baiting (1080 and Pindone)	The twenty first year and every year thereafter	500
Manage Human Disturbance (signage, education, security etc)	The twenty first year and every five years thereafter	250
Other ongoing recurring costs		
Annual reporting fee	The twenty first year and every year thereafter	1,530
Annual operations plan (for Council)	The twenty first year and every year thereafter	1,500
Periodic review of Management Plan	The twenty fifth year and every five years thereafter	3,000
Annual Reporting	The twenty first year and every year thereafter	2,500
Council reserve signs – assumes Council take control after year 10	The twenty sixth year and every fifteen years thereafter	2,000
Total present value of payments after 20 years (incl. GST)		150,894
Total present value of payments after 20 years (excl. GST)		137,176

3 Nominated bank account

3.1 The management payments will be paid into a bank account as nominated by the landowner in accordance with the requirements of this item 3 ('**the Nominated Bank Account**').

3.2 The landowner must provide the Fund Manager with details in writing of the nominated bank account within 14 days of the commencement date.

3.3 Where there is more than one owner of the biobank site, the notice to be provided in accordance with item 3.2 above must be signed by all owners of the biobank site.

3.4 The landowner must notify the Fund Manager in writing within 14 days of any change to the nominated bank account. This notice must include new bank account information and the written consent of all owners of the biobank site.

4 Annual contribution

4.1 The landowner authorises the Minister to retain the annual contribution from each management payment made to the landowner.

4.2 The Minister will, following each management payment, issue the landowner with an invoice confirming that the annual contribution has been deducted from the relevant management payment.

4.3 As contemplated by clause 18 of the BioBanking Regulation, the Minister may waive the annual contribution where:

4.3.1 the owner of the biobank site has not sold any of the biodiversity credits created for the site, or

4.3.2 there are insufficient funds in the biobank site account relating to the biobank site to meet the next scheduled management payment when it becomes payable.

allen price & scarratts pty ltd
land and development consultants

Appendix E

Nowra Office: 75 Plunkett Street, Nowra NSW 2541 • PO Box 73, Nowra 2541
Kiama Office: 1/28 Bong Bong Street, Kiama NSW 2533 • PO Box 209, Kiama 2533
tel 02 4421 6544 • **email** consultants@allenprice.com.au

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Courier	
By Hand	
Contact:	Clément Brügger / Andrew Norris
Our Ref:	P1304007JC04V01
Pages:	6 +attachments
cc.	

09 July 2019

Jemalong Mundamia Pty Ltd
c/o Allen Price & Scarretts
Attn: Matt Somers / Matt Philpott
By email

Dear Matt,

RE: GROUNDWATER MONITORING SUMMARY: MUNDAMIA URBAN RELEASE AREA (MURA), MUNDAMIA, NSW

PROPOSED DEVELOPMENT AND INVESTIGATION SCOPE

This letter is a summary of the groundwater monitoring to date at Mundamia Urban Release Area (MURA) from 22 May, 2018. This assessment of groundwater conditions provides an assessment of the likely significance of groundwater beneath the site with respect to the adjacent vegetation proposed to be retained following the site's development. The proposed development's details and the investigation scope are summarised in Table 1.

Table 1: Summary of proposed development and investigation scope.

Item	Details
Lot / DP	Lot 30 / DP 1198692
LGA	Shoalhaven City Council (SCC)
Background	A hydrogeological assessment was conducted by Martens and Associates (MA) for the proposed residential and commercial development, details of which are provided in MA report reference P1002761JR01V02, dated 21 June 2011 (MA, 2011). The previous assessment included installation of five groundwater monitoring wells (GMB1 to GMB5) and falling head tests at each well to estimate hydraulic conductivity. Previous assessment results have been considered but not reproduced in this letter. This letter should be read in conjunction with MA, 2011.
Assessment purpose	To address items A6 to A8 (additional hydrogeological modelling and stormwater management) of Department of Planning and Environment (DPE) draft development consent No. SSD 7169, dated 18 January 2018. Condition numbers in the updated draft of 2019 are C4 and C6. The purpose of the monitoring is to assess the significance and quality of the groundwater flowing beneath the site at the soil / rock interface. This groundwater has been discussed as being potentially significant for downslope vegetation.

Suite 201, Level 2, George St, Hornsby, NSW, 2077
Ph 02 9476 9999 **Fax** 02 9476 8767

> mail@martens.com.au
www.martens.com.au
MARTENS & ASSOCIATES P/L
ABN 85 070 240 890 ACN 070 240 890

Item	Details
Investigation scope of work	The following field works were conducted on 22nd and 23rd May 2018: o Ten Boreholes (BH101 to BH104 and BH106 to BH111) up to 5.60 meters below ground level (mBGL) and associated installation of monitoring wells (MW01 to MW04 and MW06 to MW10) to top of rock / soil interface. o Assessment and maintenance (replacement of existing monument) of GMB3 / MW05 (MA, 2011). o Nine Dynamic Cone Penetration (DCP) tests (DCP101 to DCP104 and DCP106 to DCP110) up to 2.51 mBGL. o One borehole (BH111) up to 2.2 mBGL and associated installation of monitoring well (MW11) adjacent to MW10 (17 July 2018). o Manual dip measurements and data collection of loggers. o Setup and installation of telemetry units for remote access to data. Investigation locations are shown in Figure 1, Attachment A. Refer to borehole logs in Attachment B, DCP 'N' counts in Attachment C and associated explanatory notes in Attachment F.
Groundwater Quality Methodology	Groundwater quality sampling was conducted from monitoring wells, when groundwater was present, using a bailer. Prior to sampling the well was bailing sufficiently to induce formation water into the well, where inadequate water was available for sampling after 1 hour sampling for that well was not completed. Sample(s) were collected into bottles and delivered to Envirolab Pty Ltd (an independent NATA accredited testing laboratory) for analysis.
Monitoring Period	Groundwater monitoring commenced 25 May 2018 and is ongoing. Groundwater levels were monitored, after initial purging (where required), by data loggers with recordings at 15 minute intervals and converted to mAHD based on site survey plan (APS, 2018) and water level measurements made by a dip meter.

Water Level Monitoring Results

Monitoring well information is summarised in Table 2. Well MW10 was installed approximately 3.3 m into the underlying weathered sandstone. As the purpose of the installed monitoring wells is to assess the groundwater at the soil / rock interface this well was 'replaced' with MW11 which was constructed at the soil / rock interface.

As MW10 does not monitor the water at the soil / rock interface levels in this well are not relevant to the current investigations and are not likely to be representative of the water levels in the underlying rock. Water in this well most likely flows in to the hole from the soil / rock interface when groundwater is present and then 'sits' in the hole for extended periods slowly leaking to surrounding rock. Data from this well is therefore not further considered.

Table 2: Monitoring well information.

Monitoring Well ID	Surveyed Ground Level (mAHD)	Depth of Well (mBGL)	Top of Rock / Bottom of Well (mAHD)
MW01	50.00	2.40	47.60
MW02	39.00	0.50	38.50
MW03	52.00	0.55	51.45
MW04	56.40	0.60	55.80
MW05 (formerly GMB3/BH5)[2]	55.24	0.75	54.49
MW06	51.20	0.30	50.90

Monitoring Well ID	Surveyed Ground Level (mAHD)	Depth of Well (mBGL)	Top of Rock / Bottom of Well (mAHD)
MW07	65.50	0.55	65.00
MW08	54.90	0.75	54.15
MW09	62.50	1.70	60.80
MW10	69.20	5.50	67.00 / 63.70[1]
MW11	69.20	2.20	67.00

Notes:

1 Well installed within extremely weathered sandstone. MW11 installed 1 m north of MW10 to top of rock.

2 MA 2011.

Water Level Monitoring Results

Groundwater level measurements obtained by dip meter and data logger are summarised in Table 3 for wells MW01 - MW09 and MW11. Groundwater level plots are provided in Figure 2 to Figure 12, Attachment D.

Monitoring data to date shows that, for the majority of the monitoring period, and at the majority of locations, there is negligible groundwater at the soil rock interface. Plotted groundwater data shows that, following a period of rainfall and subsequent groundwater the monitored levels in the wells often returns to a level of 50 – 100 mm above the base of the installed well. This level often persists until next the well is purged, after which time the levels return to 'zero'. We have considered this and have concluded that the recorded shallow, but persistent, depth of water in the monitoring wells is most likely a result of water sitting in the bottom of the constructed well pipe and / or is a shallow socket into the weathered rock. This very shallow layer of water has been inadequate to sample at each attempt as insufficient water is available within the well to allow purging and collecting of sufficient sample for laboratory analysis.

Considering these periods of shallow water as being insignificant we have tabulated the periods where groundwater was observed in each well (Table 4).

Table 3: Groundwater level monitoring results summary.

Location	Groundwater Level Dip Measurements mAHD (mBGL)								Groundwater Level Statistics from Data Logger between 23/05/2018 and 21/06/2018 mAHD (mBGL)		
	23/05/18	26/06/18	17/07/18	07/08/18	03/12/18	12/02/19	26/03/19	03/06/19	Minimum	Maximum	Range (m)
MW01	NGD[2]	NGD[2]	NGD[2]	NGD[2]	NGD [2]	NGD[2]	NGD[2]	NGD[2]	NGD[2]	NGD[2]	NGD[2]
MW02	NGD[2]	NGD[2]	NGD[2]	NGD[2]	38.73 (0.28)	38.73 (0.28)	ND[5]	NGD[2]	NGD[2]	38.73	0.23
MW03	NGD[2]	NGD[2]	NGD[2]	NGD[2]	NGD [2]	50.96 (0.49)	ND[5]	NGD[2]	NGD[2]	51.98	0.53
MW04	NGD[2]	NGD[2]	NGD[2]	NGD[2]	55.90 (0.51)	55.88 (0.52)	55.83 (0.57)	NGD[2]	NGD[2]	56.09	0.29
MW05	NGD[2]	NGD[2]	NGD[2]	NGD[2]	NGD [2]	NGD[2]	NGD[2]	NGD[2]	NGD[2]	54.83	0.34
MW06	NGD[2]	NGD[2]	NGD[2]	NGD[2]	NGD[2]	NGD[2]	NGD[2]	NGD[2]	NGD[2]	51.13	0.23
MW07	NGD[2]	NGD[2]	NGD[2]	NGD[2]	65.10 (0.4)	NGD	65.12 (0.39)	NGD[2]	NGD[2]	65.39	0.39
MW08	NGD[2]	NGD[2]	NGD[2]	NGD[2]	54.57 (0.33)	54.36 (0.54)	ND[5]	NGD[2]	NGD[2]	54.8	0.65
MW09	NGD[2]	NGD[2]	NGD[2]	NGD[2]	NGD [2]	NGD[2]	NGD[2]	NGD[2]	NGD[2]	NGD[2]	NGD[2]
MW11 [1]	NA [3]	NA [3]	NA [3]	NGD[2]	NGD [2]	NGD[2]	NGD[2]	NGD[2]	NGD[2]	NGD[2]	NGD[2]

Notes:

1 MW10 installed approximately 3.3 m into weathered rock. MW11 was installed adjacent to MW10 to better assess water at soil / rock interface as monitored in other wells

2 NGD = no groundwater detected 3 NA = Inspection date prior to well construction.

4 Includes telemetry testing period. 5 Wells not dipped.

Table 4: Periods of groundwater presence in wells over 394 days (24/5/2018 to 22/6/2019).

Location	Period of observed groundwater	Note / comment
MW01	No observed groundwater	
MW02	28/11/2018 – 22/12/2018 (25 days) Total = 25 days or 6% of period	
MW03	28/11/2018 – 4/12/2018(7 days) 13/12/2018 – 18/12/2018 (7 days) Total = 14 days or 3.5% of period	
MW04	28/11/2018 – 29/12/2018(1 day) 14/12/2018 – 16/12/2018 (2 days) Total = 3 days or 1% of period	After rainfall on 28/11 persistent <100 mm and an average of 60 mm of water observed in well.
MW05	28/11/2018 – 6/12/2018(9 days) 15/12/2018 – 26/12/2018 (12 days) Total = 21 days or 5% of period	
MW06	28/11/2018 – 4/12/2018 (7 days) 9/2/2019 – 12/2/2019 (3 days) Total = 10 days or 2.5% of period	Data gap from 4/12 – 22/11 due to logger failure. After rainfall on 23/3/2019 approximately 70 mm of water persisted for the remainder of the monitoring period.
MW07	28/11/2018 – 29/11/2018 (2 days) Total = 2 days or 0.5% of period	Water level greater than 100 mm in well for 2 days only.
MW08	06/06/2018 – 14/06/2018 (9 days) 28/06/2018 – 29/06/2018 (2 days) 28/11/2018 – 28/12/2018(31 days) 8/01/2019 – 16/01/2019 (9 days) 8/02/2019 – 13/02/2019 (6 days) 17/03/2019 – 6/04/2019 (21 days) 4/06/2019 – 22/06/19 (18 days) Total = 96 days or 24% of period	
MW09	No observed groundwater	
MW11 [1]	No observed groundwater	

Data Gaps

During the monitoring period, all wells included a telemetry (remote access) testing period (17/7/2018-24/07/2018) were data was not recorded and as such, is not included in the analysis. During the monitoring period, a number of theft and vandalism events occurred at several monitoring wells which resulted in loss of data. Repeated issues with telemetry units have also occurred which generally resulted in the delay in recovery of data from some wells and occasional loss of data. A summary of data gaps created by various events is provided in Table 4.

Table 5 Data gaps in monitoring wells during monitoring period

Monitoring Well ID	Data Gaps	Comment
MW06	17/7/18 – 26/7/18	Telemetry fault (data loss)
	4/12/18 - 22/1/2019	Telemetry fault (data loss)
	8/05/2019 – 3/06/2019	Faulty data logger (data loss)
MW07	10/12/2018-26/03/2019	Theft / vandalism of unit
MW11	10/12/18-26/03/2019[2]	Theft / vandalism of unit

Water Quality Monitoring Results

Groundwater quality monitoring results are summarised in Table 6.

Table 6: Summary of water quality results to date.

Location [1]	Sampling Date	pH	EC (µS/cm)	NOx as N (mg/L)	Ammonia as N (mg/L)	Phosphate as P (mg/L)	TP (mg/L)	TN (mg/L)
MW10	25.06.2018	5.9	170	0.3	0.020	0.025	0.4	6.5
MW08	03.12.2018	6.8	500	4.3	0.11	0.056	0.2	6.3
MW10	03.12.2018	5.3	230	0.1	0.032	<0.005	0.08	0.8

Notes:

1 Locations not listed were dry at the time of sampling.

Site inspections for the purposes of data recovery and groundwater sampling was undertaken on June 25 2018, July 17 2018, August 8 2018, December 3 2018, February 12 2019, March 26 2019 and June 3 2019. During these inspections groundwater was purged from any wells which were not dry and then a minimum of 1 hour was allowed for recovery to allow for water sampling. Other than MW10 (which is over drilled in to rock and unlikely to contain water representative of local groundwater quality) a single water sample (MW08 and December 12, 2018) was the only water quality sample able to be recovered and analysed in the monitoring period to date.

When groundwater was recorded in the wells the depth of water, and rate of recharge was insufficient to allow for sampling of water from the wells.

Conclusions

Site groundwater monitoring is ongoing and this report shall be updated as additional data is developed. Review of the completed groundwater investigations concludes that groundwater beneath the site is transient and, in the main, absent. Where groundwater is present it is either in a very thin veneer over the rock surface, or is very short lived. The most persistent groundwater observed on the site is at MW08, however, this is upslope of MW03

which lies adjacent to the vegetation under consideration. MW03 had groundwater for only 14 days during the monitoring period, meaning the more persistent/frequent groundwater at MW08 is not influencing vegetation.

Given the limited depth of observed groundwater and the small percentage of the time that groundwater is present beneath the site it is considered most unlikely that the groundwater is critical for water supply for maintenance of the health of the down slope vegetation.

Further to this preliminary assessment of groundwater conditions beneath the site we suggest that a companion document should be prepared by the vegetation consultant to characterise the vegetation condition at the start of the period, at the inspection completed mid period and at the end of the monitoring period. Provided that the conclusion from the consultant is that the vegetation's conditions was not different during the monitoring period, with no significant groundwater flows, it would be reasonable to conclude that groundwater at the soil / rock interface is not a dominant control on the continued health of the vegetation under consideration.

If you require any further information, please contact our office.

For and on behalf of

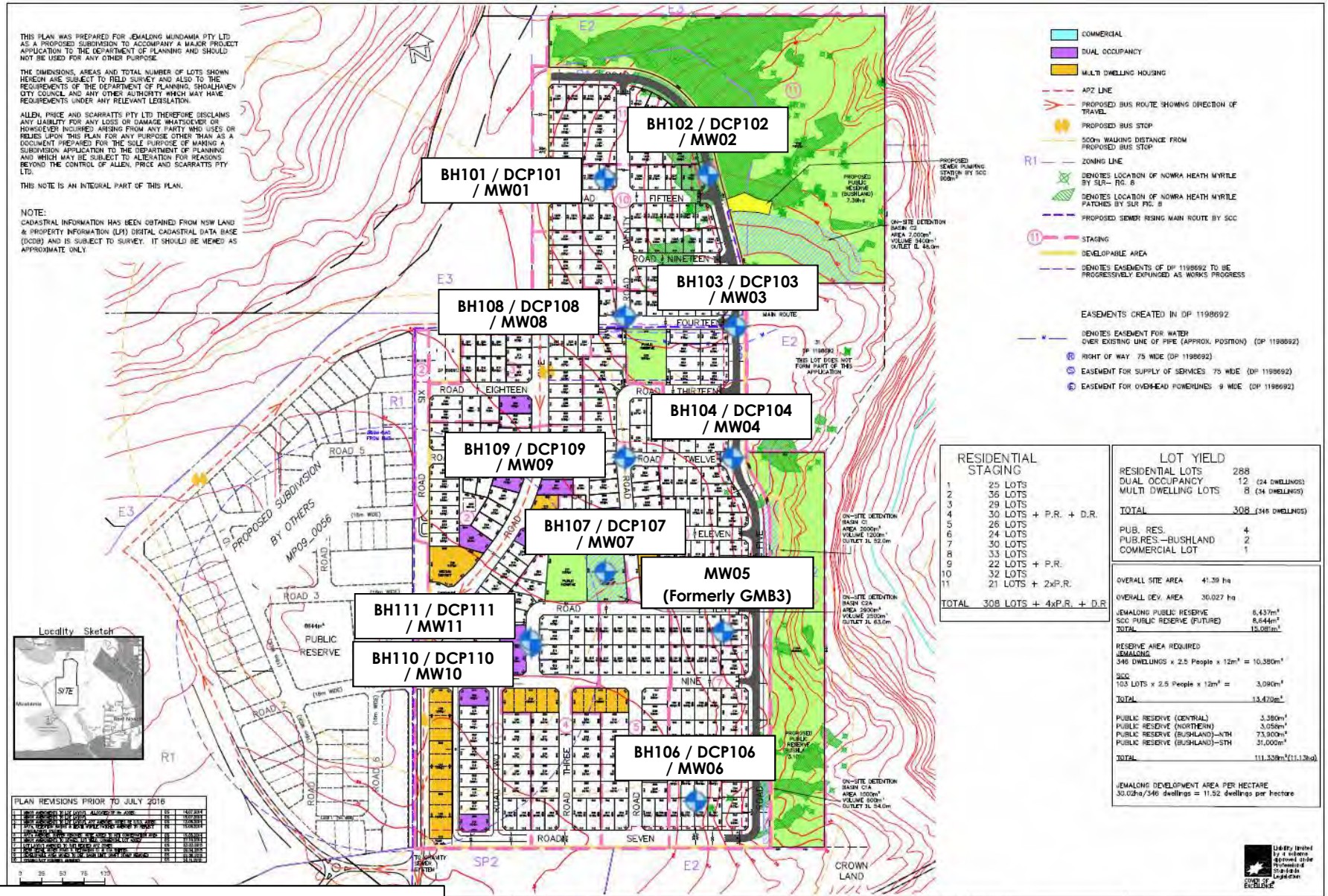
MARTENS & ASSOCIATES PTY LTD

ANDREW NORRIS
Director

ATTACHED:

A. Site plan
B. Borehole logs
C. DCP 'N' counts
D. Groundwater level plots
E. Envirolab Certificates of Analysis – 182957, 207500

Attachment A – Site Plan



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THE DIMENSIONS, AREAS AND TOTAL NUMBER OF LOTS SHOWN HEREON ARE SUBJECT TO FIELD SURVEY AND ALSO TO THE REQUIREMENTS OF THE DEPARTMENT OF PLANNING, SHOALHAVEN CITY COUNCIL AND ANY OTHER AUTHORITY WHICH MAY HAVE REQUIREMENTS UNDER ANY RELEVANT LEGISLATION.

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THIS NOTE IS AN INTEGRAL PART OF THIS PLAN.

NOTE:
CADASTRAL INFORMATION HAS BEEN OBTAINED FROM NSW LAND & PROPERTY INFORMATION (LPI) DIGITAL CADASTRAL DATA BASE (DCDB) AND IS SUBJECT TO SURVEY. IT SHOULD BE VIEWED AS APPROXIMATE ONLY.

Key:

Approximate borehole, DCP and monitoring well location.

martens

Martens & Associates Pty Ltd ABN 85 070 240 890	**Environment | Water | Wastewater | Geotechnical | Civil | Management**
Drawn: AM/MV	**PROPOSED PLAN AND MONITORING WELL LOCATIONS**
Approved: AN	**Mundamia, NSW**
Date: 03.05.2019	Source: APS, 2014
Scale: NA	Drawing: **FIGURE 1**
	Project: P1304007JC03V01

Attachment B – Monitoring Well Logs

CLIENT	Jemalong Mundamia Pty Ltd		COMMENCED	22/05/2018	COMPLETED	23/05/2018	**REF MW01**
PROJECT	Groundwater Monitoring Works		LOGGED	DI/AM	CHECKED		Sheet 1 OF 1
SITE	Jonsson Rd, Mundamia, NSW		GEOLOGY	Nowra Sandstone	VEGETATION	Grass	PROJECT NO. P1304007
EQUIPMENT		2WD ute-mounted hydraulic drill rig	EASTING		RL SURFACE	50 m	DATUM Existing Ground Level
EXCAVATION DIMENSIONS		Ø100 mm x 2.40 m depth	NORTHING		ASPECT	East	SLOPE 2-5%

Drilling					Sampling		Field Material Description						
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	PIEZOMETER DETAILS ID / Static Water Level	
AD/V	M	Not Encountered	1	50.00	4007/BH101/0.4/S/1 D 0.50 m			SM	TOPSOIL: Silty SAND, fine grained, brown, trace roots.	D	F - St	MW01	Concrete
				0.80 49.20	4007/BH101/0.8/S/1 D 0.80 m			CL	Sandy CLAY, low plasticity, pale brown, orange.				Sand
				1.10 48.90				CL	Silty CLAY, low plasticity, red, grey, trace fine grained sand, subangular quartz gravels.	M<<PL	VSt		Bentonite
	H		2	*2.20* 47.80 *2.40*					Red, grey, yellow-brown, trace subangular sandstone gravels.		H		Screen
									Hole Terminated at 2.40 m				Sand
			3										
			4										
			5										

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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MARTENS & ASSOCIATES PTY LTD
Suite 201, 20 George St. Hornsby, NSW 2077 Australia
Phone: (02) 9476 9999 Fax: (02) 9476 8767
mail@martens.com.au WEB: http://www.martens.com.au

Engineering Log - TEST

CLIENT	Jemalong Mundamia Pty Ltd		COMMENCED	22/05/2018	COMPLETED	23/05/2018	**REF MW02**
PROJECT	Groundwater Monitoring Works		LOGGED	DI/AM	CHECKED		Sheet 1 OF 1
SITE	Jonsson Rd, Mundamia, NSW		GEOLOGY	Nowra Sandstone	VEGETATION	Grass	PROJECT NO. P1304007
EQUIPMENT		2WD ute-mounted hydraulic drill rig	EASTING		RL SURFACE	39 m	DATUM Existing Ground Level
EXCAVATION DIMENSIONS		0.50 m depth	NORTHING		ASPECT	East	SLOPE 3%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	PIEZOMETER DETAILS ID Static Water Level
S	L-M	Not Encountered		39.00 *0.20* 38.80 *0.50*				SM	TOPSOIL: Silty SAND, fine to medium grained, brown, dark grey, with roots. With subangular to subrounded sandstone and quartz gravels.	D	St	MW02 Concrete Bentonite Screen Sand
									Hole Terminated at 0.50 m			

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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MARTENS & ASSOCIATES PTY LTD
Suite 201, 20 George St. Hornsby, NSW 2077 Australia
Phone: (02) 9476 9999 Fax: (02) 9476 8767
mail@martens.com.au WEB: http://www.martens.com.au

Engineering Log - TEST

CLIENT	Jemalong Mundamia Pty Ltd		COMMENCED	22/05/2018	COMPLETED	23/05/2018	**REF MW03**
PROJECT	Groundwater Monitoring Works		LOGGED	DI/AM	CHECKED		Sheet 1 OF 1
SITE	Jonsson Rd, Mundamia, NSW		GEOLOGY	Nowra Sandstone	VEGETATION	Grass	PROJECT NO. P1304007
EQUIPMENT		2WD ute-mounted hydraulic drill rig	EASTING		RL SURFACE	52 m	DATUM Existing Ground Level
EXCAVATION DIMENSIONS		0.55 m depth	NORTHING		ASPECT	North	SLOPE <2%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	PIEZOMETER DETAILS ID Static Water Level
S	L-M	Not Encountered		52.00 ***0.15*** 51.85 ***0.55***				SM SM	TOPSOIL: Silty SAND, fine to medium grained, brown, with roots. Silty SAND, fine to medium grained, pale brown, trace quartz gravels.	D	S F - St	MW03 Concrete Bentonite Screen Sand
			1 2 3 4 5						Hole Terminated at 0.55 m			

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

MARTENS & ASSOCIATES PTY LTD
Suite 201, 20 George St. Hornsby, NSW 2077 Australia
Phone: (02) 9476 9999 Fax: (02) 9476 8767
mail@martens.com.au WEB: http://www.martens.com.au

Engineering Log - TEST

CLIENT	Jemalong Mundamia Pty Ltd		COMMENCED	22/05/2018	COMPLETED	23/05/2018	**REF MW04**
PROJECT	Groundwater Monitoring Works		LOGGED	DI/AM	CHECKED		Sheet 1 OF 1
SITE	Jonsson Rd, Mundamia, NSW		GEOLOGY	Nowra Sandstone	VEGETATION	Grass	PROJECT NO. P1304007
EQUIPMENT		2WD ute-mounted hydraulic drill rig	EASTING		RL SURFACE	56.4 m	DATUM Existing Ground Level
EXCAVATION DIMENSIONS		0.60 m depth	NORTHING		ASPECT	East	SLOPE 5%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	PIEZOMETER DETAILS ID Static Water Level
				56.40				SM	TOPSOIL: Silty SAND, fine to medium grained, brown, with roots.		St	MW04
				0.20								Concrete
S	M	Not Encountered		56.20				SM	Silty SAND, fine to medium grained, orange-brown, with subangular to subrounded sandstone gravels.	D	VSt	Bentonite
				0.60								Screen Sand
									Hole Terminated at 0.60 m			

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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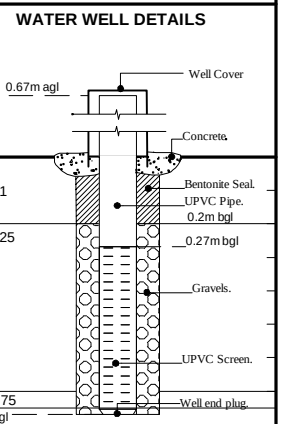
MARTENS & ASSOCIATES PTY LTD
Suite 201, 20 George St. Hornsby, NSW 2077 Australia
Phone: (02) 9476 9999 Fax: (02) 9476 8767
mail@martens.com.au WEB: http://www.martens.com.au

Engineering Log - TEST

CLIENT	**Malbec**	**COMMENCED**	18.10.10	**COMPLETED**	18.10.10	**REF**	**BH5**
PROJECT	**Hydrogeological Investigation**	**LOGGED**	BR	**CHECKED**	AN	**Sheet**	**1 of 1**
SITE	**Mundamia (Lot 3, DP568613)**	**GEOLOGY**	Sandstone	**VEGETATION**	Grass	**PROJECT NO.**	P1002761
EQUIPMENT	Auger	**EASTING**	-	**RL SURFACE**	55.24m AHD		
EXCAVATION DIMENSIONS	Ø90mm X 0.6m depth	**NORTHING**	-	**ASPECT**	North	**SLOPE**	5%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING		
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	WATER WELL DETAILS
A	Nil	N	D	0.2			SM	ORGANIC SILTY SAND - Dark brown.			A	0.1	2761/5/0.1
A	Nil	N	M	0.7			SM	ORGANIC SILTY SAND - Light brown, gravels (10-30mm, 10%), slightly moist, moisture increasing with depth.			A	0.25	2761/5/0.25
A	Nil	N	M	0.75			EW	EXTREMELY WEATHERED SANDSTONE - Quartz gravels (2-4mm, 5%), slightly moist.			A	0.75	2761/5/0.75
				1.0				Borehole terminated at 0.75m on extremely weathered sandstone.					
				2.0									
				3.0									
				4.0									
				4.5									



EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

Quality Sheet No. 4

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Engineering Log - Borehole

CLIENT	Jemalong Mundamia Pty Ltd		COMMENCED	22/05/2018	COMPLETED	23/05/2018	**REF MW06**
PROJECT	Groundwater Monitoring Works		LOGGED	DI/AM	CHECKED		Sheet 1 OF 1
SITE	Jonsson Rd, Mundamia, NSW		GEOLOGY	Nowra Sandstone	VEGETATION	Grass	PROJECT NO. P1304007
EQUIPMENT		2WD ute-mounted hydraulic drill rig	EASTING		RL SURFACE	51.2 m	DATUM Existing Ground Level
EXCAVATION DIMENSIONS		0.30 m depth	NORTHING		ASPECT	North	SLOPE 5-10%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	PIEZOMETER DETAILS ID Static Water Level
S	L-M	Not Encountered		51.20 *0.30*				SM	TOPSOIL: Silty SAND, fine to medium grained, brown, dark grey, with roots.	D	F - St	MW06 MW06 Concrete Sand
									Hole Terminated at 0.30 m			

1
2
3
4
5

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - TEST

CLIENT	Jemalong Mundamia Pty Ltd		COMMENCED	22/05/2018	COMPLETED	23/05/2018	**REF MW07**
PROJECT	Groundwater Monitoring Works		LOGGED	DI/AM	CHECKED		Sheet 1 OF 1
SITE	Jonsson Rd, Mundamia, NSW		GEOLOGY	Nowra Sandstone	VEGETATION	Grass	PROJECT NO. P1304007
EQUIPMENT		2WD ute-mounted hydraulic drill rig	EASTING		RL SURFACE	65.5 m	DATUM Existing Ground Level
EXCAVATION DIMENSIONS		0.55 m depth	NORTHING		ASPECT	Northeast	SLOPE <2%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	PIEZOMETER DETAILS ID Static Water Level
AD/V	M	Not Encountered		65.50				SM-SC	TOPSOIL: Silty Clayey SAND, fine to medium grained, brown, trace subangular to subrounded sandstone gravels.	D	St	MW07
				0.50				SM	Silty SAND, fine to coarse grained, red-brown, with fine subangular quartz and sandstone gravels, trace clay.		VSt	
									Hole Terminated at 0.55 m			

Concrete
Screen
Bentonite
Sand

1
2
3
4
5

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Engineering Log - TEST

CLIENT	Jemalong Mundamia Pty Ltd		COMMENCED	22/05/2018	COMPLETED	23/05/2018	**REF MW08**
PROJECT	Groundwater Monitoring Works		LOGGED	DI/AM	CHECKED		Sheet 1 OF 1
SITE	Jonsson Rd, Mundamia, NSW		GEOLOGY	Nowra Sandstone	VEGETATION	Grass	PROJECT NO. P1304007
EQUIPMENT		2WD ute-mounted hydraulic drill rig	EASTING		RL SURFACE	54.9 m	DATUM Existing Ground Level
EXCAVATION DIMENSIONS		Ø100 mm x 0.80 m depth	NORTHING		ASPECT	North	SLOPE 2-5%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	PIEZOMETER DETAILS ID Static Water Level
AD/V	L	Not Encountered		54.90				SM	TOPSOIL: Silty SAND, fine to medium grained, brown, with roots.			MW08
				0.20								
				54.70				SM	Silty SAND, fine to medium grained, dark grey, grey, trace clay and subangular quartz gravel.	M	F - St	
				0.80								
									Hole Terminated at 0.80 m			

Concrete
Bentonite
Screen
Sand

1
2
3
4
5

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - TEST

CLIENT	Jemalong Mundamia Pty Ltd		COMMENCED	22/05/2018	COMPLETED	23/05/2018	**REF MW09**
PROJECT	Groundwater Monitoring Works		LOGGED	DI/AM	CHECKED		Sheet 1 OF 1
SITE	Jonsson Rd, Mundamia, NSW		GEOLOGY	Nowra Sandstone	VEGETATION	Grass	PROJECT NO. P1304007
EQUIPMENT		2WD ute-mounted hydraulic drill rig	EASTING		RL SURFACE	62.5 m	DATUM Existing Ground Level
EXCAVATION DIMENSIONS		Ø100 mm x 1.70 m depth	NORTHING		ASPECT	East	SLOPE <2%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	PIEZOMETER DETAILS ID Static Water Level
AD/V	M	Not Encountered	1	62.50 0.10 0.20 62.30 0.80 61.70 1.70				SM SM SC	TOPSOIL: Silty SAND, fine to medium grained, brown, trace clay. Yellow-brown. Silty SAND, fine to coarse grained, red-brown, with subangular fine to medium grained sandstone and ironstone gravels, trace clay. Clayey SAND, fine to coarse grained, trace subangular fine grained quartz gravels.	D	H VSt H	MW09 Concrete Sand Bentonite Screen Sand
	H		2						Hole Terminated at 1.70 m			
			3									
			4									
			5									

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - TEST

CLIENT	Jemalong Mundamia Pty Ltd		COMMENCED	22/05/2018	COMPLETED	23/05/2018	**REF MW10**
PROJECT	Groundwater Monitoring Works		LOGGED	DI/AM	CHECKED		Sheet 1 OF 1
SITE	Jonsson Rd, Mundamia, NSW		GEOLOGY	Nowra Sandstone	VEGETATION	Grass	PROJECT NO. P1304007
EQUIPMENT		2WD ute-mounted hydraulic drill rig	EASTING		RL SURFACE	69.2 m	DATUM Existing Ground Level
EXCAVATION DIMENSIONS		Ø100 mm x 5.60 m depth	NORTHING		ASPECT	North	SLOPE 2%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	PIEZOMETER DETAILS ID MW10 Static Water Level
AD/V				0.10 69.10				ML CL	TOPSOIL: Sandy SILT, low plasticity, brown and dark brown, trace clay and roots. Silty CLAY, low plasticity, pale brown, yellow-brown, with fine grained sand.		St	MW10 Concrete
				0.70 68.50					Red-brown, pale brown, yellow-brown.			
	M		1	1.00 68.20					From 1.0m to 1.35m red and grey, trace subangular to subrounded ironstone gravels.			Sand
				1.35 67.85					Grey and pale grey.	M<<PL	VSt	Casing
			2								H	
	H			2.30 66.90				CL	Sandy Silty CLAY, low plasticity, pale red-brown, trace fine subangular to subrounded quartz gravels (extremely weathered sandstone).			Bentonite
				2.60 66.60					Pale red-brown.			
	M	23/05/18	3							M (<PL)		
				3.50								
				3.60 65.60				SC CL	Clayey SAND, fine to coarse grained, pale yellow and pale grey. Sandy Silty CLAY, low plasticity, pale red-brown, trace fine subangular to subrounded quartz gravels (extremely weathered sandstone).	M7 W		Sand
	M-H		4									Screen
				4.50 64.70					Grey, pale grey.	M (<PL)		
			5									
	H			5.60					Hole Terminated at 5.60 m			

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - TEST

CLIENT	Jemalong Mundamia Pty Ltd		COMMENCED	17/07/2018	COMPLETED	17/07/2018	**REF MW11**
PROJECT	Groundwater Monitoring Works		LOGGED	AM	CHECKED		Sheet 1 OF 1
SITE	Jonsson Rd, Mundamia, NSW		GEOLOGY	Nowra Sandstone	VEGETATION	Grass	PROJECT NO. P1304007
EQUIPMENT		2WD ute-mounted hydraulic drill rig	EASTING		RL SURFACE	69.2 m	DATUM Existing Ground Level
EXCAVATION DIMENSIONS		Ø100 mm x 2.20 m depth	NORTHING		ASPECT	North	SLOPE 2%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	PIEZOMETER DETAILS ID MW11 Static Water Level
AD/V	M	Not Encountered	0	*0.10* 69.10				ML	TOPSOIL: Sandy SILT, low plasticity, brown and dark brown, trace clay and roots.		St	MW11
								CL	Silty CLAY, low plasticity, pale brown, yellow-brown, with fine grained sand.		S - F	Concrete
				0.70 68.50					Red-brown, pale brown, yellow-brown.			Sand
			1	*1.00* 68.20					From 1.0m to 1.35m red and grey, trace subangular to subrounded ironstone gravels.	M (<<PL)	VSt	Bentonite
				1.35 67.85					Grey and pale grey.			Screen.
			2	*2.20*							H	Sand
			3						Hole Terminated at 2.20 m			
			4									
			5									

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Engineering Log - TEST

Attachment C – DCP 'N' Counts

Dynamic Cone Penetrometer Test Log Summary

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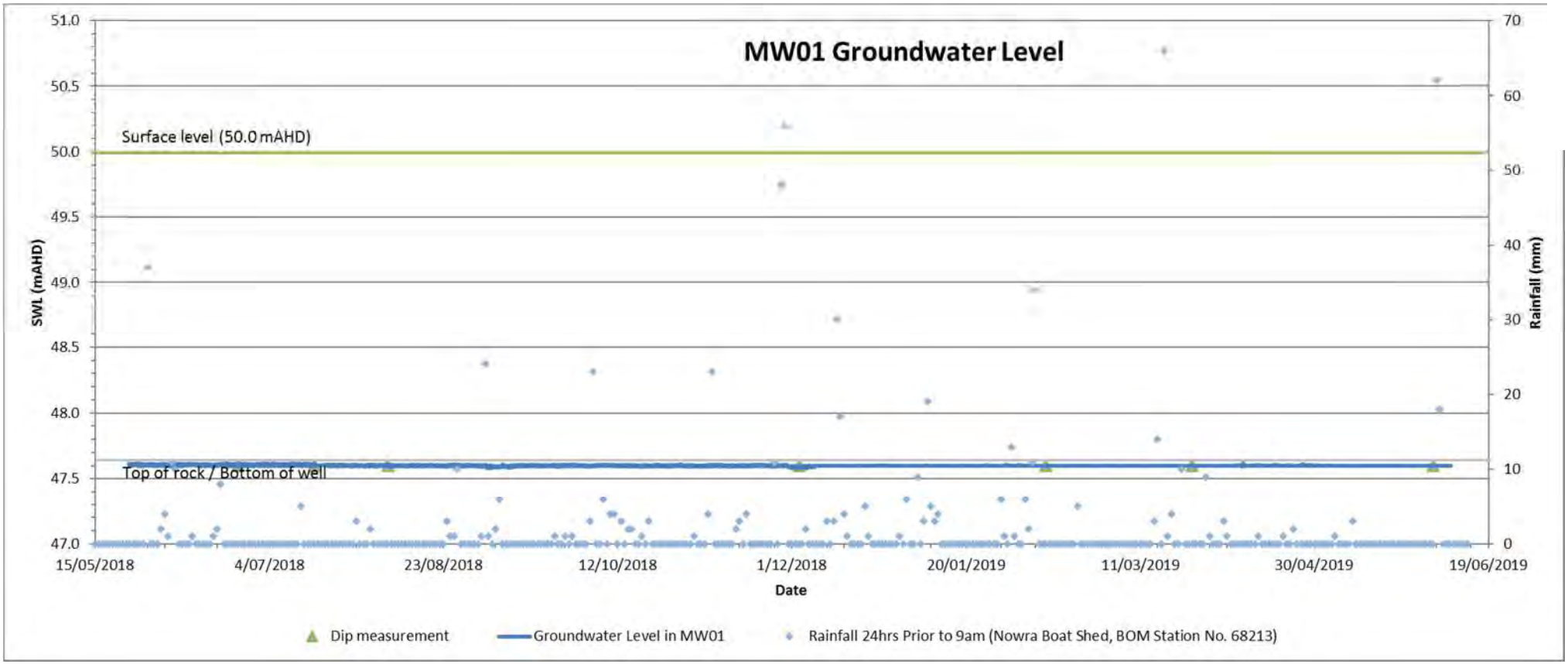
Site	Jonsson Road, Mundamia, NSW	DCP Group Reference	P1304007JS03V01
Client	Jemalong Mundamia Pty Ltd	Log Date	22.05.2018 to 23.05.2018 and 17.07.2018
Logged by	AM/DI		
Checked by	HN		
Comments	DCP commenced at 50 mm BGL.		

TEST DATA

Depth Interval (m)	DCP101	DCP102	DCP103	DCP104	DCP105	DCP107	DCP108	DCP109	DCP110	DCP111
0.15	3	1	1	4	4	4	4	21	6	5
0.30	6	6	5	9	5	4	3	12	4	3
0.45	4	4/50 mm	7	9	6	6	5	12	3	1
0.60	8		6/50 mm	10	10	17	7	12	8	8
0.75	9	Bounce at 0.4 mBGL.			11/60 mm	18/100 mm	8/100 mm	38	8	7
0.90	9		Bounce at 0.5 mBGL.	Bounce at 0.65 mBGL.					9	7
1.05	9				Bounce at 0.71 mBGL.	Bounce at 0.75 mBGL.	Bounce at 0.7 mBGL.	High 'N' Counts, terminate at 0.80 mBGl.	12	11
1.20	11								9	11
1.35	14								7	12
1.50	14								12	10
1.65	15								17	21
1.80	17								9	18
1.95	11								17	26
2.10	22								15	Bounce at 2.15 mBGL.
2.25	Bounce at 2.15 mBGL.								35	
2.40									27/60	
2.55									Bounce at 2.51 mBGL.	
2.70										
2.85										
3.00										
3.15										
3.30										
3.45										
3.60										
3.75										
3.90										
4.05										

Attachment D – Groundwater Level Plots



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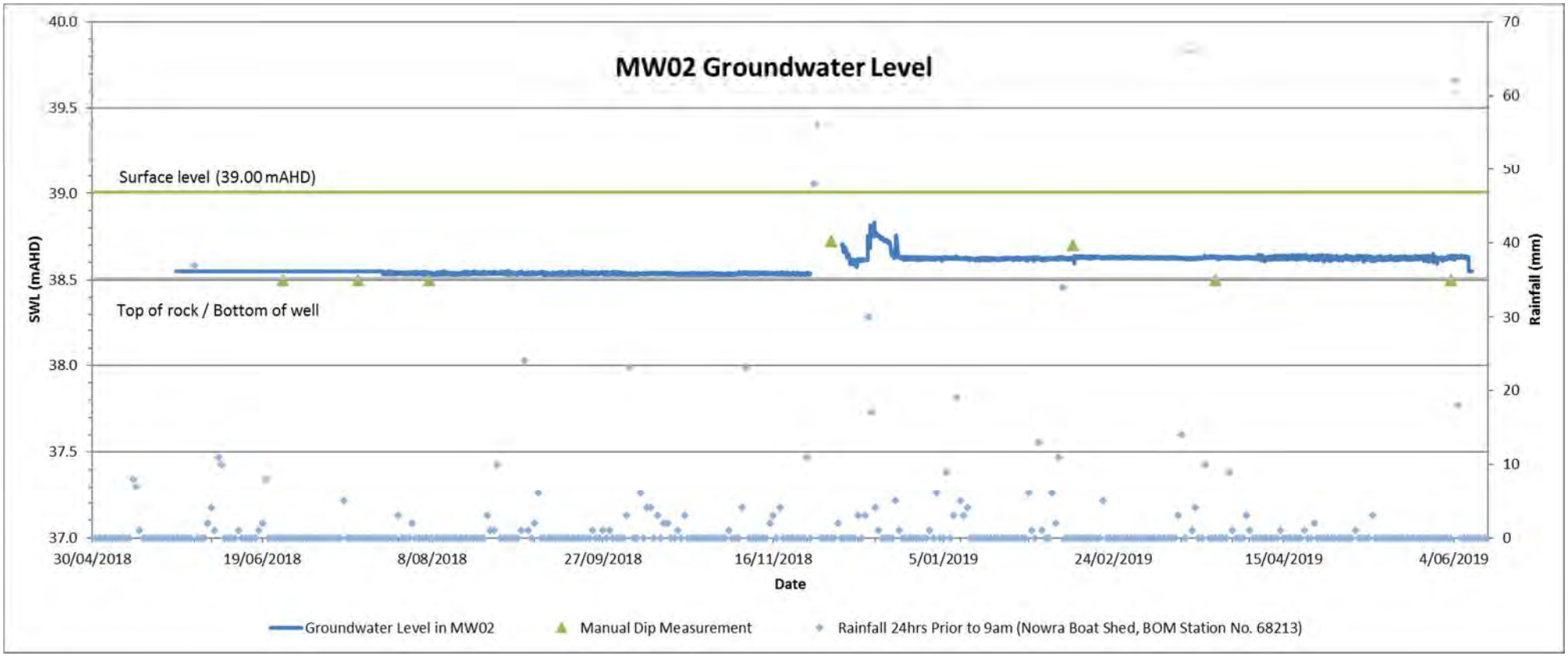
Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	CB	**MW01 GROUNDWATER MONITORING PLOT** **Mundamia, NSW**	Drawing: **FIGURE 1**
Approved:	AN		
Date:	22.06.2019		
Scale:	NA		Project: P1304007JC03V02



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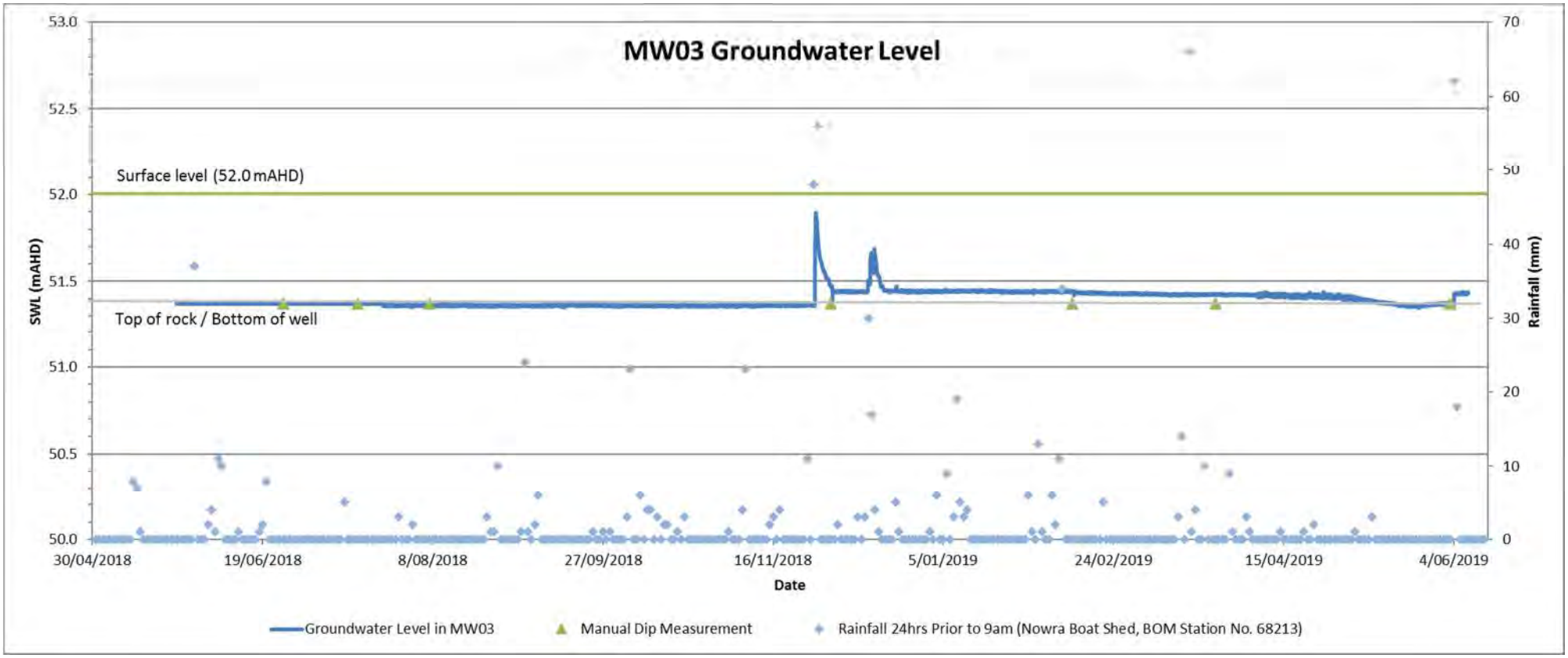
Drawn:	CB	**MW01 GROUNDWATER MONITORING PLOT** **Mundamia, NSW**	Drawing: **FIGURE 2**
Approved:	AN		
Date:	22.06.2019		
	NA		

Scale:

Project: P1304007JC03V02



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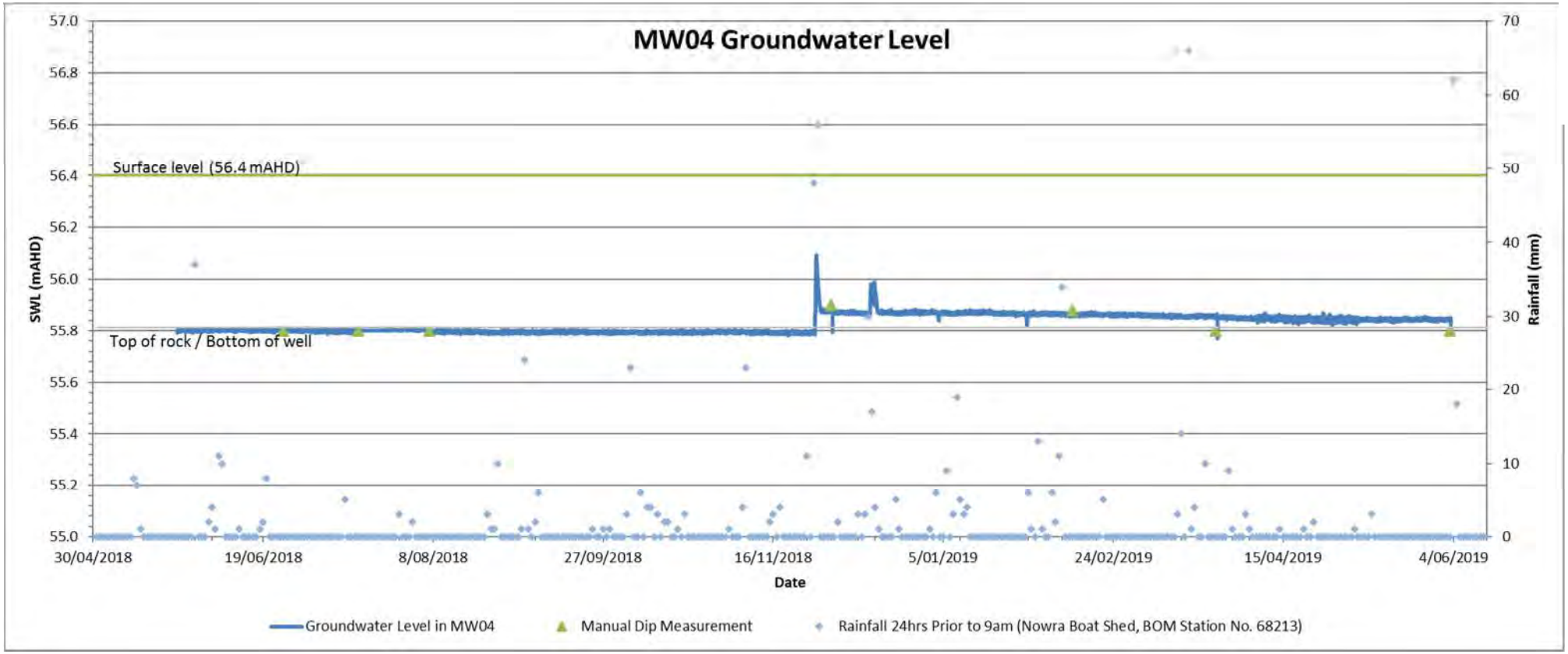
Drawn:	CB	**MW01 GROUNDWATER MONITORING PLOT** **Mundamia, NSW**	Drawing: **FIGURE 3**
Approved:	AN		
Date:	22.06.2019		
	NA		

Scale: Project: P1304007JC03V02



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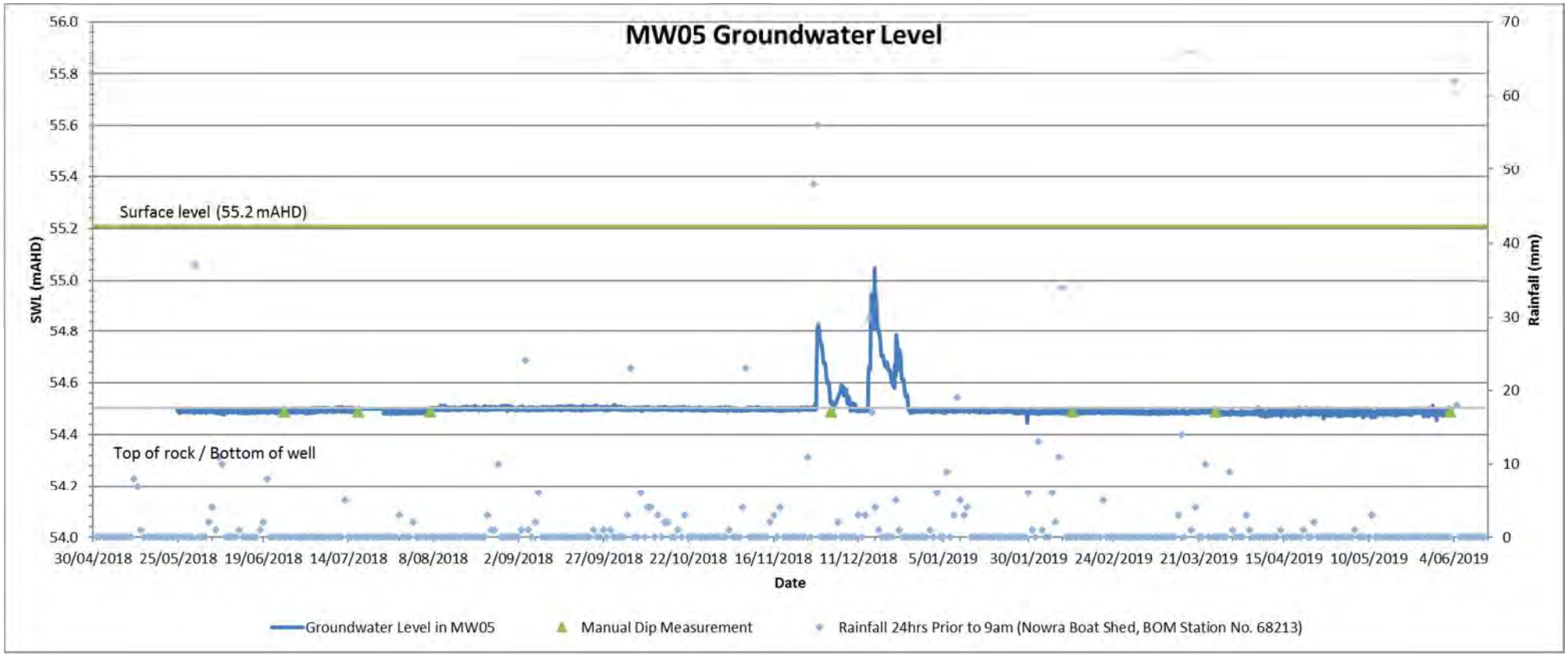
Drawn:	CB	**MW01 GROUNDWATER MONITORING PLOT** **Mundamia, NSW**	Drawing: **FIGURE 4**
Approved:	AN		
Date:	22.06.2019		
	NA		

Scale:

Project: P1304007JC03V02



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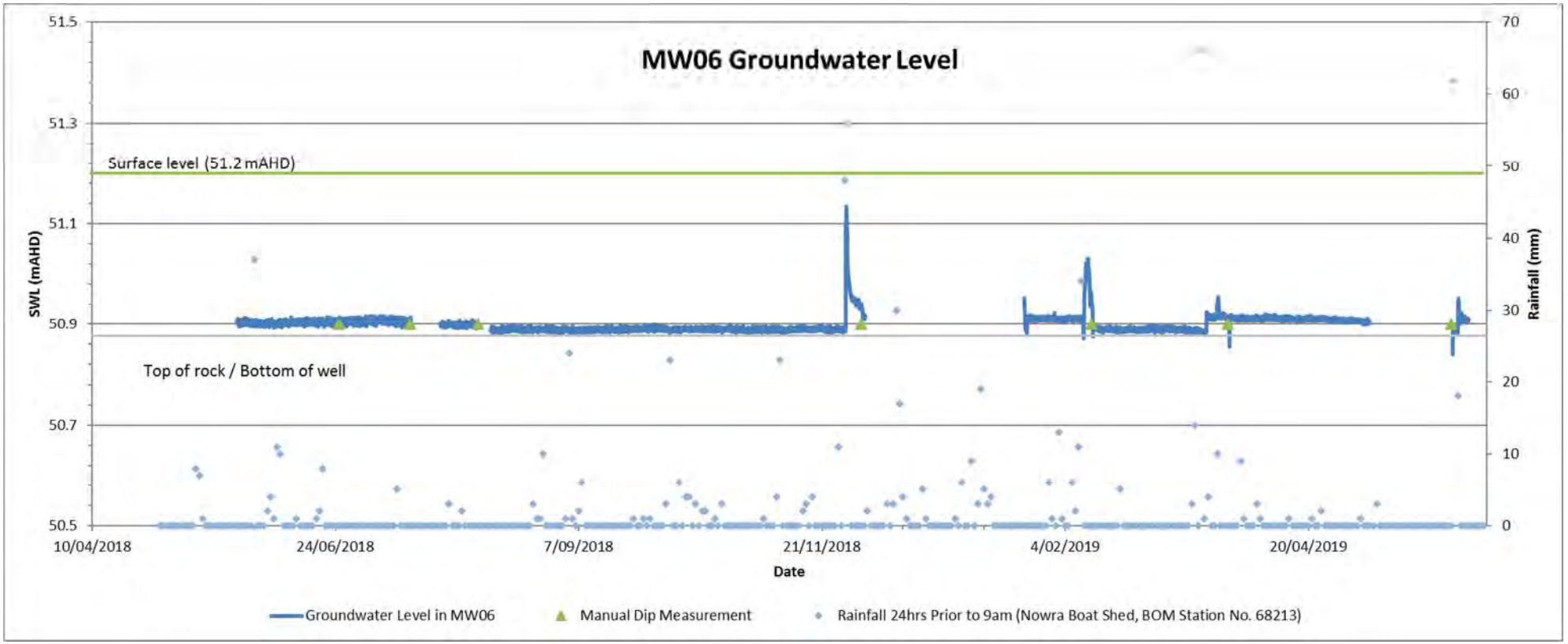
Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	CB	**MW01 GROUNDWATER MONITORING PLOT** **Mundamia, NSW**	Drawing: **FIGURE 5**
Approved:	AN		
Date:	22.06.2019		
Scale:	NA		Project: P1304007JC03V02



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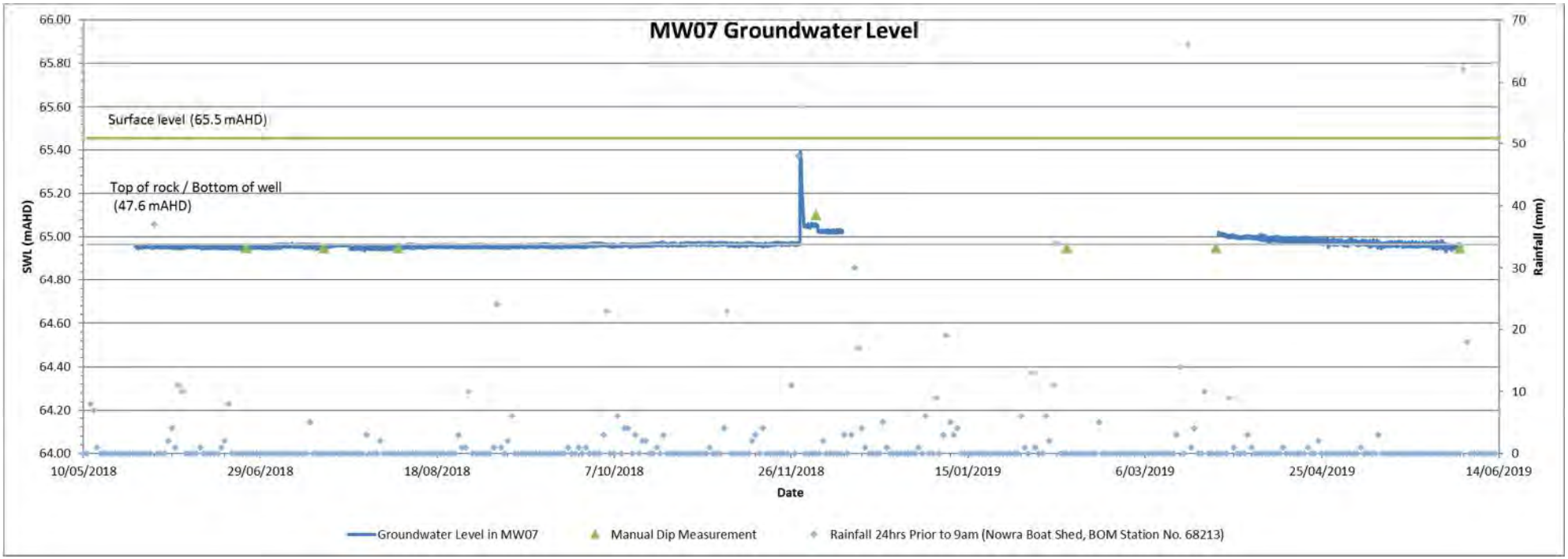
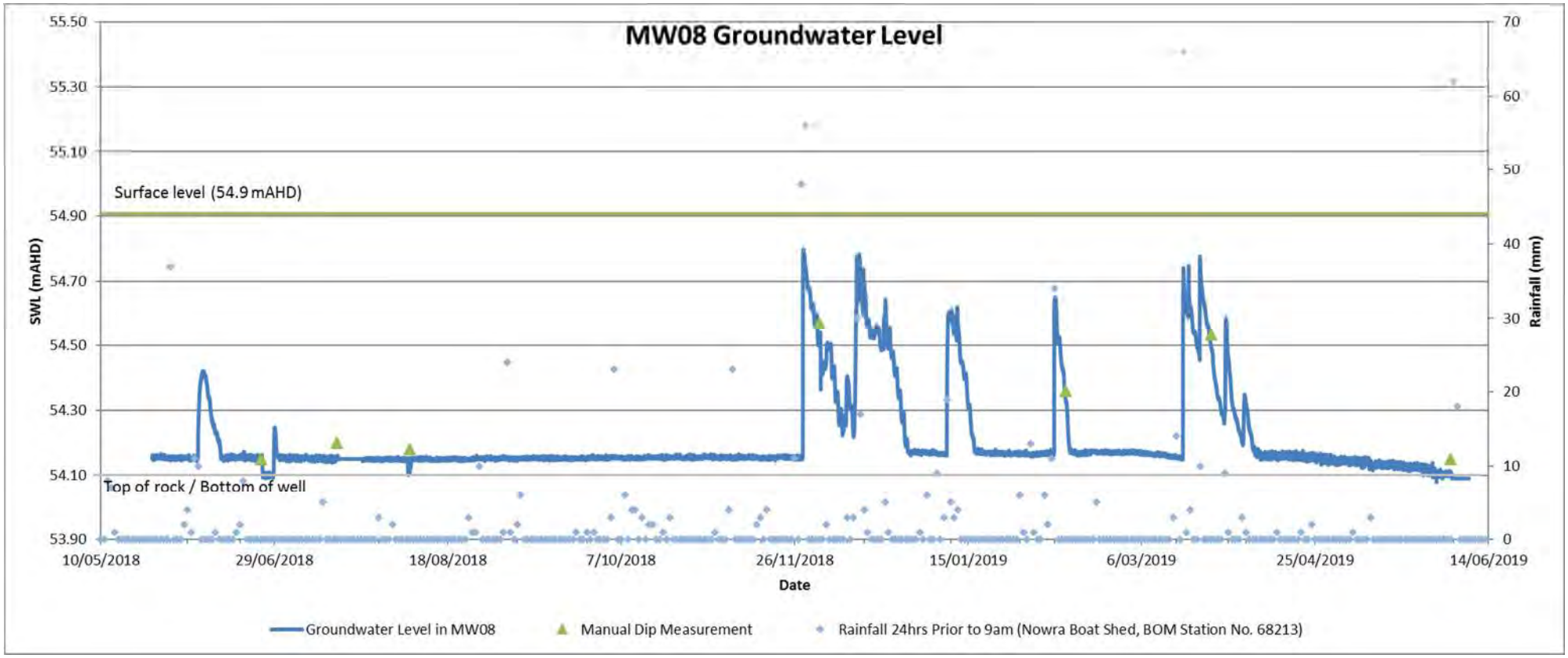
Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	CB	**MW01 GROUNDWATER MONITORING PLOT** **Mundamia, NSW**	Drawing: **FIGURE 6**
Approved:	AN		
Date:	22.06.2019		
Scale:	NA		Project: P1304007JC03V02



Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	CB	**MW01 GROUNDWATER MONITORING PLOT** **Mundamia, NSW**	Drawing: **FIGURE 7**
Approved:	AN		
Date:	22.06.2019		
Scale:	NA		Project: P1304007JC03V02



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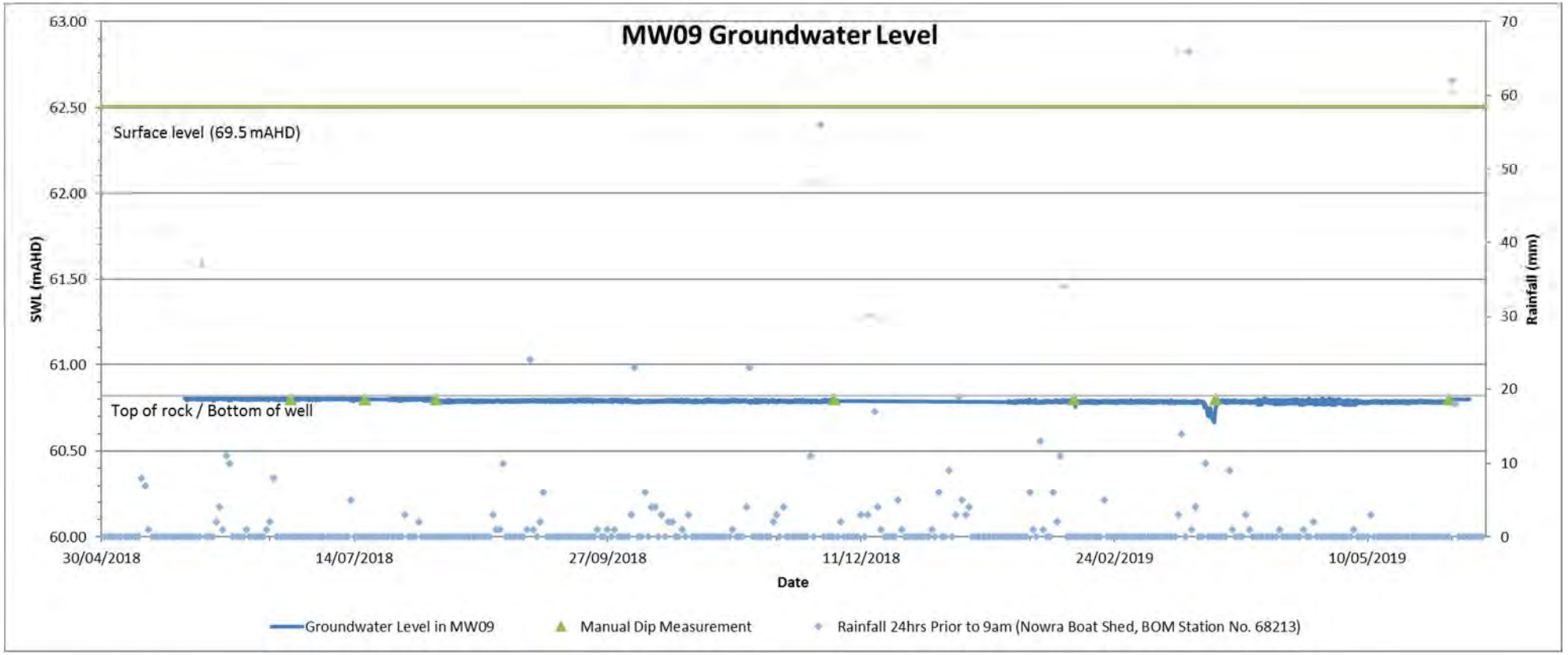
Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	MV	**MW05 GROUNDWATER MONITORING PLOT** **Mundamia, NSW**	Drawing: **FIGURE 8**
Approved:	AN		
Date:	22.06.2019		
Scale:	NA		Project: P1304007JC03V01



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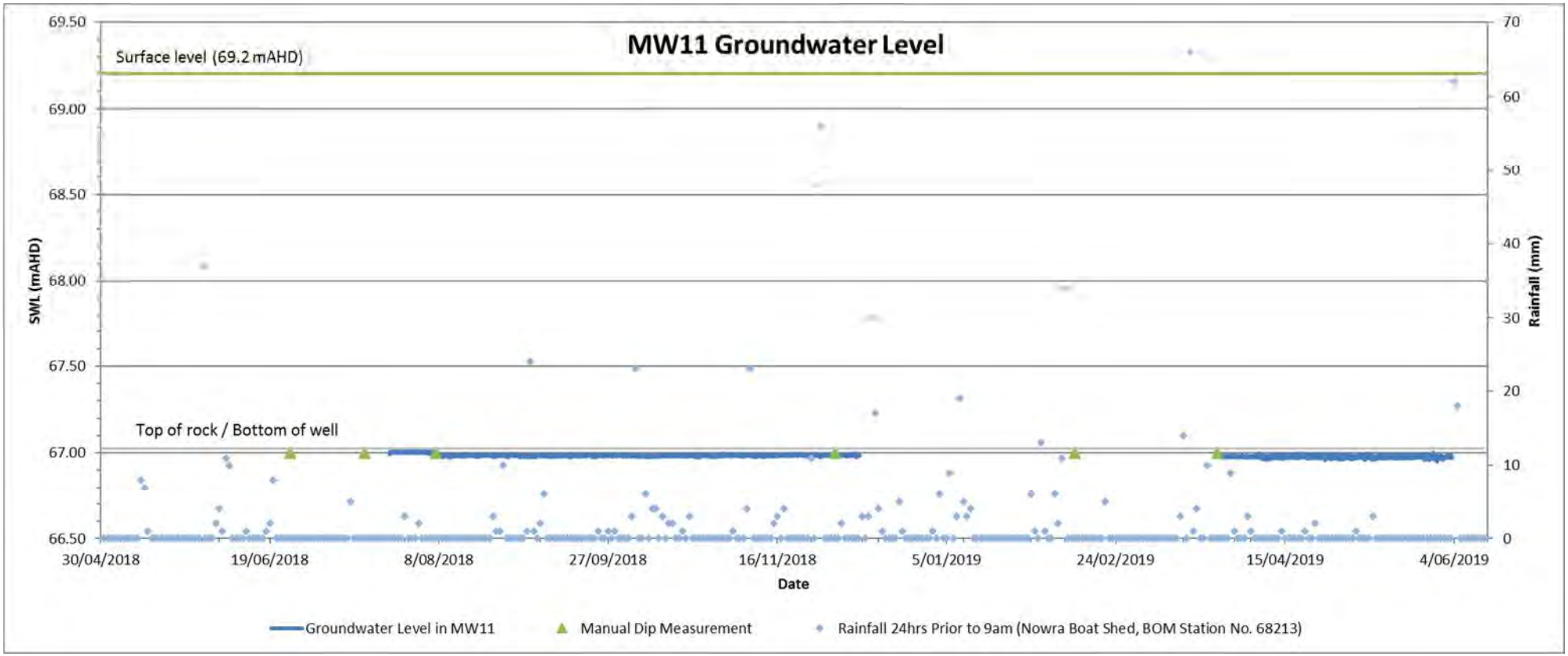
Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	CB	**MW01 GROUNDWATER MONITORING PLOT** **Mundamia, NSW**	Drawing: **FIGURE 9**
Approved:	AN		
Date:	22.06.2019		
	NA		

Scale:

Project: P1304007JC03V02



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Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	CB	**MW01 GROUNDWATER MONITORING PLOT** **Mundamia, NSW**	Drawing: **FIGURE 11**
Approved:	AN		
Date:	22.06.2019		
Scale:	NA		Project: P1304007JC03V02

Attachment E – Laboratory Test Certificate

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 194844

Client Details

Client	Martens & Associates Pty Ltd
Attention	Accounts Email, Andrew Mesthos, Andrew Norris
Address	Suite 201, 20 George St, Hornsby, NSW, 2077

Sample Details

Your Reference	**P1304007 - Mundamia**
Number of Samples	1 Water
Date samples received	26/06/2018
Date completed instructions received	26/06/2018

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	03/07/2018
Date of Issue	03/07/2018

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Ken Nguyen, Senior Chemist
Nick Sarlamis, Inorganics Supervisor

Authorised By

Jacinta Hurst, Laboratory Manager

Miscellaneous Inorganics		
Our Reference		194844-1
Your Reference	UNITS	4007/MW10/180625
Date Sampled		25/06/2018
Type of sample		Water
Date prepared	-	26/06/2018
Date analysed	-	26/06/2018
pH	pH Units	5.9
Electrical Conductivity	µS/cm	170
NOx as N in water	mg/L	0.3
Total Nitrogen in water	mg/L	6.5
Ammonia as N in water	mg/L	0.020
Phosphate as P in water	mg/L	0.025

Metals in Waters - Total		
Our Reference		194844-1
Your Reference	UNITS	4007/MW10/180625
Date Sampled		25/06/2018
Type of sample		Water
Date prepared	-	27/06/2018
Date analysed	-	27/06/2018
Phosphorus - Total	mg/L	0.4

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-055	Nitrate - determined colourimetrically. Soils are analysed following a water extraction.
Inorg-055/062	Total Nitrogen - Calculation sum of TKN and oxidised Nitrogen.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Soils are analysed following a KCl extraction.
Inorg-060	Phosphate determined colourimetrically based on EPA365.1 and APHA latest edition 4500 P E. Soils are analysed following a water extraction.
Metals-020	Determination of various metals by ICP-AES.

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			26/06/2018	[NT]	[NT]	[NT]	[NT]	26/06/2018	[NT]
Date analysed	-			26/06/2018	[NT]	[NT]	[NT]	[NT]	26/06/2018	[NT]
pH	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	99	[NT]
Electrical Conductivity	µS/cm	1	Inorg-002	<1	[NT]	[NT]	[NT]	[NT]	96	[NT]
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	[NT]	[NT]	[NT]	[NT]	101	[NT]
Total Nitrogen in water	mg/L	0.1	Inorg-055/062	<0.1	[NT]	[NT]	[NT]	[NT]	85	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	[NT]	[NT]	[NT]	[NT]	102	[NT]
Phosphate as P in water	mg/L	0.005	Inorg-060	<0.005	[NT]	[NT]	[NT]	[NT]	116	[NT]

QUALITY CONTROL: Metals in Waters - Total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			27/06/2018	[NT]	[NT]	[NT]	[NT]	27/06/2018	[NT]
Date analysed	-			27/06/2018	[NT]	[NT]	[NT]	[NT]	27/06/2018	[NT]
Phosphorus - Total	mg/L	0.05	Metals-020	<0.05	[NT]	[NT]	[NT]	[NT]	108	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

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ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 207500

Client Details

Client	Martens & Associates Pty Ltd
Attention	D Irwin, Andrew Norris
Address	Suite 201, 20 George St, Hornsby, NSW, 2077

Sample Details

Your Reference	**P1304007 - Mundamia**
Number of Samples	2 Water
Date samples received	06/12/2018
Date completed instructions received	06/12/2018

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	13/12/2018
Date of Issue	13/12/2018

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Results Approved By
Long Pham, Team Leader, Metals
Nick Sarlamis, Inorganics Supervisor

Authorised By

Jacinta Hurst, Laboratory Manager

Miscellaneous Inorganics			
Our Reference		207500-1	207500-2
Your Reference	UNITS	4007/MW08/3.12.18/W	4007/MW10/3.12.18/W
Date Sampled		03/12/2018	03/12/2018
Type of sample		Water	Water
Date prepared	-	06/12/2018	06/12/2018
Date analysed	-	06/12/2018	06/12/2018
Total Nitrogen in water	mg/L	6.3	0.8
NOx as N in water	mg/L	4.3	0.1
Ammonia as N in water	mg/L	0.11	0.032
Phosphate as P in water	mg/L	0.056	<0.005
pH	pH Units	6.8	5.3
Electrical Conductivity	µS/cm	500	230

Metals in Waters - Acid extractable			
Our Reference		207500-1	207500-2
Your Reference	UNITS	4007/MW08/3.12.18/W	4007/MW10/3.12.18/W
Date Sampled		03/12/2018	03/12/2018
Type of sample		Water	Water
Date prepared	-	07/12/2018	07/12/2018
Date analysed	-	10/12/2018	10/12/2018
Phosphorus - Total	mg/L	0.2	0.08

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-055	Nitrate - determined colourimetrically. Soils are analysed following a water extraction.
Inorg-055/062	Total Nitrogen - Calculation sum of TKN and oxidised Nitrogen.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Soils are analysed following a KCl extraction.
Inorg-060	Phosphate determined colourimetrically based on EPA365.1 and APHA latest edition 4500 P E. Soils are analysed following a water extraction.
Metals-020	Determination of various metals by ICP-AES.

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			06/12/2018	[NT]	[NT]	[NT]	[NT]	06/12/2018	[NT]
Date analysed	-			06/12/2018	[NT]	[NT]	[NT]	[NT]	06/12/2018	[NT]
Total Nitrogen in water	mg/L	0.1	Inorg-055/062	<0.1	[NT]	[NT]	[NT]	[NT]	114	[NT]
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	[NT]	[NT]	[NT]	[NT]	100	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	[NT]	[NT]	[NT]	[NT]	103	[NT]
Phosphate as P in water	mg/L	0.005	Inorg-060	<0.005	[NT]	[NT]	[NT]	[NT]	99	[NT]
pH	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	103	[NT]
Electrical Conductivity	µS/cm	1	Inorg-002	<1	[NT]	[NT]	[NT]	[NT]	103	[NT]

QUALITY CONTROL: Metals in Waters - Acid extractable						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			07/12/2018	[NT]	[NT]	[NT]	[NT]	07/12/2018	[NT]
Date analysed	-			10/12/2018	[NT]	[NT]	[NT]	[NT]	10/12/2018	[NT]
Phosphorus - Total	mg/L	0.05	Metals-020	<0.05	[NT]	[NT]	[NT]	[NT]	102	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
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Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

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Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

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Appendix F

Nowra Office: 75 Plunkett Street, Nowra NSW 2541 • PO Box 73, Nowra 2541
Kiama Office: 1/28 Bong Bong Street, Kiama NSW 2533 • PO Box 209, Kiama 2533
tel 02 4421 6544 • **email** consultants@allenprice.com.au

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ABN 87 096 512 088
www.ecoaus.com.au

MEMORANDUM

TO	Matt Somers, Matt Philpott and Chris Shaw
FROM	Meredith Henderson
DATE	23 May 2018
SUBJECT	**Mundamia – groundwater dependent ecosystems advice regarding draft consent conditions**

Updated 13/11/2013

Background

1. The draft consent conditions for the development at George Evans Road Mundamia by Jemalong Mundamia Pty Ltd list several putative ground water dependent ecosystems (GDE). For the purposes of this advice, GDE is taken to also include the threatened species *Triplarina nowraensis.* The term GDE refers to both the plural and singular.

2. The area in question refers to the whole site, both development and offset as per Figure 3 of the Biodiversity Offset strategy (SLR 2016).

3. In forming this advice, several pieces of information have been relied upon:
   - Flora and Fauna Report – SLR Consulting 2010
   - National Recover Plan *Triplarina nowraensis*
   - Referral to the Commonwealth SLR 2010
   - Referral decision by the Commonwealth
   - Saving our Species management action summary for *Triplarina nowraensis* 2015-2016 OEH
   - Groundwater Dependent Ecosystem Atlas Bureau of Meteorology 2018
   - Bionet Vegetation Classification Database OEH 2018
   - Swamp Sclerophyll Forest EEC Final Determination NSW Scientific Committee
   - Biodiversity Offset Strategy SLR Consulting 2016
   - Flora and Fauna Assessment report SLR Consulting 2015.

4. The purpose of this advice is to:
   - Determine if any of the matters by the draft consent conditions are likely to be GDE
   - Determine if there is any supporting reference material regarding any relationship between the matters listed and hydrogeology
   - Determine the source of the assertions that the matters listed are GDE.

Draft Consent Conditions

5. The draft consent conditions (at B5) assert that the following biodiversity are dependent on a relationship with groundwater:
   - Nowra Heath Myrtle (*Triplarina nowraensis*)
   - 'Small moss gardens'
   - 'Swamp Paperbark community'
   - Tiny Greenhood Orchid (*Pterostylis vernalis*).

6. Elsewhere (at A6(g)), the draft consent conditions infer that 'Kunzea shrubland' is also a GDE. For the purposes of this advice, given the absence of commonly accepted terms for the vegetation types, the following assumptions have been made:
   - 'Paperbark Closed Forest' is taken to mean the biometric vegetation type SR648 Swamp mahogany swamp sclerophyll forest on coastal lowlands (PCT1231)
   - 'Kunzea heathland' is taken to mean SR556 Hairpin Banksia - *Kunzea ambigua* -All*ocasuarina distyla* heath on coastal sandstone plateaux (PCT881)
   - 'Small moss gardens' do not correspond with any recognised plant community type, but consistent with the Flora and Fauna Assessment Report (SLR 2015) are defined as:
     - *where there is exposed bedrock adjacent to the Kunzea Shrubland, small 'moss gardens' are present.*

Presence of GDE

Vegetation types

7. The Bureau of Meteorology GDE Atlas maps the whole site as containing a moderate potential GDE, and maps two 'vegetation types' being present on the site. The two vegetation types mapped by the Atlas are:
   - Currambene-Batemans Lowland Forest
   - Shoalhaven Sandstone Forest.

8. These two vegetation types correspond with vegetation mapping units of Tozer et al (2010). Inspection of the biometric vegetation types reveals that these two vegetation types correspond with:
   - SR592 Red Bloodwood - Blackbutt - Spotted Gum shrubby open forest on coastal foothills, southern Sydney Basin (Currambene-Batemans Lowland Forest)
   - SR594 Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin (Shoalhaven Sandstone Forest).

9. Neither of these vegetation types have been mapped on the site. Therefore, the mapped vegetation as per the SLR mapping will be used to determine if the vegetation present is likely to be dependent on groundwater.

10. The vegetation type SR556 Hairpin Banksia - *Kunzea ambigua -Allocasuarina distyla* heath on coastal sandstone plateaux, is listed on the Bionet Vegetation Classification Database as PCT881. The descriptive attributes of that community in the database does not include that the community would be dependent on groundwater. The source scientific literature (Tozer et al 2010, Tozer et al 2006) does not discuss or describe that the vegetation is or is likely to be a GDE. Tozer et al (2006) describe that high frequency fire may threaten the diversity of this vegetation due to the proliferation of obligate seeders and that the shallow soils may desiccate during drought.

11. The vegetation type SR648 Swamp mahogany swamp sclerophyll forest on coastal lowlands, is listed on the Bionet Vegetation Classification Database as PCT1231. The descriptive attributes of that community in the database does not include that the community would be dependent on groundwater. The source scientific literature states that the community 'is a low eucalypt forest with an open shrub layer and a dense groundcover of sedges and forbs, and occurs as scattered patches along the coastline at elevations below 15m ASL in drainage lines and depressions on sandy alluvium and coastal sand flats'. In general, the Mundamia site is about 50 m ASL.

12. The vegetation PCT 1231 is associated with the endangered ecological community *Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions*. In the Final Determination by the NSW Scientific Committee, the community is described as:
    - [It generally] occupies small alluvial flats and peripheral parts of floodplains where they adjoin lithic substrates or coastal sandplains. The soils are usually waterlogged, stained black or dark grey with humus, and show little influence of saline ground water.

13. The BioNet vegetation classification database, source reference material and the Final Determination for Swamp Sclerophyll Forest do not highlight any relationship between the vegetation types and groundwater, which are mapped back to Paperbark Closed Forest and Kunzea Heathland.

14. The notion that the moss gardens are dependent on groundwater may have arisen from the following statement made in the Flora and Fauna Assessment Report (SLR 2015):
    - 'These [moss gardens] appear to be sustained, to some extent at least, by groundwater discharges along the top of the sub:surface bedrock, but are not strictly part of the Kunzea Shrubland community (although they are often, but not exclusively, located amongst or at the upper extremities of stands of Kunzea).'

15. The moss gardens are likely to be a subset of the vegetation type SR556 Hairpin Banksia - *Kunzea ambigua -Allocasuarina distyla* heath on coastal sandstone plateaux. The above discussion indicates that this vegetation type is not likely to be dependent on groundwater. The relationship between the survival of the community, and therefore the moss gardens, and the presence of groundwater is not described in the reference material. The vegetation type is listed as occurring where the is high coastal rainfall of between 1,200 and 1,500 mm per annum. The moss gardens appear on the crests of the rock pavements at the site, and on lower section of the rock ledges where seepage occurs. Given their appearance on the crests of the pavement, the moss gardens could not be entirely reliant on groundwater.

***Triplarina nowraensis* (Nowra Heath Myrtle)**

16. The National Recovery Plan for Nowra Heath Myrtle outlines the ecology, distribution, status, threats and actions to halt decline in the species. It was drafted to meet both State and Federal requirements.

17. According to the Plan, about 60% of the populations occur in areas with impeded drainage. However the Plan acknowledges that populations do occur on drier sites. The Plan does not make any reference to groundwater as a requirement for the maintenance of the species or that a lack of groundwater would be a threat to the species.

18. Threats to this species are listed in the Plan as:
    - Myrtle Rust
    - Vehicle track use and maintenance
    - Inappropriate fire regimes
    - Urban development
    - Weeds.

19. A study by Hogbin on the relationship between water quality and mortality in the species revealed that while storm events resulted in elevated nutrients in water reaching Nowra Heath Myrtle, these were within tolerable limits. In situ experiments showed that adult plants can withstand extremely high nutrient levels with no significant effect on growth or survival. There was an effect on seedlings however.

20. The Plan lists actions to halt decline in the species, however it does not outline any actions relevant to maintenance of groundwater or any particular hydrological regime.

21. It is clear that some populations of this species do occur in areas that are relatively moist. However, the presence of some of the populations, including part of the population on this site, occurring on drier areas would suggest that the species is not entirely dependent on groundwater.

***Pterostylis vernalis* (Spring Tiny Greenhood Orchid)**

22. The final determination made by the NSW Scientific Committee in 2011 states that *Pterostylis vernalis* is linked with a very specific habitat preferring moisture regimes associated with the flow of water through shallow soil over rock. The habitat is further described as being heath or heathy forest over sandstone sheets.

23. The SLR report (2012) states that:
    - small 'moss gardens' are the typical habitat of the critically endangered *Pterostylis vernalis* orchid. Dedicated surveys for this species by Shoalhaven City Council (SCC) and Environmental InSites in 2010 and 2011 identified populations of this species in 'moss gardens' to the south, west and northwest of the subject land.

24. The SLR report also makes the assertion that the species may be dependent on groundwater (at least that portion travelling horizontally between the soil and exposed sheets of sandstone). However, there is no definitive evidence in the literature that there is a strict relationship between the species and groundwater. The relationship is inferred from its presence within moss beds atop the exposed sandstone rock.

25. Despite many years of intensive searches for this species on the site, neither Council nor the various consultants have detected this species as being present. Surveys have been conducted on the site since 2006 and have occurred during suitable seasons over a 10 year period.

26. While the species may be associated with the moss gardens it is not present on the site.

Moss gardens

27. A source of the assertion that the moss gardens are associated with groundwater may be attributable to a range of statements and inferences made by:
    - The habitat of *Pterostylis vernalis* as listed in the Final Determination
    - The impact assessment by SLR.

28. There is no definitive evidence in the literature to support a direct relationship between the moss gardens and groundwater.

29. Logically any moss garden downslope is going to have some connection to water flowing from the top of the ridge. It is not clear whether the water flowing between the soil and rock plays a more significant role than incipient rain fall or flows over the surface, or the interception of dew by the moss gardens.

Summary and conclusion

30. There is little evidence to support that Nowra Heath Myrtle, the two vegetation types or the moss gardens are groundwater dependent ecosystems. There is some suggestion in the final determination for *Pterostylis vernalis* that this species is associated at least with some water flow between the shallow soil and the rock surface.
31. *Pterostylis vernalis* was not found on site, despite about a decade or survey for this species. Both OEH and Council, as well as ecological consultants have not found this species within the lands managed by Jemalong Mundamia Pty Ltd.
32. The link between groundwater and most of the ecological values present within the site has not been established. Monitoring of groundwater could be done through the establishment of short- and long-term bores. However, the consequences of change in the above ground vegetation may not be attributable to any changes in groundwater regimes, should that occur.

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Appendix G

Nowra Office: 75 Plunkett Street, Nowra NSW 2541 • PO Box 73, Nowra 2541
Kiama Office: 1/28 Bong Bong Street, Kiama NSW 2533 • PO Box 209, Kiama 2533
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Suite 204, Level 2
62 Moore Street
Austinmer NSW 2515
t: (02) 4201 2203

25 June 2019

Our ref: 8815

Jemalong Mundamia Pty Ltd
c/- Allen Price and Scarratts
PO Box 73
Nowra NSW 2541

Attention: Matthew Somers

Dear Matt,

Monitoring of moss gardens, Nowra Heath Myrtle and Swamp Forest

Jemalong Mundamia Pty Ltd engaged Eco Logical Australia Pty Ltd (ELA) to establish baseline monitoring of three biodiversity values present at the proposed Mundamia development. The values to be monitored were determined by the NSW Department of Planning and Environment's draft conditions of consent. They were:

- Moss gardens
- *Triplarina nowraensis* (Nowra Heath Myrtle)
- Swamp Paperbark Forest
- *Pterostylis vernalis*.

Ground water monitoring wells were established in June 2018. Baseline biodiversity values were measured in October 2018 and again in June 2019. This brief report outlines the approach and results of the biodiversity monitoring.

If you have any questions about the report or the results, please contact me at meredithh@ecoaus.com.au or by phone on 02 4201 2209.

Regards,

Meredith Henderson
Principal Ecologist

1. Background

Areas containing moss gardens or *Triplarina nowraensis* at Mundamia were suspected of being groundwater dependent ecosystems (GDE) by the consent authority. To satisfy the Department of Planning and Environment (DPE), monitoring of the groundwater was to be undertaken for 12 months prior to any vegetation clearance. Groundwater monitoring wells have been in place for 12 months as at June 2019. The relationship between groundwater and the vegetation present on the site is unclear.

Draft consent conditions from DPE indicate that there are several 'GDE' present at the site:

- Moss gardens associated with rock pavement heath and the Kunzea shrubland
- Swamp Paperbark Forest
- *Pterostylis vernalis*
- *Triplarina nowraensis* (Nowra Heath Myrtle).

Of the matters listed above, only three are present on the site, and only two may have a response to water travelling between the soil surface and the rock surface. These two matters are the moss gardens and Nowra Heath Myrtle. The Swamp paperbark forest is not likely to be dependent on the water travelling between the soil surface and the rock plate beneath, since it occurs on deeper sandy-loam soils adjacent to a small watercourse.

2. Methodology

2.1 Moss gardens

Areas of moss overlain on sandstone rock outcrops were identified near groundwater monitoring wells. In general, areas to be monitored occurred towards the boundary of the proposed development area and the proposed Biobank Agreement Site. This was to allow for future monitoring should the development be approved. Quadrats of about 1 m x 1 m were measured and corners spray painted with fluorescent paint to allow for relocation. Waypoints and photographs were taken of the quadrats.

Percentage cover values within the plots were estimated for the following:

- Moss
- Weeds
- Soil or rock.

A qualitative condition score was given for the moss gardens. The following score classes were applied:

- 0 – dead or completely senescent moss
- 1 – severely damaged or close to senescence
- 2 – major damage including browned, grazing or other physical damage and major weed encroachment
- 3 – desiccation and browning, moss clumps starting to break off
- 4 – minor damage or browning, minor weed occurrence
- 5 – no physical damage, browning, grazing or weeds present.

Plots were established on 24 October 2018, with a follow up visit on 24 June 2019.

2.2 Nowra Heath Myrtle

Five sub-populations of the Nowra Heath Myrtle were sampled to determine if there was any relationship between groundwater and the 'health' of the plants. Where Nowra Heath Myrtle occurred near the monitoring wells, a sub sample of the plants was established. Five adult plants were tagged with high visibility flagging tape and each was given a unique number to allow for subsequent monitoring efforts.

Basic life history attributes were taken for each individual plant. These were:

- Height (m)
- Flowers (0 = absent, 1 = present)
- Fruits (0 = absent, 1 = present).

A qualitative condition score was given for each individual plant. The following score classes were applied:

- 0 – dead or completely senescent
- 1 – severely damaged or close to senescence
- 2 – major damage, browning or other physical damage
- 3 – branches broken off, browning, many branchlets dead
- 4 – minor damage or browning, minor branchlets dead
- 5 – no physical damage or browning.

Plants were sampled on 24 October 2018 and 24 June 2019.

2.3 Swamp Paperbark Forest

Most of the Swamp Paperbark Forest would be removed as part of the proposed development. None of this vegetation type would be retained in the Biobank Agreement area for management in-perpetuity. However, to satisfy the draft conditions of consent, a brief inspection of the vegetation was undertaken. A short list of dominant canopy, mid storey and ground covers were noted. Descriptions of the apparent 'health' of the vegetation was also noted. No quantitative measures were undertaken since this vegetation type would be removed as part of the proposed development.

2.4 Pterostylis vernalis

The final determination made by the NSW Scientific Committee in 2011 states that *Pterostylis vernalis* is linked with a very specific habitat preferring moisture regimes associated with the flow of water through shallow soil over rock. The habitat is further described as being heath or heathy forest over sandstone sheets.

The SLR report (2012) states that:

small 'moss gardens' are the typical habitat of the critically endangered Pterostylis vernalis *orchid. Dedicated surveys for this species by Shoalhaven City Council (SCC) and Environmental InSites in 2010*

and 2011 identified populations of this species in 'moss gardens' to the south, west and northwest of the subject land.

The SLR report also makes the assertion that the species may be dependent on groundwater (at least that portion travelling horizontally between the soil and exposed sheets of sandstone). However, there is no definitive evidence in the literature that there is a strict relationship between the species and groundwater. The relationship is inferred from its presence within moss beds atop the exposed sandstone rock.

Despite many years of intensive searches for this species on the site, neither Council nor the various consultants have detected this species as being present. Surveys have been conducted on the site since 2006 and have occurred during suitable seasons over a 10-year period.

While the species may be associated with the moss gardens it is not present on the site.

No monitoring of this species has occurred on the site.

2.5 Limitations

This report describes basic monitoring of biodiversity values that may be associated with the flow of groundwater across the site. However, since this is not a fully factored experimental design, there is no ability to completely ascribe any changes in groundwater to the 'health' of any of these biodiversity values. For example, the relationship between the health of the swamp and overland flow cannot be established since these overland flows are not likely to originate from a groundwater source. Furthermore, there is no ability to restrict either groundwater or overland flow or incipient rainfall to the values sampled. Doing so would allow a complete experimental design that is robust, however this would not be reasonable and would be far beyond the scope of such a project.

3. Results

3.1 Moss gardens

In October 2018, the average percentage cover of moss across the five gardens sampled was 50%, with an average weed cover of about 10% and rock cover of about 30%. Condition ranged between 3 and 4. Where plots had a condition score of 3, the moss was very dry, broken, showed signs of trampling and grazing. All but one plot contained weed species.

In June 2019, the average cover of moss was 50%, weed cover was 15% and rock cover was 35%. Condition ranged from 3 to 5. Plots with a condition of 3 still exhibited signs of physical damage, where moss clumps were broken off and were weed invaded. The major difference between the two sampling periods was that the moss in June 2019 was considerably greener and moist.

3.2 Nowra Heath Myrtle

In October 2018, no Nowra Heath Myrtle were in flower. Two plants had evidence of old flowers and one plant was forming fruits. No fully developed fruits or seed capsules were present on any plant sampled. The average condition score assigned to induvial plants was 4. Condition ranged from 3 to 5.

Where the condition was 3, the plants had many dead branches and damage. Overall, the condition was good, with few plants showing any signs of leaf drop, browning or other stress.

In June 2019, the overall condition of the plants had declined. This was borne out in the increase in the number of individuals scoring 3 or less for condition. All the plants with a condition score of 3 or less exhibited signs of physical damage including broken branches. It is not known whether these were from human disturbance or other animals. None of the plants were in flower, but 14 of the 25 plants sampled had fruit capsules. Apart from the physical damage, none of the plants exhibited any signs of leaf drop or other stress.

3.3 Swamp Paperbark Forest

The area of Swamp Paperbark Forest observed near monitoring well 02 had a canopy of *Melaleuca linariifolia* with *Parsonsia straminea*. The mid storey was *Kunzea ambigua, Calochlaena dubia, Triplarina nowraensis, Lantana camara* and *Gahnia melanostachys*. The groundcover was variable with *Entolasia marginata, Juncus* sp., and *Hibbertia scandens*. In October 2018, the *Gahnia* was very brown, with a high volume of standing dead material. By contrast in June 2019, the *Gahnia* was greener, there was more *Lantana* encroachment, but there was still a high cover of dead standing material and dried leaf litter.

3.4 Rainfall

During the six months leading to October 2018, the area experienced 204.6 mm rainfall (Figure 1). The average long-term rainfall for the same months is 393.6 mm (source Bureau of Meteorology 2019). Between November 2018 and 24 June 2019, the area received 685.2 mm rainfall (Figure 1). The average rainfall for the same period is 680.9 mm. Therefore, leading up to the October 2018 survey, there had been half the average rainfall, while in the months leading to the June 2019 survey rainfall was average.

Figure 1 Rainfall between May 2018 and 24 June 2019 at the Nowra RAN Air Station AWS (station 068072; source Bureau of Meteorology). Red dots indicate site surveys.

4. Discussion

Overall the 'health' of the biodiversity values appeared to be average to good in the initial survey in October 2018. Some of the moss gardens were quite dry, but this does not seem to have affected their ability to recover with more substantial rainfall. There did not appear to be any negative consequences of below average rainfall on the health of the Nowra Heath Myrtle. The plants sampled were in relatively good health in the October 2018 and June 2019 surveys. There does however appear to have been some damage to the Nowra Heath Myrtle plants, but this is not likely to be related to rainfall or groundwater.

The moss gardens were greener in the June 2019 survey than in the October 2018 survey. This may be more related to incipient rainfall being average in the months leading to June 2019 and the well below average rainfall in the months prior to October 2018. This was similar to the apparent increase in 'greenness' in the understorey plants in the Swamp Paperbark Forest. Other factors such as evaporation, shade and humidity could also drive greenness in the moss gardens and Swamp Paperbark Forest.

This monitoring was not established to tease out all the factors that may affect health of the biodiversity values sampled. However, it appears that there may be a greater risk to the persistence of the values from disturbances such as human thoroughfares, grazing by macropods, trampling and weed invasion.

Results from the groundwater monitoring should be examined to determine if base flows changed across the survey periods.

allen price & scarratts pty ltd
land and development consultants

Appendix H

Nowra Office: 75 Plunkett Street, Nowra NSW 2541 • PO Box 73, Nowra 2541
Kiama Office: 1/28 Bong Bong Street, Kiama NSW 2533 • PO Box 209, Kiama 2533
tel 02 4421 6544 • **email** consultants@allenprice.com.au

ABN 62 609 045 972
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DAY DESIGN PTY LTD
CONSULTING ACOUSTICAL ENGINEERS

50 JUNCTION STREET, NOWRA 2541
P. 02 4421 2933 SOUTHCOAST@DAYDESIGN.COM.AU WWW.DAYDESIGN.COM.AU

Aircraft and Traffic Noise Intrusion Report

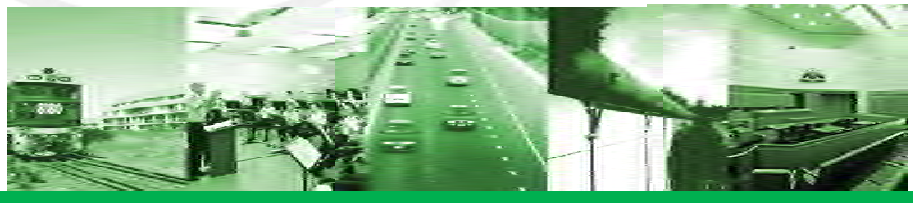
Proposed Subdivision
Lot 30 DP 1198692, Mundamia, NSW

REPORT NUMBER
5402-1.1R Rev C

DATE ISSUED
13 May 2015

Prepared For:
Jemalong Mundamia Pty Ltd
C/- Allen Price and Associates
75 Plunkett Street
Nowra NSW 2541

Attention: Ms Debbi Szota



Revision History

Status	Date	Prepared	Checked	Comment
Draft 1	20/06/2014	Matthew Harwood	Stephen Gauld	Emailed to client for review
Final	23/06/2014	Matthew Harwood	Stephen Gauld	
Rev A	01/12/14	Matthew Harwood		Amended site plan
Rev B	16/01/15	Matthew Harwood		Amended Lot Numbers
Rev C	13/05/15	Matthew Harwood		Amended Lot Numbers

Document 5402-1.1R REV C, 14 pages plus attachments

Disclaimer

The work presented in this document was carried out in accordance with the Day Design Pty Ltd Quality Management System. Day Design is certified to AS9001.

This report has been prepared for the client identified in Section 1.0 only and cannot be relied or used by any third party. Any representation, statement, opinion or advice, expressed or implied in this report is made in good faith but on the basis that Day Design is not liable (whether by reason of negligence, lack of care or otherwise) to any person for any damage or loss whatsoever which has occurred or may occur in relation to that person taking or not taking (as the case may be) action in any respect of any representation, statement, or advice referred to above.

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1.0 EXECUTIVE SUMMARY

Jemalong Mundamia Pty Ltd proposes to develop a residential subdivision at Lot 30 DP 1198692, Mundamia, NSW as shown in Figure 1. Mundamia is located approximately 3 kilometres south west of the township of Nowra and approximately 6 kilometres north of HMAS Albatross, Naval Air Station.

The subdivision will comprise 319 residential lots to be constructed over 11 stages as shown in the attached Appendix A. To the south west of the site is the University of Wollongong (UOW), Nowra Campus and adjoining the site to the west is vacant land owned by Shoalhaven City Council, also proposed for residential subdivision in the future by an unrelated proponent.

The NSW Department of Planning and Infrastructure has requested a noise intrusion assessment to accompany the Development Application. The assessment is to address the potential for noise intrusion from road traffic as well as aircraft associated with HMAS Albatross.

In assessing the potential for noise impact from aircraft, consideration has been given to Australian Standard AS2021:2000 *"Aircraft Noise Intrusion – Building Siting and Construction".* The site is located approximately 3.8 kilometres outside of the HMAS Albatross Australian Noise Exposure Forecast (ANEF) 2014 contour 20. Consequently an aircraft noise intrusion assessment is not required for this proposal as the site is assessed as being acceptable for residential development.

In assessing the potential for noise impact from on-road traffic, consideration has been given to Clause 102 of SEPP (Infrastructure) 2007. Traffic volumes in the vicinity of the site, both currently and following development of all proposals in the area are significantly below the trigger of 40,000 vehicle movements per day. Consequently a traffic noise intrusion assessment is also not required for this proposal.

However, an assessment has been undertaken of the potential for traffic generated by the subdivision and adjacent proposed subdivision to impact future dwellings within the subdivision. Future traffic noise levels have been established from projected future traffic volumes generated by both proposals as detailed in Section 5 of this report.

These levels have been used to determine compliance with the NSW Department of Planning and Infrastructure's *"Development near Rail Corridors and Busy Roads – Interim Guidelines"* 2008. The Guidelines set internal noise level criteria of 35 dBA (L_{eq}) inside bedrooms and 40 dBA (L_{eq}) inside other habitable spaces, for road and rail noise emission.

The acceptable internal noise limits can be achieved for all future dwellings within the subdivision using standard construction methods as outlined in Section 6 of this report.

2.0 CONSULTING BRIEF

Day Design Pty Ltd was commissioned by Jemalong Mundamia Pty Ltd to carry out a road and aircraft noise intrusion study for a proposed residential subdivision at Lot 30 DP 1198692, Mundamia, NSW.

This commission involves the following:

- Prepare a location plan showing the juxtaposition of the proposed site to the nearest major roads and HMAS Albatross, Naval Air Station.
- Determine acceptable noise levels in accordance with Australian Standard AS2021:2000 *"Aircraft Noise Intrusion – Building Siting and Construction".*
- Determine acceptable noise levels in accordance with the NSW Department of Planning and Infrastructure's document *"Development Near Rail Corridors and Busy Roads – Interim Guidelines"* (2008).
- Measure or determine the level of road and aircraft noise emission at the site if required.
- Carry out a traffic noise intrusion computer analysis of future dwellings and provide recommendations for noise control if required.
- Prepare an Aircraft and Traffic Noise Intrusion Report.

3.0 DESCRIPTION OF PROPOSED SUBDIVISION AND ENVIRONS

Jemalong Mundamia Pty Ltd proposes to develop a residential subdivision at Lot 30 DP 1198692, Mundamia, NSW as shown in Figure 1. Mundamia is located approximately 3 kilometres south west of the township of Nowra and approximately 6 kilometres north of HMAS Albatross.

The subdivision will comprise 319 residential lots to be constructed over 11 stages as shown in the attached Appendix A. To the south west of the site is the University of Wollongong (UOW), Nowra Campus and adjoining the site to the west is vacant land also proposed for residential subdivision in the future by an unrelated proponent. The adjacent proposal will comprise 65 low density and 69 medium density residences as well as a child care centre and a retail / commercial component.

Figure 1. Location Plan – Mundamia, NSW.

4.0 ACOUSTICAL CIRTERIA

4.1 Department of Planning and Infrastructure

In their letter Jemalong Mundamia Pty Ltd, reference MP08_0141 dated 2/8/13, the Department states:-

*"**10. Noise Impacts.***

- *A revised noise impact assessment should be provided that includes assessment of aircraft noise and road traffic noise impacts and include recommendations regarding measures required to mitigate any adverse noise impacts. (Note: in this regard and for comparison refer to the noise assessment submitted with the environmental assessment for project application MP09_0056)."*

4.2 Traffic Noise Criteria

The NSW Department of Planning and Infrastructure published the *"Development Near Rail Corridors and Busy Roads – Interim Guidelines"* in 2008. The Guidelines refer to Clause 102 (Road) of the State Environment Planning Policy (Infrastructure) 2007.

Clause 102 *"Impact of road noise or vibration on non-road development"*, sates:

> *"(1) This clause applies to development for any of the following purposes that is on land in or adjacent to the road corridor for a freeway, a tollway or a transit way or any other road with an annual traffic volume of more than 40,000 vehicles per day (based on the traffic volume data published on the website of the RTA* [RMS]*) and the consent authority considers is likely to be adversely affected by road noise or vibration:*
>
> *(a) a building for residential use,*
>
> *(b) a place of public worship,*
>
> *(c) a hospital,*
>
> *(d) an education establishment or child care centre.*
>
> *(2) Before determining a development application for development to which this clause applies, the consent authority must take into consideration any guidelines that are issued by the Director-General for the purposes of this clause and published in the Gazette.*
>
> *(3) If the development is for the purposes of a building for residential use, the consent authority must be satisfied that appropriate measures will be taken to ensure that the following L_{Aeq} levels are not exceeded:*
>
> *(a) in any bedroom in the building – 35 dB(A) at any time between 10 pm and 7 am;*
>
> *(b) anywhere else in the building (other than a garage, kitchen, bathroom or hallway) – 40 dB(A) at any time."*

4.3 Aircraft Noise Criteria

Australian Standard AS 2021:2000 *"Aircraft Noise Intrusion – Building Siting and Construction",* together with Australian Noise Exposure Forecast (ANEF) charts, provides guidelines for determining whether the extent of aircraft noise intrusion makes building sites 'acceptable', 'unacceptable' or 'conditionally acceptable' for the types of activity to be, or being, undertaken.

Building site acceptability is determined from Table 2.1 of AS 2021:2000 by comparing the building type under consideration with the ANEF zone in which it is located.

Section 2.3.1 defines 'Acceptable' as follows:-

"If from Table 2.1, the building site is classified as 'acceptable', there is usually no need for the building construction to provide protection specifically against aircraft noise. However, it should not be inferred that aircraft noise will be unnoticeable in areas outside the ANEF 20 contour. (See Notes 1, 2 and 3 of Table 2.1)."

Table 2.1 of AS 2021:2000 is reproduced in Figure 2 below.

TABLE 2.1

BUILDING SITE ACCEPTABILITY BASED ON ANEF ZONES

(To be used in conjunction with Table 3.3)

Building type	ANEF zone of site		
	Acceptable	Conditionally acceptable	Unacceptable
House, home unit, flat, caravan park	Less than 20 ANEF (Note 1)	20 to 25 ANEF (Note 2)	Greater than 25 ANEF
Hotel, motel, hostel	Less than 25 ANEF	25 to 30 ANEF	Greater than 30 ANEF
School, university	Less than 20 ANEF (Note 1)	20 to 25 ANEF (Note 2)	Greater than 25 ANEF
Hospital, nursing home	Less than 20 ANEF (Note 1)	20 to 25 ANEF	Greater than 25 ANEF
Public building	Less than 20 ANEF (Note 1)	20 to 30 ANEF	Greater than 30 ANEF
Commercial building	Less than 25 ANEF	25 to 35 ANEF	Greater than 35 ANEF
Light industrial	Less than 30 ANEF	30 to 40 ANEF	Greater than 40 ANEF
Other industrial	Acceptable in all ANEF zones		

NOTES:

1 The actual location of the 20 ANEF contour is difficult to define accurately, mainly because of variation in aircraft flight paths. Because of this, the procedure of Clause 2.3.2 may be followed for building sites outside but near to the 20 ANEF contour.

2 Within 20 ANEF to 25 ANEF, some people may find that the land is not compatible with residential or educational uses. Land use authorities may consider that the incorporation of noise control features in the construction of residences or schools is appropriate (see also Figure A1 of Appendix A).

3 There will be cases where a building of a particular type will contain spaces used for activities which would generally be found in a different type of building (e.g. an office in an industrial building). In these cases Table 2.1 should be used to determine site acceptability, but internal design noise levels within the specific spaces should be determined by Table 3.3.

Figure 2. AS 2021:2000 Table 2.1.

HMAS Albatross ANEF 2014 contours are shown in the attached Appendix B. The subject site is located approximately 3.8 kilometres outside the 20 ANEF contour as shown in the attached Appendix C.

This location is not considered to be near to the 20 ANEF contour (see Note 1 in Figure 2) in any sense as it is 3.8 km outside the 20 ANEF contour. The location of the site is considered 'acceptable' without the need for building construction to provide protection for aircraft noise.

No further assessment of aircraft noise intrusion is required.

5.0 ROAD TRAFFIC NOISE

5.1 Existing Traffic Noise Levels

The subject site is not near a major road as can be seen in Figure 1. The author visited the site on a number of occasions throughout May and June 2014 and traffic noise was not measurable or consistently audible at any time, with the exception of the occasional passing heavy vehicle on Yalwal Road.

In our opinion and in accordance with Clause 102 of the SEPP (Infrastructure) 2007, as detailed in Section 4.2 of this report, a traffic noise assessment is not required based on the current traffic flows.

5.2 Future Traffic Noise Levels

5.2.1 Traffic Volumes

Day Design has reviewed the following documents in relation to predicted traffic volumes arising from the proposed developments:-

- 'Transport Report for Proposed Residential Subdivision, Mundamia', prepared by Colston, Budd, Hunt & Kafes Pty Ltd, reference 8351, dated May 2012 (Report 1);
- 'Mundamia Traffic Impact Study', prepared by Bitzios Consulting Pty ltd, reference P1110.002R Mundamia TIS, dated 14/12/12 (Report 2);
- 'Noise Assessment, Proposed Rezoning, George Evans Road, Mundamia', prepared by Atkins Acoustics, reference 42.6788.L1.Rev01:CFCD6, dated 18/12/2012 (Report 3); and
- NSW Roads and Maritime Services' letter to Shoalhaven City Council, reference STH08/02218/02, dated 11/06/2013 (Letter).

Report 1, Section 3.17 states *"The proposed development will generate some 310 to 330 vehicles per hour two-way during the morning and afternoon peak periods."* This relates to the Jemalong Mundamia Pty Ltd subdivision only.

Report 2 in Table 2.3 predicts that the developments will generate an average 563.5 peak hour vehicle trips. This relates to both proposed subdivisions combined (see Figure 1).

Neither report predicts 'daily' vehicle movements, however Report 3, section 4.2, states *"Information from Bitzios Consulting and additional details from SET Consultants confirm the following daily traffic volumes:-*

- *Spine Road (south of town centre) 3000 – 4000 vpd*
- *Spine Road (north of town centre) 1000 – 2000 vpd."*

The Letter contends that some predictions are understated, however this relates specifically to volumes on existing roads and not volumes generated by the proposals themselves.

In any event, a review of all the data shows that the proposed subdivisions will produce annual traffic volumes significantly less than 40,000 per day on both the Spine Road within the development area, as well as combined with existing traffic on Yalwal Road to the south of the subdivision.

Consequently, a traffic noise assessment is not required for this proposal in accordance with Clause 102 (1) of SEPP (Infrastructure 2007) as detailed in Section 4.2 of this report.

5.2.2 Traffic Noise Predictions

Notwithstanding the above, we have considered the potential noise impact for vehicle movements generated by the subdivision developments on future dwellings fronting the Spine Road.

Assuming the worst-case scenario of 4000 vpd passing any given residence on the proposed Spine Road, we have calculated potential traffic noise levels as follows:-

Day Design Pty Ltd has previously measured the sound exposure level of a number of vehicles passing at a fixed measurement location. Based on this data we have established an average sound exposure level (SEL) of **69 dBA** for a typical car pass by travelling at approximately 50 km/h, at a distance of 15 metres.

Day time and night time traffic noise levels can then be calculated from the formula:

- $L_{eq,\ day\ /\ night}$ = SEL + 10 $\log_{10}$ (N) – 10 $\log_{10}$ (T) where N is the number of vehicle movements and T is the time in seconds.

We have assumed in accordance with Report 3 that 80 % of vehicle movements occur during the day (7 am to 10 pm) and 20 % at night (10 pm to 7 am), i.e. 3200 and 800 respectively.

Table 1 below shows the calculated traffic noise levels at the closest façade of the nearest proposed future dwellings to the Spine Road, assumed to be 15 metres.

Table 1 Predicted L_{eq} Road Traffic Noise Levels

Description		Measured Sound Pressure Levels (dB) at Octave Band Centre Frequencies (Hz)							
	dBA	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Daytime time $L_{eq,\ 15\ hr}$ Road Traffic noise level	**57**	59	59	51	52	55	49	39	30
Night time $L_{eq,\ 9\ hr}$ Road Traffic noise level	**51**	53	53	45	46	49	43	33	26

The octave band spectrum is based on actual noise measurements of passing vehicles.

These outdoor traffic noise levels are used in this assessment to determine the potential for compliance with the acceptable indoor road traffic noise criteria.

5.3 Required Road Traffic Noise Reduction

Based on the acceptable internal noise levels established in Section 4.2 of this report, the required noise reduction from road traffic is as follows:-

- (57 – 40 =) 17 dB for habitable rooms during the day (7 am to 10 pm), and
- (51 – 35 =) 16 dB for Bedrooms at night (10 pm to 7 am).

6.0 RECOMMENDED ACOUSTICAL TREATMENT

We have modelled the façade of an indicative dwelling on computer and calculated the level of road traffic noise intrusion through the roof, walls, windows and doors, for example:-

- Bedroom - 4 m x 3 m x 2.4 m carpeted with one window (2100 x 2400 mm); and
- Living / Dining – 8 m x 5 m x 2.4 m wooden or tiled flooring with one glazed sliding door (2100 x 2700 mm) and extra windows (2100 x 2400 mm).

Based on the level of required noise reduction generated by traffic from the proposed subdivisions, the acceptable internal noise limits can be met for any future dwellings using standard construction methods, for example as follows:-

- Brick veneer or fibre cement composite clad external walls;
- A pitched, tiled or sheet metal roof with sarking, one layer of 10 mm standard plasterboard on the underside of timber ceiling joists lined with standard thermal insulation; and
- Minimum 4 mm float glass throughout.

It should be noted that traffic noise levels will be lower still in practice as the above predictions assume all 4000 daily vehicle movements pass within 15 metres of any given dwelling, which will not be the case for the majority of dwellings, if any.

7.0 CONCLUSION

An assessment of the potential noise intrusion from aircraft and traffic has been undertaken at the site of a proposed residential subdivision at Lot 30 DP 1198692 Mundamia, NSW.

The site is located approximately 3.8 kilometres beyond HMAS Albatross' Australian Noise Exposure ANEF 20 contour. Therefore standard building construction may be used in the construction of residential dwellings in the subdivision, in accordance with AS2021.

The site is not located near any road way with existing or future annual traffic volumes of more than 40,000 vehicles per day. Consequently a road traffic noise intrusion assessment is not required in accordance with Clause 102 (Road) of the State Environment Planning Policy (Infrastructure) 2007.

However, an assessment of the potential noise intrusion from road traffic generated by the proposed subdivision combined with future proposals in the area has been undertaken to determine the potential impact on future dwellings within the subdivision.

The internal noise level recommendations set by the Department of Planning and Infrastructure, in their *"Development Near Rail Corridors and Busy Roads – Interim Guidelines"* (2008) can be achieved for all future dwellings within the development using standard construction methods as outlined in Section 6 of this report.

Matthew Harwood MAAS.

Senior Acoustical Consultant
for and on behalf of Day Design Pty Ltd.

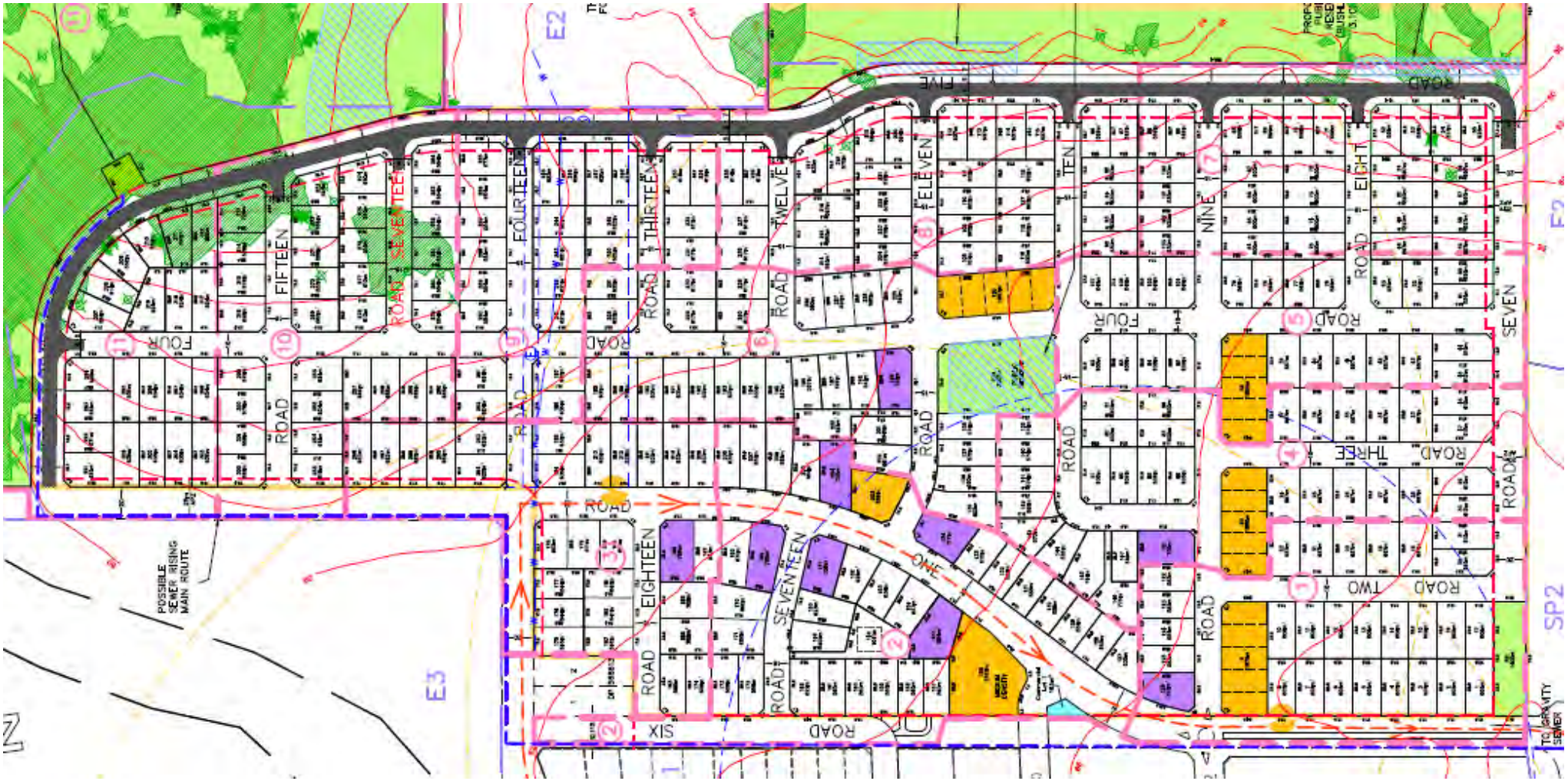
A.A.A.C. MEMBERSHIP
Day Design Pty Ltd is a member company of the Association of Australian Acoustical Consultants, and the work herein reported has been performed in accordance with the terms of membership.

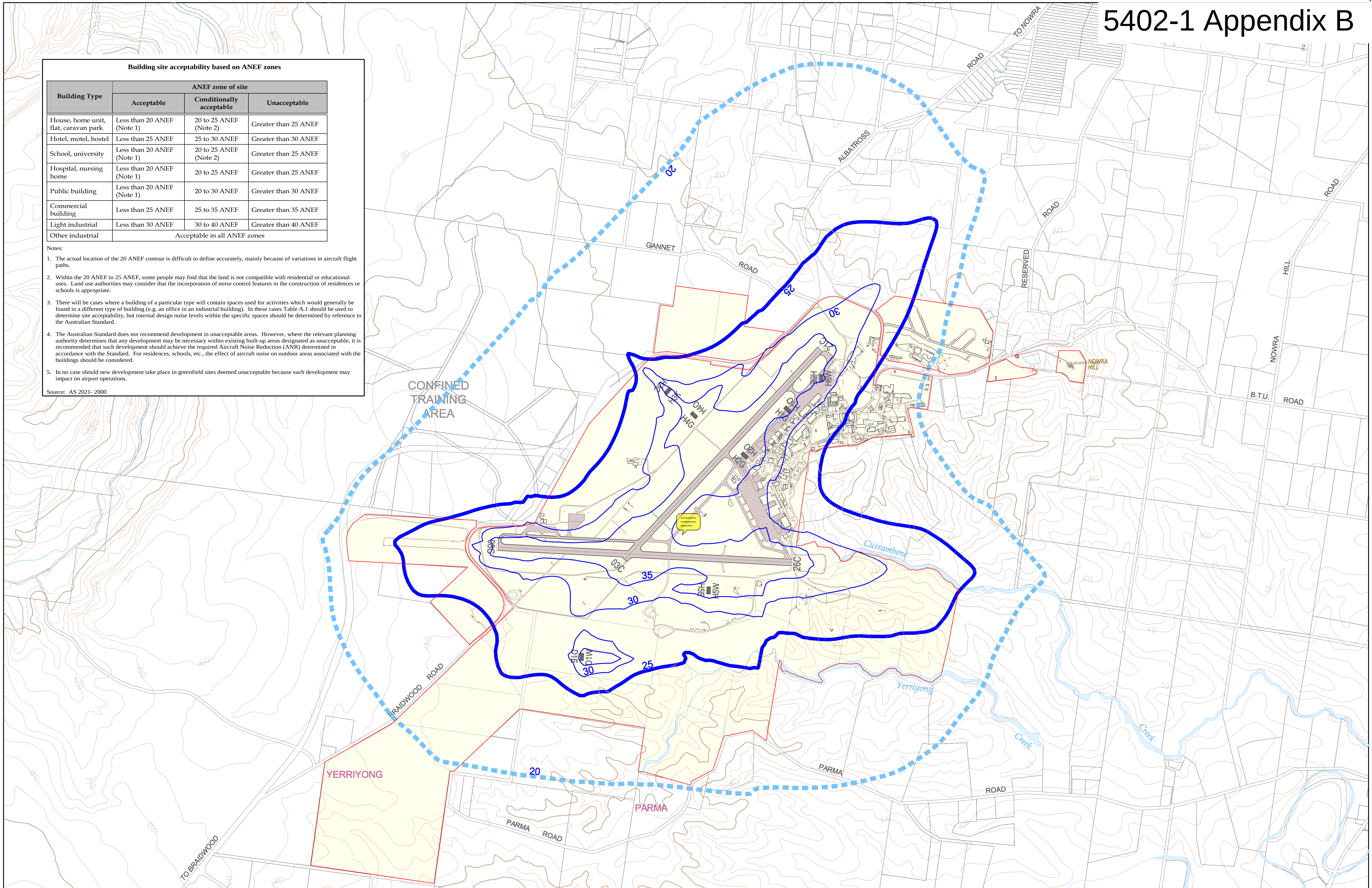
Attachments:

- Appendix A – Proposed Subdivision Layout
- Appendix B – HMAS Albatross ANEF 2014 contours
- Appendix C – Proposed development location in relation to HMAS ANEF 20 contour

Proposed Residential Development
Lot 30 DP 1198692, Mundamia, NSW
(Source: Allen, Price and Associates, ref 25489-11, rev 07, dated 09/04/2015)

5402-1
Appendix A





Building site acceptability based on ANEF zones

Building Type	ANEF zone of site		
	Acceptable	Conditionally acceptable	Unacceptable
House, home unit, flat, caravan park	Less than 20 ANEF (Note 1)	20 to 25 ANEF (Note 2)	Greater than 25 ANEF
Hotel, motel, hostel	Less than 25 ANEF	25 to 30 ANEF	Greater than 30 ANEF
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Hospital, nursing home	Less than 20 ANEF (Note 1)	20 to 25 ANEF	Greater than 25 ANEF
Public building	Less than 20 ANEF (Note 1)	20 to 30 ANEF	Greater than 30 ANEF
Commercial building	Less than 25 ANEF	25 to 35 ANEF	Greater than 35 ANEF
Light industrial	Less than 30 ANEF	30 to 40 ANEF	Greater than 40 ANEF
Other industrial	Acceptable in all ANEF zones		

Notes:

1. The actual location of the 20 ANEF contour is difficult to define accurately, mainly because of variations in aircraft flight paths.
2. Within the 20 ANEF to 25 ANEF, some people may find that the land is not compatible with residential or educational uses. Land use authorities may consider that the incorporation of noise control features in the construction of residences or schools is appropriate.
3. There will be cases where a building of a particular type will contain spaces used for activities which would generally be found in a different type of building (e.g. an office in an industrial building). In these cases Table A.1 should be used to determine site acceptability, but internal design noise levels within the specific spaces should be determined by reference to the Australian Standard.
4. The Australian Standard does not recommend development in unacceptable areas. However, where the relevant planning authority determines that any development may be necessary within existing built-up areas designated as unacceptable, it is recommended that such development should achieve the required Aircraft Noise Reduction (ANR) determined in accordance with the Standard. For residences, schools, etc., the effect of aircraft noise on outdoor areas associated with the buildings should be considered.
5. In no case should new development take place in greenfield sites deemed unacceptable because such development may impact on airport operations.

Source: AS 2021- 2000

LEGEND:

20 / 25 — ANEF CONTOURS, SHOWING ANEF VALUES

NOTES :

1. *ANEF CONTOURS WERE GENERATED USING INM v6.1.*
2. *FOR TRACK, PROFILE AND AIRCRAFT MOVEMENT DETAILS REFER TO HMAS ALBATROSS 2014 ANEF SUMMARY REPORT (GHD), September 2004*

This 2014 ANEF contour plan of HMAS Alatross is endorsed by

Signature: Chris Bee (ASSPED) Date: 17 Jan 05

Chris Bee
Assistant Secretary Strategic Planning and Estate Development

SCALE IN METRES
250 0 250 500
(1 : 25,000 for A3 size)

GHD
MANAGEMENT
ENGINEERING
ENVIRONMENT

23/10839/ALB DGN/
SUMMARY/FIGURE 21 ANEF.DGN

AUSTRALIA
Department of Defence

SEPTEMBER 2004

HMAS ALBATROSS, NOWRA NSW
2014 ANEF SUMMARY REPORT

2014 ANEF

Proposed Residential Development in relation to HMAS ANEF 20 Contour

(not to scale)

5402-1
Appendix C