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Our Ref: 018/13

11 September 2013

Mr Steve McGrath
General Manager
Coffs Harbour City Council
Locked Bag 155
COFFS HARBOUR NSW 2450

Dear Sir

Planning Proposal: Lot 13 DP 591220, Cook Drive, Coffs Harbour.

I am writing on behalf of Mr. J and Mrs. M Auld to advise of a Planning Proposal to seek the rezoning of part of the above lands to B5 Business Development. Please find enclosed a Planning Proposal Report which addresses the matters in relation to the rezoning of the land.

As outlined in the Report the main justifications for the rezoning are:

- The cleared parts of the land have been inadvertently zoned for environmental protection purposes;
- The highest and best use under the current zoning is for a single dwelling house or dual occupancy development which are incompatible with the surrounding trade service uses and the hazards associated with flooding and bushfire applying to the land;
- The rezoning will allow for the development of a bulky goods retail premises or light industrial premises which are compatible with the surrounding area and provide for better outcomes in terms of flood and bushfire protection;
- The development of the land for a bulky goods retail premises or light industrial premises provides a financial incentive for the rehabilitation of the degraded bushland on the balance of the land which is to retain an environmental protection zoning;
- The rezoning provides an incentive for improving the ecological values on the balance of the land and provision of a wildlife corridor in perpetuity and possible cycle way and pedestrian link between the South Coffs Industrial and Residential areas;
- The proposed rezoning will provide for a capital investment of approximately $2.8million and will provide much needed investment and employment opportunities in this locality;

The proposed rezoning is in keeping with the zoning on the adjoining land and is in keeping with Council's strategic directions for business development in the locality; and

Zoning the cleared parts of the land to B5 will provide for a bulky goods or light industrial development on the land that can serve the growing housing market associated with the new residential release areas of North Boambee Valley and South Coffs harbour which are within 2km of the land.

It is considered that the rezoning is in keeping with Council's vision for sustainable development within the City and is worthy of Council's support.

Should you require any further information please do not hesitate to contact me.

Yours faithfully

Rick Bennell
Town Planner

Attachment

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Report: Planning Proposal

Proposal: Rezoning part of the land to B5 Business Development Zone

Property: Lot 13 DP 591220, Cook Drive, Coffs Harbour

Applicant: Mr. J and Mrs. M Auld

Author: Bennell & Associates

Date: 11 September 2013

BENNELL & ASSOCIATES

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Section 1

Summary

Bennell and Associates has been engaged by Mr. J and Mrs. M Auld to prepare this Planning Proposal Report in support of the rezoning of the cleared parts of the subject land from Environmental Protection purposes to the B5 Business Development zone. The land was originally zoned Special Uses and was part of a future Highway Corridor (Eastern Arterial) that was to bypass the Coffs Harbour City Centre along the alignment of Hogbin Drive. The preferred route for a western bypass for the Highway made this corridor redundant and surplus to the then Roads and Traffic Authority's needs; the Special Uses (Classified Road) zoning under Local Environmental Plan (LEP) 2000 also became redundant.

The rezoning from Special Uses was considered under the South Coffs LEP and under this LEP the cleared part of the land was inadvertently zoned for environmental protection purposes. On 10 October 2012 a submission was made to the exhibition of the Draft Coffs Harbour LEP 2012 seeking the rezoning of the cleared parts of the land for industrial purposes (i.e. IN1 General Industrial) in keeping with the adjoining lands to the south east. Council subsequently reported that: ...*it may be more appropriate to zone the land the same as land adjoining the western boundary of the site, being the B5 Business Development zone, as proposed in draft LEP 2012.'* The Council report concluded that: ... *the optimum way forward for a proposal of this nature is for a planning proposal to rezone the land. The necessary environmental studies could then be prepared to better inform decisions.*

The Planning Proposal is for the rezoning of the cleared parts of the land to B5 Business Development. The cleared parts of the land are defined by those parts of the land outside the drip line of the forested areas and fitting within a rectangular shaped area (measuring 34m x 82m) with an area of 2788m2. Under the B5 zoning the land will be subject to the floor space ratio and height control provisions of LEP 2013 which would allow a two storey building with a maximum floor space of 1,394m2 on the cleared parts of the land.

The remainder of the land would be retained as bushland in perpetuity and would form part of a wildlife corridor extending to Newports Creek. This will result in 12,110m2 of land set aside as a habitat corridor and buffer between the business and industrial zone. The report has identified rehabilitation measures under a detailed Vegetation Management Plan to ensure the ecological values of the land are improved. The report also suggests that the land could form part of an off road cycleway to provide access between the South Coffs Industrial area and the South Coffs Urban release area. The rezoning provides the financial incentive for the rehabilitation of this land that is not afforded under the current zoning.

The land is subject to bushfire hazard and flooding and detailed reports on these hazards have been prepared as part of this planning proposal. The reports indicate that these hazards can be managed and the land can be developed for a bulky goods retail premises or a light industrial use as would be expected with the zoning change. The report demonstrates that the rezoning and likely use of the land for a bulky goods retail premises or a light industrial use provides a better alternative, in terms of flooding bushland management and fire hazard, to the likely use of the land for a single dwelling house under the current zoning.

The proposed rezoning provides for a more compatible land use strategy for the subject land than the current zoning which allows for a dwelling house on the land as the 'best and highest' use. A dwelling house would not be compatible in terms of aesthetics, surrounding industrial land use functions, noise and environmental management of the balance of the land. Conversely a bulky goods or light industrial building would be compatible with the site and surrounding mixed industrial and business area.

In terms of capital investment, the proposal is expected to result in a development with a construction cost in the order of $2.8 million that will assist in an economic boost for the local economy. The construction phase will provide employment opportunities for builders, plumbers, electricians, painters, landscapers, utility technicians, plasterers, fabricators and other contractors. The proposal will also provide post construction jobs that will further assist the local economy.

Council's Our Living City Settlement Strategy outlines significant growth around the South Coffs Harbour area including the North Boambee Valley Release Area (849 possible dwellings), South Coffs Release Area (477 possible dwellings) and Boambee Rural Residential Release Area (23 possible dwellings). These new dwellings in these release areas will increase demand for bulky goods items and light industrial uses associated with the construction industry. The subject land is strategically placed to provide for the trade service needs of the housing construction industry being located close to the Pacific Highway and within 2km of theses future housing areas.

The rezoning of the cleared parts of the land to allow a bulky goods premises or light industrial premises represents sound planning practice and provides for a development that is compatible with the surrounding area and an opportunity to deliver a number of environmental benefits outlined above. The proposal is in keeping with Council's vision for a sustainable city and is worthy of Council's support.

Site Plan of Potential Development after rezoning

Section 2

Introduction

Bennell and Associates has been engaged by Mr. J and Mrs. M Auld to prepare this Planning Proposal Report in support of the rezoning of the cleared parts of the subject land from Environmental Protection purposes to the B5 Business Development zone.

2.1 Background:

The following provides a summary of the history of the zoning of the land followed by a summary of the planning process and an outline of the scope of this report.

2.1.1 Planning History

The land was originally part of a future Highway Corridor (Eastern Arterial) that was to bypass the Coffs Harbour City Centre along the alignment of Hogbin Drive; the land was previously owned by the then Roads and Traffic Authority (RTA). Urban development in the vicinity of Richmond Drive in the northern part of the road corridor and later an alternative western bypass solution made this corridor redundant and surplus to the RTA's needs; the Special Uses (Classified Road) zoning under Local Environmental Plan (LEP) 2000 also became redundant.

The rezoning from Special Uses was considered under the South Coffs LEP and under this LEP the cleared part of the land was inadvertently zoned for environmental protection purposes. The supporting Local Environmental Study (LES) recommended, inter alia, zoning the entire corridor south of Cook Drive for environmental protection purposes on the basis of the Flora and Fauna Surveys conducted by Kendall and Kendall on 4 January 2000 and included as Appendix 2 to the LES.

The Flora and Fauna studies clearly identify this land as a "Low Quality Habitat Area"; refer to Appendix A extract from Appendix 2 of the LES. Unfortunately the key to this graphic in Appendix 2 was ambiguous and led to the land being grouped with the balance of the land which supports koala habitat with a medium quality habitat value. It is to be noted that there were no other identified constraints in the LES that could lead to the conclusion that the land should be zoned for environmental protection purposes.

On 10 October 2012 a submission was made to the exhibition of the Draft Coffs Harbour LEP 2012 seeking the rezoning of the cleared parts of the land for industrial purposes (i.e. IN1 General Industrial) in keeping with the adjoining lands to the south east.

In response to this submission Council considered both zoning options and reported on the 13 December 2012 as follows:

- *Zone IN1 General Industrial*

The submission has requested the north western corner of the site be zoned IN1. In the event the land was considered suitable for development, it may not necessarily be appropriate to zone the land for industrial development, because the land does not sit adjacent to IN1 zoned land in draft LEP 2012. It would be separated from the IN1 zone to the east by vegetation and the E2 zone.

- *Zone B5 Business Development*

In the event the land was considered suitable for development, it may be more appropriate to zone the land the same as land adjoining the western boundary of the site, being the B5 Business Development zone, as proposed in draft LEP 2012. The objective of this zone is to enable a mix of business and warehouse uses, and bulky goods premises that require a large floor area, in locations that are close to, and that support the viability of, centres. Given the environmental sensitivity of the surrounding land, it might be more suited to this type of development than an industrial use.

The Council report on the submission also made the following relevant points in relation to the issues concerning flooding and vegetation management:

- *Flooding*

Council's Environmental Services (Flooding) Section has advised that flooding is a significant issue in the area. Existing businesses in the area have experienced two or three flood events in 2009. Council's current controls require new lots to be above the 1:100 year flood level. Any rezoning would need to satisfactorily address the relevant Section 117 Directions (4.3 Flood Prone Land). This information is not currently available and rezoning therefore is not supported.

- *Vegetation Management*

Council's Recreational Services Section have advised that no details on the condition of the site, rubbish or weed infestation has been provided. Detailed assessment on the condition, flora and fauna values of the land as well as any proposed maintenance regime would need to be provided to enable Council to consider whether this urban bushland would be of benefit in community ownership.

The Council report on the submission concluded that:

It is considered that the optimum way forward for a proposal of this nature is for a planning proposal to rezone the land. The necessary environmental studies could then be prepared to better inform decisions.

This planning proposal is in response to this conclusion.

2.1.2 Planning Proposal Process

A gateway determination is issued by the Minister for Planning (or delegate) and specifies whether a planning proposal is to proceed and, if so, in what circumstances (Environmental Planning and Assessment Act, 1979- Section 56).

The purpose of the gateway determination is to ensure there is sufficient justification early in the process to proceed with a planning proposal. The gateway determination is a checkpoint for planning proposals before significant resources are committed to carrying out technical studies and investigations.

Gateway Process: The gateway process has the following five steps:

- **Step 1 Planning proposal** – the relevant planning authority is responsible for the preparation of a planning proposal, which explains the effect of and justification for the plan. If initiated by the Minister (rather than the local council which is mostly the case) the Minister can appoint the Director-General or a joint regional planning panel to be the relevant planning authority.

- **Step 2 Gateway** – The Minister or delegate) determines whether the planning proposal is to proceed. This Gateway acts as a checkpoint to ensure that the proposal is justified before further studies are done and resources are allocated to the preparation of a plan. A community consultation process is also determined at this time. Consultations occur with relevant public authorities and, if necessary, the proposal is varied.

- **Step 3 Community consultation** – the proposal is publicly exhibited (generally low impact proposals for 14 days, others for 28 days). A person making a submission may also request a public hearing be held.

- **Step 4 Assessment** – The relevant planning authority considers public submissions and the proposal may be varied as necessary. Parliamentary Counsel then prepares a draft local environmental plan – the legal instrument.

- **Step 5 Decision** – With the Minister's (or delegate's) approval the plan becomes law.

2.1.3 Scope of Report

This report provides for the information with respect to Step 1 and provides an outline of the proposal, a justification of the proposal and a response to the matters required to be addressed by Council as detailed above. The structure of the report is as follows:

- The Land and Surrounding Environment;
- Planning Proposal;
- Local Strategic Directions;
- State and Regional Policies and Ministerial Directions; and
- Key Issues.

Section 3

The Land and Surrounding Environment

3.1 The Land:

The subject land is located approximately 2.5km south of the Coffs Harbour City Centre on the eastern side of the Pacific Highway. The real property description is Lot 13 DP591220 and the property has frontage to Cook Drive; refer Figure 1. Cook Drive is a collector road serving the South Coffs Industrial Estate.

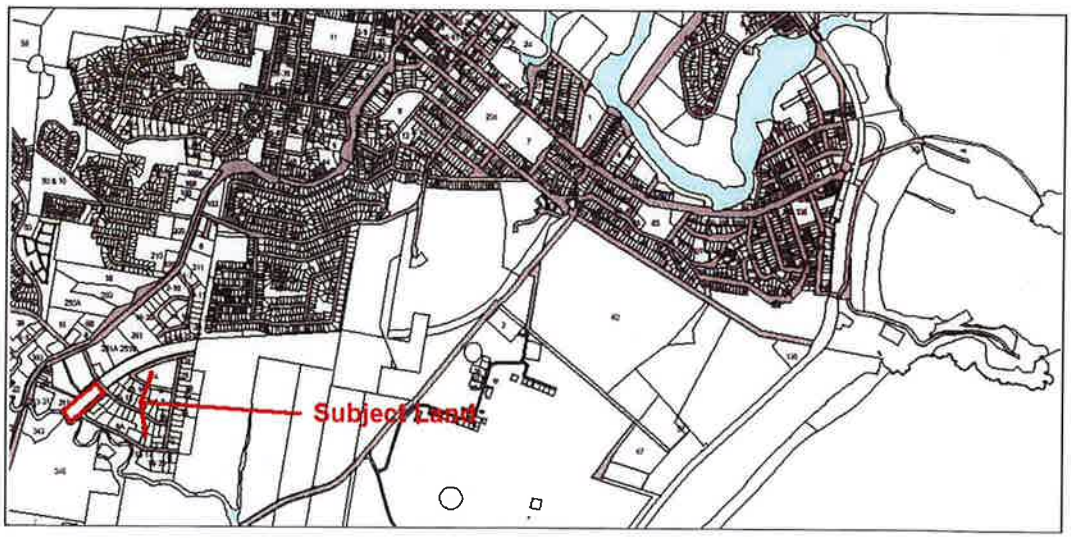


Figure 1: **Locality** (source: CHCC GIS)

The land is generally rectangular in shape with the southern boundary defined by Newports Creek. The land has an area of 1.433 hectares and the cleared part of the land, which is the subject of this rezoning proposal, has an area of 0.2787hectares (2787m2). The long axis of the land parcel is over 235m and the short axis is in excess of 60m; the land has a 60.365m frontage to Cook Drive and an extensive frontage to O'Keefe Drive, refer Figure 2 below. A detailed site plan of the site by IG Evison and Partners is included in Appendix A.

The land is generally flat and has an elevation ranging from 4m Australian Height Datum (AHD) at the north eastern end to 2m AHD at the south western end near Newports Creek.

The land supports native vegetation consisting of Dry and Wet Sclerophyll Forests with the drier forest located towards Cook Drive and the wetter forest near Newports Creek. The cleared part of the land is located near Cook Drive and is a mix of grassed areas and barren areas,

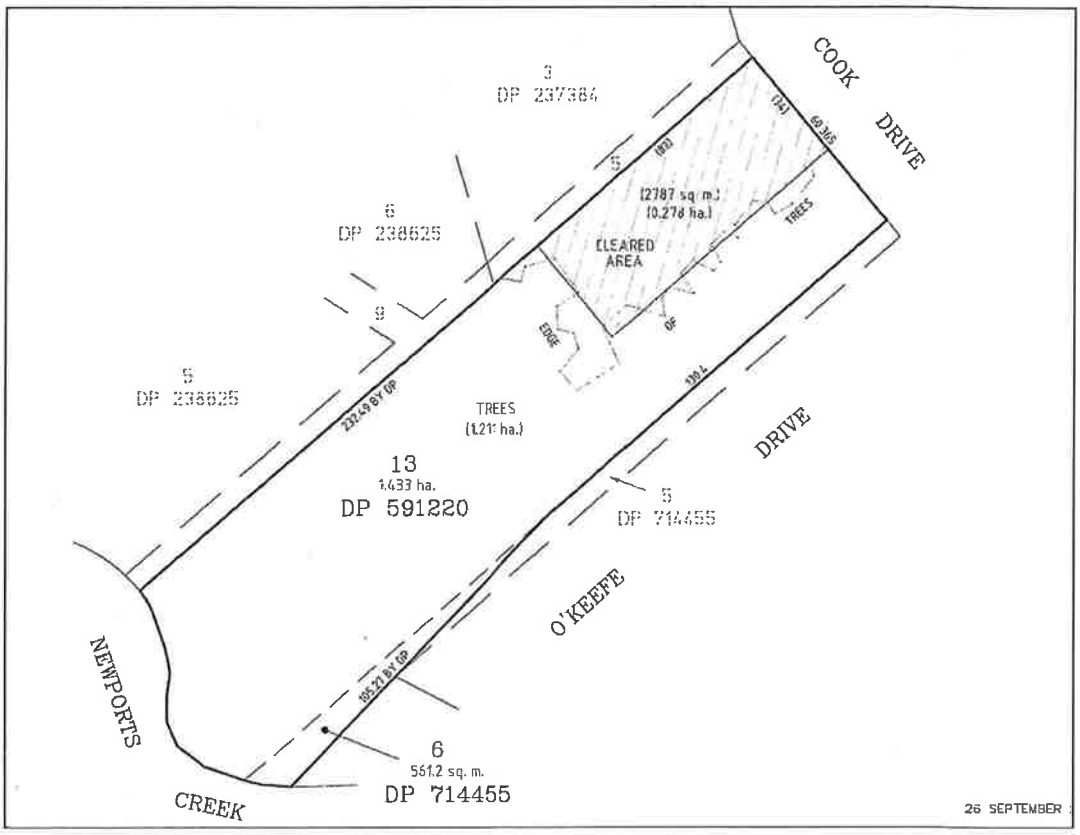


Figure 2: **Site Plan**

The land is vacant but has been used for the dumping and storage of various materials over time.

The land is mapped as being flood prone, subject to low-high hazard acid sulfate soil risk, partly bushfire prone and supports koala habitat; it being noted that the high hazard acid sulfate soils, koala habitat and bushfire risk areas generally relate to the forested parts of the land.

The land has access to the reticulated water and sewer system and the electrical grid and telecommunications network is available to the land.

Figure 3: **Aerial Photo of Subject Land** (source: CHCC GIS)

While the land is subject to a number of constraints that create some limitations for development, none of these constraints are considered prohibitive to the development of the cleared parts of the land. Nevertheless, it would be prudent for the areas mapped as koala habitat to be protected and conserved in any future development of the land.

3.2 The Surrounding Environment:

The land forms part of the Newports Creek catchment which extends from the Boambee State Forest to the airport before connecting with the Boambee Creek catchment. The land lies on the lower part of the catchment. The catchment includes native forests and heavily urbanised areas; the subject land is in a heavily urbanised part of the catchment within the South Coffs Industrial area; refer Figure 4.

The northern boundary of the land is defined by Cook Drive which is a two way, sealed collector road. On the opposite side of Cook Drive from the subject land is the forested surplus road corridor and a number of metal fabricators.

The southern boundary of the land is defined by the meandering Newports Creek and on the opposite side of the creek from the subject land are the Coffs Harbour Health Campus (Hospital) and a private medical centre and associated car parking areas.

To the west of the subject land is a large site under construction to be used as a large hardware retail and wholesale outlet ("Bunnings") and immediately to the west of this land is the Pacific Highway. Between the 'Bunnings' site and the subject land is a narrow strip of Council owned land (Lot 5 DP 237384) that is classified as community land and is likely to have been created for the sewer line which extends along this alignment.

The eastern boundary of the subject land is defined by O'Keefe Drive and on the opposite side of this road from the subject land is a range of light industrial uses including a metal fence manufacturer and panel beaters workshop.

Figure 4: **Aerial Photo of Surrounding Environment** (source: CHCC GIS)

The surrounding environment is best described as a highly urbanised environment that is dominated by light industrial uses and the soon to be constructed large hardware store. The subject land and its surrounding environment are relatively robust areas that would be tolerable of a development on the subject land that retained the forested parts of the land and allowed the cleared parts of the land to be developed with a compatible use.

The Proposal

4.1 Planning Proposal:

The objectives of this planning proposal are:

- To provide for a more compatible 'best and highest' use than the current 'best and highest' use as a site for a dwelling house;
- To provide for the development of the cleared parts of the land in conformity with the proposed business zone that is to apply to the adjoining land;
- To provide for the improved management of the vegetated parts of the land by increasing the economic viability of the balance of the land; and
- To provide for the development of the land in keeping with its environmental and servicing capacity.

The intended outcomes from the rezoning are:

- The development of a building, with a floor area not exceeding 1,394m2, on the cleared parts of the land to be used for a use in conformity with the B5 Business Development zone under the new LEP 2013; this use is likely to be a bulky goods or light industrial use;
- The provision of an incentive for an alternative development than the current permitted highest and best use for a single dwelling house or dual occupancy development on the land; these domestic uses are incompatible with the existing and potential uses and character of the surrounding area;
- The development of a one to two storey building that is in keeping with Council's design excellence criteria that makes a positive contribution to the urban form and streetscape of Cook Drive, in particular, and the gateway to the City Centre generally;
- The provision of a development that will provide employment opportunities during construction and post construction;
- An improvement to the ecological, aesthetic and functional values of the existing native vegetation on the land and creation of an opportunity for the potential future development of an off road cycleway and wildlife corridor in perpetuity; and
- A new development upon the land that meets the flooding and bushfire hazard objectives of Council and the NSW Rural Fire Service;

The Planning Proposal is for the rezoning of the cleared parts of the land to B5 Business Development. The cleared parts of the land are defined by those parts of the land outside the drip line of the forested areas and fitting within a rectangular shaped area (measuring 34m x 82m) with an area of 2788m2. The land is currently zoned 7A Environmental Protection (Habitat and Catchment) under LEP 2000 and is proposed to be zoned E2 Environmental Conservation under LEP 2013.

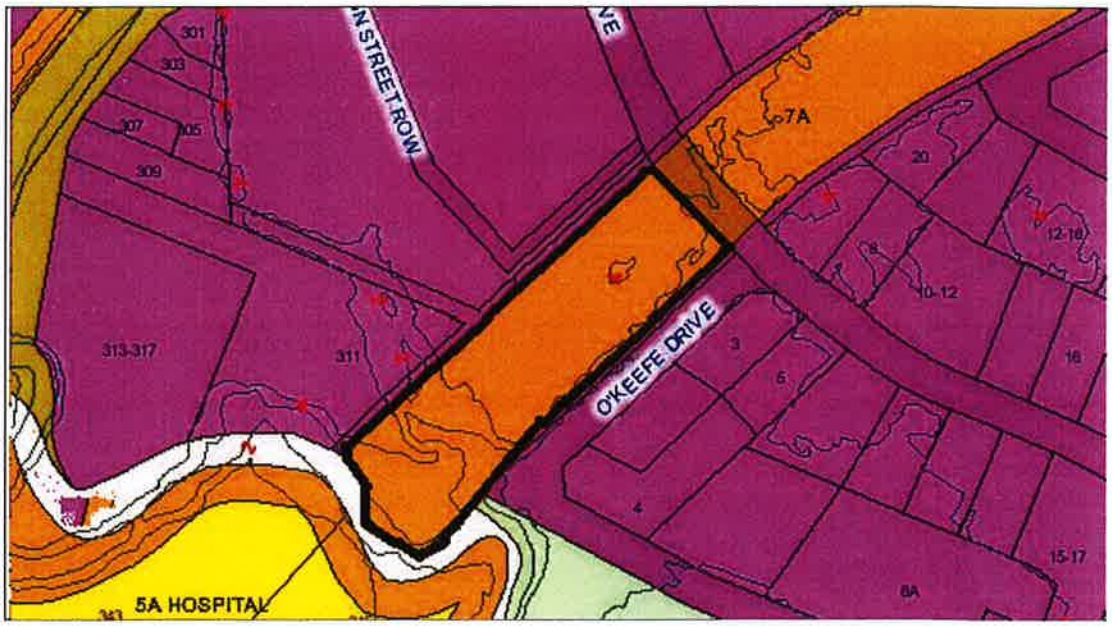


Figure 5: Current Zoning under LEP 2000

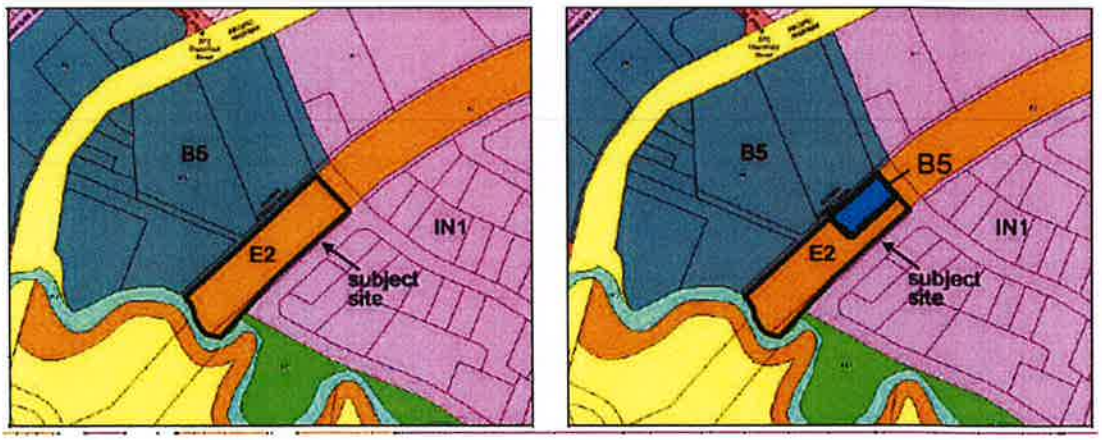


Figure 6: Zoning under LEP 2013 Zoning under Planning Proposal

Figure 5 above shows the existing zoning under LEP 2000 and Figure 6 shows the zoning under LEP 2013 and proposed zoning under this planning proposal. It is to be noted that LEP 2013 is expected to be gazetted before the zoning under this planning proposal is determined.

The objectives, permitted uses and prohibited uses under the B5 zone as described in the adopted LEP 2013 are shown in the table below:

Land Use Table B5 Business Development Zone
1.Objectives of zone
To enable a mix of business and warehouse uses, and bulky goods premises that require a large floor area, in locations that are close to, and that support the viability of, centres.
2. Permitted without consent
Building identification signs; Home-based child care; Home businesses; Home occupations
3. Permitted with consent
Backpackers' accommodation; Bulky goods premises; Child care centres; Dwelling houses; Garden centres; Hardware and building supplies; Hotel or motel accommodation; Kiosks; Landscaping material supplies; Light industries; Passenger transport facilities; Plant nurseries; Respite day care centres; Roads; Rural supplies; Serviced apartments; Take away food and drink premises; Timber yards; Vehicle sales or hire premises; Warehouse or distribution centres Any other development not specified in item 2 or 4
4. Prohibited
Agriculture; Air transport facilities; Airstrips; Amusement centres; Animal boarding or training establishments; Boat building and repair facilities; Boat launching ramps; Boat sheds; Camping grounds; Caravan parks; Cemeteries; Charter and tourism boating facilities; Correctional centres; Crematoria; Depots; Eco-tourist facilities; Electricity generating works; Entertainment facilities; Exhibition homes; Exhibition villages; Farm buildings; Forestry; Freight transport facilities; Function centres; Funeral homes; Heavy industrial storage establishments; Highway service centres; Home occupation (sex services); Industries; Jetties; Marinas; Mooring pens; Moorings; Office premises; Port facilities; Recreation facilities (major); Registered clubs; Residential accommodation; Restricted premises; Retail premises; Rural industries; Sewerage systems; Sex services premises; Tourist and visitor accommodation; Transport depots; Truck depots; Vehicle body repair workshops; Vehicle repair stations; Waste or resource management facilities; Water recreation structures; Water treatment facilities; Wharf or boating facilities

As can be seen by the table above the B5 zone allows a wide range of business uses expected in 'peripheral business centres and prohibits the core uses expected in the central business centres, notably commercial premises and retail premises. The site's: location within the South Coffs Industrial area; adjoining light industrial uses; and, soon to be constructed, bulky goods premises (i.e."Bunnings"), lends itself to a light industrial or bulky goods use. These uses are considered to be the most likely compatible future use of the land.

To realise the development of the land for this purpose it is reasonable to expect that the land will require filling to create a building platform above the planning flood level. In this regard the cleared part of the land will be filled to 0.5m above the flood level. It is to be noted that filling is likely to be required in any event for development under the current Environmental Protection zoning for a dwelling house. The potential flood impacts of this filling are addressed later in this report.

Under the B5 zoning the land will be subject to the floor space ratio and height control provisions of LEP 2013; Clauses 4.4 and 4.3 respectively. The maximum floor space ratio and building height limit applying to the 'Bunnings' land, which is to be rezoned to B5, under LEP 2013 is 0.5:1 and 11m, respectively. By applying these controls to the subject land, it is expected that a one to two storey bulky goods or light industrial building with a floor area of 1,394m2 (i.e. 0.5 x 2,788m2) would be developed on part of the development pad established on the land; the balance of the land would be used for access, parking and deliveries.

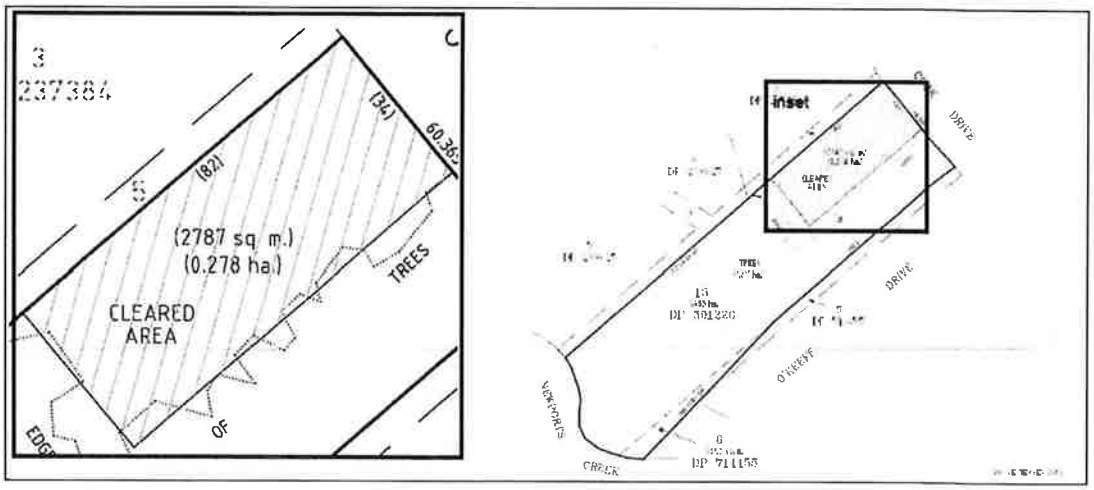


Figure 7: Land to be rezoned

Part of the proposal is for the protection of the balance of the land to be zoned E2 to form part of the habitat corridor that follows the surplus road corridor. This will protect this land as a buffer and corridor in perpetuity. This part of the land is recognised as having important habitat values and is mapped as primary koala habitat.

Section 5

Local Strategic Directions

There are a number of local policy documents that are used to guide development and rezoning decisions within the Coffs Harbour City Local Government Area. The main documents of relevance to this proposal are:

- Gateway Strategy;
- Our Living City Strategy.
- Business lands Strategy; and
- Review of Business Centres Hierarchy.

5.1 Gateway Strategy:

This Strategy was prepared in 2004 and, as the name suggests, set out to: '*create "gateways" to the City of Coffs Harbour to create a sense of arrival into the local community and to provide for safe pedestrian movement between the eastern and western sides of the Highway.*'

The subject land falls within the general area of the Southern Precinct which was described in the strategy as a myriad of industrial and light industrial land uses, interspersed with car dealerships. The general character was seen as one of large scale activity, dominated by significant vehicular movements. The general character of the roadway was seen as similar to the northern end of the Study Area, with deteriorated landscape character and requiring improvements to landscape treatment.

The visual clutter caused by the dominance of advertising structures along the Highway and the poor appearance to the urban landscape, as the entry to Coffs Harbour, were cited as major issues. The report recommended, inter alia, a review of the Signage Development Control Plan and improvements to the landscape character to screen some of the unsightly industrial developments that align the Highway.

This proposal will help improve the aesthetic appearance of the site by providing a land use zoning that will provide an impetus for redevelopment of this barren unattractive site. The proposed rezoning and resultant development will add to the sense of entry to the City and will make a positive contribution to this southern gateway location.

This planning proposal is in keeping with this strategy.

5.2 Our Living City Strategy

The Our Living City Strategy (OLC Strategy) is Council's Growth Management Strategy prepared in 2007. The OLC Strategy was prepared pursuant to Clause 38(3) of the North Coast Regional Environmental Plan 1988, and sets out a future for the growth and development of the Local Government Area until 2031. The goal of OLC Settlement Strategy is to foster healthy urban communities which contribute to delivering our Vision for the city:

The Healthy City, the Smart City and the Cultural City for our Future.

In terms of economic development, the OLC Strategy seeks to maintain the business centres hierarchy and increase employment and education opportunities, particularly in relation to innovation. The OLC strategy outlines significant growth around the South Coffs Harbour area including the North Boambee Valley Release Area (849 possible dwellings), South Coffs Release Area (477 possible dwellings) and Boambee Rural Residential Release Area (23 possible dwellings); refer Figure 8 below. These new dwellings in these release areas will increase demand for bulky goods items and light industrial uses associated with the housing construction industry.

In terms of environmental sustainability, the OLC Strategy seeks to protect existing habitat areas and protect these areas from adverse impacts; the OLC Strategy is particularly interested in ensuring that the beaches, natural habitat, clean water and open spaces areas are preserved and maintained for enjoyment by existing and future generations.

As stated above, part of the proposal is for the protection of the balance of the land that supports native vegetation (to be zoned E2) to form part of the habitat corridor that follows the surplus road corridor. This will ensure this land is protected as a buffer and corridor for existing and future generations.

The proposal is consistent with this strategy.

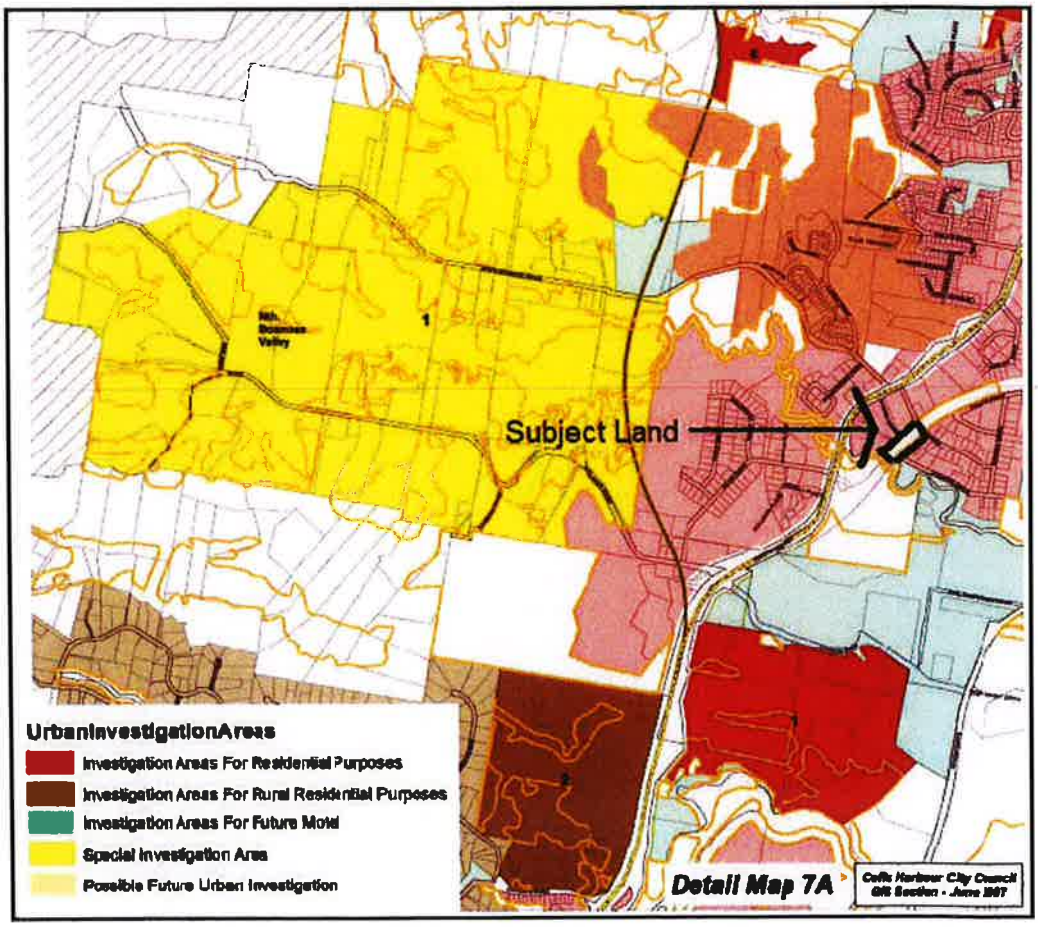


Figure 8: Extract from OLC Strategy Map 7A

5.3 Business Lands Strategy:

The Business Lands Strategy was prepared in 2010 to provide Council and the community with a strategic planning framework to guide the future development of commercial lands within the Coffs Harbour Local Government Area. The Strategy was prepared to form the Business Lands component of the Coffs Harbour City Local Growth Management Strategy.

The strategy recommended applying six business zones in the draft LEP: B1 Neighbourhood Centre, B2 Local Centre, B3Commercial Core, B4 Mixed Use, B5 Business Development and B6 Enterprise Corridor.

The Strategy recommended maintaining the primacy of the Coffs Harbour CBD as the principal business, office and retail hub of the City and to continue the hierarchy of business zones which was established under LEP 2000. The strategy also recommended a floor space ratio limit of 0.5:1 and a height limit of 11m for the B5 zone.

The strategy observed that:

> *Retailing in Coffs Harbour is characterised by a range of different types of retailing formats and these have significant implications for land-use. Big Box Retailing, Bulky Goods Retailing and Mainstreet Retail activities are all present in the LGA. These different broad land-use types have different landuse requirements and this should be reflected in planning policy and controls. For example, bulky goods retailing will typically require large, flat lots with good highway access and exposure.*

The Strategy acknowledged the development of bulky goods retailing in the 4A Industrial zone and recommended targeted areas to be zoned for bulky goods retailing (i.e. B5 Business Development).

The strategy formed the basis of the provisions of LEP 2013.

5.4 Review of Business Centres Hierarchy:

This document was prepared in 2011 to review the existing business centres hierarchy of Coffs Harbour and to provide direction for the business zones throughout the Local Government Area under the new Standard Instrument.

The Strategy recommended that parts of the Cook Drive area be rezoned B5 Business Development to provide for warehouse and bulky goods retail developments that require large floor areas in locations close to and that support (but not detract from) the vitality of Centres. The review notes that Highway locations are appropriate for bulky goods retailing because these uses rely on easy access and some exposure to major roads and associated passing trade.

This review accepts that bulky goods retailing has an important and legitimate role in the retail sector but raises caution over the potential for impact upon the major business centres. The review notes that expansion of the B5 zone and bulky good retailing outside of the designated locations is very undesirable.

Figure 9: Business Centres in Coffs Harbour Source: SGC Economics and Planning 2009

This Review led to the rezoning of the 'Bunnings' land to B5 Business Development and it is anticipated that if the subject land was not zoned for environmental protection purposes it would have been similarly zoned as a logical extension of the B5 zoning; the bushland areas on the land would have presented a logical boundary and buffer between the proposed B5 zone and IN1 General industrial zone.

In light of the above, this planning proposal is considered to be in keeping with the intent of the Review by providing a B5 Business Development zone in an area (i.e. Cook Drive) located near the Highway and away from the main CBD.

Section 6

State and Regional Policies and Ministerial Directions

The principal State and Regional policies applying to the land are embodied within:

- Mid North Coast Regional Strategy:
- North Coast Regional Environmental Plan;
- State Environmental Planning Policy (SEPP) No.71- Coastal Protection;
- The NSW Coastal Policy; and
- Ministerial Directions.

6.1 Mid North Coast Regional Strategy:

The Mid North Coast Regional Strategy is the principal strategy for managing growth and development on the Mid North Cost of NSW. The Strategy envisages a population increase of 94,000 people and a growth rate of 1.1% per annum; the current population of the Mid North Coast is around 330,000 people.

The Strategy nominates Coffs Harbour, Port Macquarie and Great Lakes/Taree as the main areas under population growth pressure. Coffs Harbour is identified as a Major Regional Centre; refer to Figure 10 below. Major Regional Centres are to be the focus of population growth, employment, higher order retailing, bulky goods operations and the focal point for subregional road and other transport networks.

An additional 59,600 dwellings will be required to meet the housing demands of this population by 2031 according to the Strategy. The Strategy includes maps of growth areas designated to accommodate housing in the Mid North Coast Region until 2031.

To provide employment services for this population the Strategy sates:

> *that additional commercial floor space (including car parking and associated services) will need to be provided in a manner that maintains and reflects this hierarchy. Additional floor space will be established through the redevelopment of existing centres and business zones. However, it is recognised that some new commercial development will be needed to service the new release areas and these areas will need to be consistent with the commercial hierarchy and integrated into planning these new areas.*

The strategy acknowledges that Coffs Harbour and the other Major Regional Centres will take the majority of future commercial development as they have the greatest capacity.

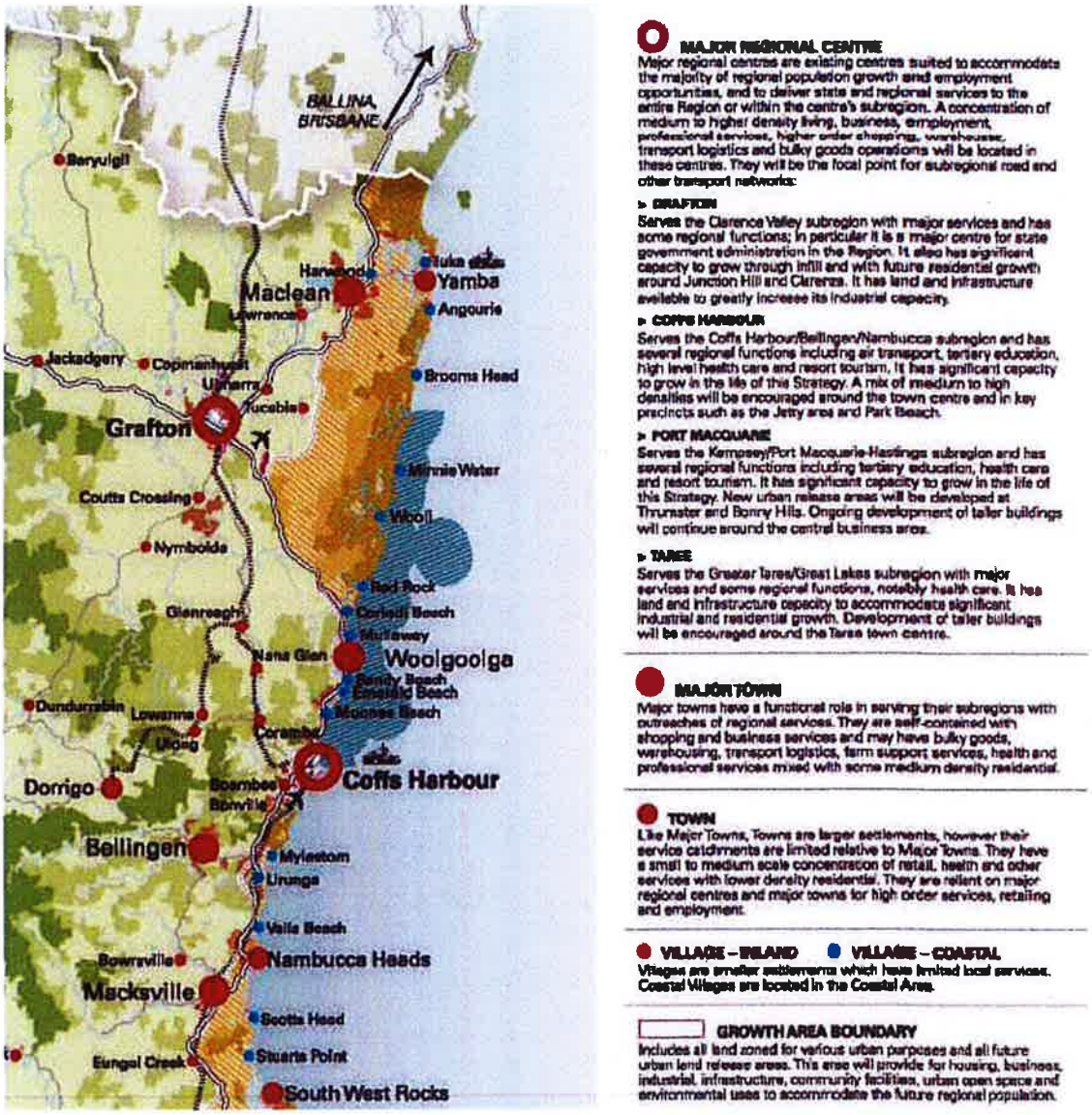


Figure 10: Mid North Coast Regional Strategy

The proposal provides for a logical extension of an existing business centre and is in keeping with the objectives of providing additional employment opportunities in close proximity to new release areas. The proposal is consistent with the Mid North Coast Regional Strategy.

6.2 North Coast Regional Environmental Plan:

North Coast Regional Environmental Plan (REP) 1988 is now deemed to be a SEPP. The provisions under the REP relevant to the rezoning of the subject land and the means of addressing the provision are discussed below:

Clause 29 Plan preparation—natural areas and water catchments

A draft local environmental plan should:

(a) retain existing provisions allowing the making of tree preservation orders,

(b) not alter or remove existing environmental protection, scenic protection or

(c) escarpment preservation zonings or controls within them, without undertaking a detailed analysis to determine whether there will be adverse environmental effects resulting from such action,

(d) include significant areas of natural vegetation including rainforest and littoral rainforest, riparian vegetation, wetlands, wildlife habitat, scenic areas and potential wildlife corridors in environmental protection zones,

(e) contain provisions which require that development in domestic water catchment areas or on land overlying important groundwater resources does not adversely affect water quality, and

(f) require consent for the clearing of natural vegetation in environmental protection, scenic protection or escarpment preservation zones.

Comment: The cleared part of the land was inadvertently zoned for environmental protection purposes as a result of the South Coffs Harbour LES. Nevertheless, this proposal provides for the protection of the forested areas of the site. This will result in 12,110m2 of land set aside as a habitat corridor and buffer between the business and industrial zones.

The proposal is in keeping with this Clause.

Clause 39 Plan preparation—retail, commercial or business activities

A draft local environmental plan should not provide for the establishment of significant retail, commercial or business development unless:

(a) the expansion is adjacent to or adjoins the existing commercial centre, or

(b) if the expansion is not adjacent to or adjoining the existing centre, that development is in accordance with a commercial/retail expansion strategy prepared by the council, published for public discussion and:

(i) be available, without charge, for public inspection and comment at the office of the council during normal office hours, and

(ii) be forwarded by the council for their information to such public authorities as, in the opinion of the council, have responsibilities reasonably requiring them to be aware of the strategy.

Comment: The proposal provides for a minor extension of the proposed B5 Business Development zone. The proposal is for a minor extension of the business zone providing for an additional 1394m2 of floor space potential. The proposal will not undermine the existing business centres hierarchy and is in keeping with this Clause.

Clause 40 Plan preparation—principles for urban zones

A draft local environmental plan applying to urban areas should adopt the following principles:

(a) zoning should be simple and flexible,

(b) provisions for flexible zone boundaries may apply to any zones except environmental protection zones,

(c) detailed guidelines within the broad zone parameters should be identified in a development control plan, and

(d) the principle of minimising energy use, in particular in the design of buildings and effective transport systems.

Comment: Coffs Harbour City Council has in place a new Development Control Plan that will come into effect when LEP 2013 is made. This DCP and LEP 2013 set guidelines for:

- Height limits
- Floor Space Ratio Limits
- Water Sensitive Urban Design;
- Stormwater Management and Flooding;
- Landform Modification;
- Water and Sewer Services;
- Landscaping;
- Acid Sulfate Soils;
- Energy Efficiency; and

Adequate planning and development controls will be in place for the development of the subject land.

The proposal is in keeping with this Clause.

Clause 45A Plan preparation—flood liable land

A draft local environmental plan should:

(a) not alter the zoning of flood liable land the zoning of which is described as special use—flood liable, rural, open space, scenic protection, conservation, environment protection, water catchment or coastal lands protection, or similarly described, to a zone described as residential, business, industrial, special use, village or similarly described, and

(b) not contain provisions which apply to flood liable land and which:

(i) permit an intensification of development on that land, or
(ii) are likely to result in an increase in the need for flood mitigation measures (including emergency measures), infrastructure or services, or
(iii) permit development to be carried out without development consent, except development for the purpose of agriculture which does not include landfill, drainage canals, fences, buildings or structures in the following places:

- *floodways,*
- *high hazard flood fringe,*
- *high hazard flood storage areas,*

as defined in the Floodplain Development Manual,

unless justified by a floodplain management plan prepared by the council in accordance with the Floodplain Development Manual.

Comment: The subject land is mapped as being flood prone and a Flood Impact Assessment has been conducted by Cardno (NSW/Act) Pty Ltd in consultation with Coffs Harbour City Council. This matter is reported in detail below.

Clause 45 Plan preparation—hazards

(1) A draft local environmental plan should not permit development for tourism, rural housing or urban purposes on land subject to the following hazards, namely:

(a) coastal processes,

(b) flooding or poor drainage,

(c) dangers arising from potential or actual acid sulphate soils,

(c1) dangers arising from contaminated land,

(c2) geological or soil instability,

(d) bush fire,

(e) aircraft noise at levels of more than 25 (measured according to the Australian Noise Exposure Forecast),

(f) air or water pollution, or airborne pollution, within 400 metres of sewage treatment works,

(g) disposal of septic effluent,

(h) existing offensive or hazardous industries, and

(i) high tension electrical power lines,

unless the council has made an assessment of the extent of the hazard and included provisions in the plan to minimise adverse impact.

(2) (Repealed)

(3) In the event of a bush fire hazard being identified for land on which dwellings are proposed to be permitted, the council shall not permit development unless it is satisfied that arrangements where appropriate have been made to:

(a) require the creation of a perimeter road or reserve which circumscribes the hazard side of the land intended for that development,

(b) require the creation of a fire radiation zone located on the bushland side of the perimeter road,

Comment: The land is not subject to any coastal processes or any identified geological instability or soil instability. The land is not located near any aircraft noise generation areas, offensive or hazardous industries and is not located near a sewerage treatment works or high voltage power lines.

The land is subject to the 1:100 year flood planning level, a low risk of acid sulfate soil and bushfire hazard. The investigations have shown that these risks are manageable and will not prevent the land being developed for bulky goods retailing or a light industrial use permitted under the B5 zone. The environmental hazards are addressed in detail later in this report.

Clause 47 Plan preparation and development control—principles for commercial and industrial development

Before preparing a draft local environmental plan relating to commercial or industrial development, the council should take into consideration the following principles:

(a) strong multi-functional town centres should be maintained to focus the drawing power of individual businesses and maintain the integrity of the main business area by only zoning land for further commercial or retail development where that development adjoins or is adjacent to the existing town centre,

(b) provisions contained in local environmental plans relating to retail, commercial, business and industrial zones should be flexible, especially to enable the development of light service industry near the central business district,

(c) there should be an adequate supply of zoned industrial land located where it is physically capable of development for industrial purposes, is not environmentally fragile and can be serviced at a reasonable cost.

Comment: The proposal is for a minor extension to the existing B5 Business Development zone that will provide an additional 1394m2 of floor space that will be restricted by the permitted uses allowed under the B5 zone; general retailing and commercial premises are not permissible in this zone. The land is located 2.5km away from the City Centre and is likely to provide for a bulky goods premises or a light industrial use; these uses are appropriately located away major business centres to allow for the large floor plate and access for loading and unloading demanded by these uses. Given the relatively minor floor space area and the site's location, the proposed rezoning will have no impact upon the integrity of the City Centre or any other nearby centres.

Clause 50 Plan preparation—height controls

Before preparing a draft local environmental plan applying to an urban area, the council should consider the necessity for height controls on buildings and include such controls as it considers appropriate.

Comment: The land will be subject to the 11m height limit under LEP 2013.

The proposal is in keeping with this Clause.

Clause 58 Plan preparation—servicing urban areas

A draft local environmental plan should not permit development for urban purposes unless the council is satisfied that:

(a) the proposed development will make the most economic use of existing services,

(b) where the proposed development is adjacent to an existing urban area and that urban area will be substantially increased, the provision of a reticulated water and sewer system will be provided at reasonable cost to each lot,

(c) the proposed development is located in an area which is consistent with the findings of any urban land release strategy prepared for the local government area or, where no such strategy has been prepared, the proposed development is located in the area to which services can be provided most readily,

(d) consideration has been given to the identification of effluent disposal and discharge points,

(e) domestic water catchment areas and water storage areas are not likely to be polluted as a result of the proposed development, and

(f) consideration has been given to the provision of public transport facilities, pedestrian and cycleways.

Comment: The development of the land represents an economically efficient use of the land with water, sewer and road services readily available to the land.

As stated above the land is located in an area *which is consistent with the findings of* the Coffs Harbour City land release strategy as expressed in the OLC Strategy.

The land can be connected to the reticulated sewer network and will have *no effluent discharge points.*

The land is not within a *domestic water catchment area and water storage area.*

The land is located in an existing urban area that is serviced by buses and can be accessed by cyclists and pedestrians; a new off road cycleway and pedestrian network could be extended over the land to link the South Coffs residential release with the South Coffs Industrial area.

The proposal meets the criteria of this Clause.

6.3 State Environmental Planning Policy No. 71:

SEPP No. 71 – Coastal Protection applies to the subject land as land is within the coastal zone. Council is required to take into account the matters listed in Clause 8 of the Policy when preparing a Draft Local Environmental Plan. These are listed below together with a response on how the proposal meets the requirement.

Matters for Consideration	Response
Aims of the Policy which seek to protect and better manage the NSW Coast.	The proposal is for a development in keeping with Council's Settlement Strategy which in turn has been prepared in keeping with coastal management policies.
Existing public access along the foreshore is to be retained.	Proposal will have no impact on public access.
Opportunities for new public access to the foreshore to be considered.	NA
Suitability of development in terms of type, location and design and its relationship with surrounding areas.	Site is suitable for this scale of development and is in keeping with the zoning of the surrounding lands.
Any detrimental impacts upon foreshore amenity, including overshadowing of foreshores or loss of significant views.	The proposal will have no impact upon the foreshore.
Scenic qualities of the NSW Coast.	The proposal will improve the scenic qualities of the precinct and add to the gateway appeal of this location. It will, in time, replace a barren parcel of land with a commercial development and result in the maintenance of a vegetated wildlife corridor and buffer.
Measures to conserve animals (including fish and marine vegetation) and existing wildlife corridors.	Habitat areas are to be protected and to provide an improved outcome for native flora and fauna.
The likely impact of coastal hazards and processes.	The land is not subject to any significant coastal hazards or processes; flooding issues are addressed later.
Measures to reduce potential conflict between land-based and water based coastal activities.	There are no land or water based conflicts to deal with.
Measures to protect Aboriginal culture.	The land is a highly disturbed site that is unlikely to be the source of any Aboriginal cultural values.
Likely impact on the water quality of coastal waterbodies.	The land can be developed to have a positive impact in terms of water quality with the imposition of WSUD measures.
Conservation and preservation of heritage items.	There are no identified heritage items on the land or on the adjoining lands.
Encouragement of compact towns and cities.	The proposal assists in creating a compact Town Centre; it is a logical extension of the adjoining business zone.
Cumulative impacts upon the environment and measures to ensure water and energy efficiency.	The proposal is in keeping with the City Settlement Strategy that has considered the wider cumulative impacts. Proposal will be subject to Section J of the BCA to ensure any new building is energy efficient.

6.4 NSW Coastal Policy:

The NSW Coastal Policy was released in 1997 and provides a vision for a sustainable future for the NSW Coast. The Policy establishes a number of strategic actions relating to the Natural Environment, Natural Processes and Climate Change, Aesthetic Qualities, Cultural Heritage, Ecologically Sustainable Human Settlement and Public Access and Use.

As stated above the proposal can be developed to have a positive impact upon the natural environment with the protection of the forested parts of the land and through the incorporation of water quality measures.

In terms of natural processes and environmental hazards, the proposal can be developed in a manner that will have a neutral impact upon the natural systems. Hazards relating to acid sulfate soils, bushfire impacts and flooding can be adequately managed and the existing koala habitat areas can be protected and enhanced through a Vegetation Management Plan (VMP); the VMP is addressed later in the report.

The subject land is an elevated site located well away from the coast and above predicted levels for sea level rise. The development of the land in an energy efficient manner is in keeping with Climate Change policies.

The land has potential to provide an important visual gateway to the city and a well designed building with landscaping can deliver benefits to the visual qualities of the City and coast generally.

The land does not accommodate a listed heritage item, is not within a heritage conservation area and is unlikely to be the source of any cultural heritage significance.

The proposal is in keeping with Council's settlement strategy which provides for ecologically sustainable human settlement; the proposal provides for a logical extension of the urban area and helps to consolidate the South Coffs Industrial /Trade Centre.

The land has access to pedestrian and cycleway links that add to the network of non-motorised transport links in the locality. However, it is to be noted that bulky goods retailing and light industrial uses are usually car orientated uses.

The proposal is in keeping with the Coastal Policy.

6.5 Ministerial Directions:

Ministerial Directions are directions that apply to a planning proposal to meet the state Government planning policies and strategies. The directions apply to the following policy areas:

1. Employment and Resources;
2. Environment and Heritage;
3. Housing, Infrastructure and Urban Development;
4. Hazard and Risk;
5. Regional Planning;
6. Local Plan Making; and
7. Metropolitan Planning.

The Ministerial Directions under Section 117 of the Environmental Planning and Assessment Act 1979 of relevance to this proposal are addressed as follows:

Direction 1.1 Business and Industrial Zones: Under this Direction a planning proposal must:

(a) give effect to the objectives of this direction,

(b) retain the areas and locations of existing business and industrial zones,

(c) not reduce the total potential floor space area for employment uses and related public services in business zones,

(d) not reduce the total potential floor space area for industrial uses in industrial zones, and

(e) ensure that proposed new employment areas are in accordance with a strategy that is approved by the Director-General of the Department of Planning.

Comment: The objectives of the direction seek to:

- encourage employment growth in suitable locations,
- protect employment land in business and industrial zones, and
- support the viability of identified strategic centres.

The proposal provides for an extension of the B5 zone to provide additional employment opportunities which is suitably located south of the City Centre in an area designated for considerable urban growth. The proposal is a minor extension of the B5 zone and will have no impact upon the viability of the business centres in the LGA. The proposal is in keeping with the objectives and the requirement to retain existing business zones; the proposal will add to the existing South Coffs business zone.

The proposal provides for an additional 1394m2 of floor space and is in keeping with the Business Centres Hierarchy as expressed in Council's Growth Management Strategy discussed earlier.

The proposal is consistent with this Direction.

Direction 2.1 Environmental Protection Zones: The objective of this direction is to protect and conserve environmentally sensitive areas. A planning proposal must include provisions that facilitate the protection and conservation of environmentally sensitive areas. Moreover, a planning proposal that applies to land within an environment protection zone or land otherwise identified for environment protection purposes in a LEP must not reduce the environmental protection standards that apply to the land (including by modifying development standards that apply to the land).

Comment: The subject land is zoned for environmental protection purposes; it is zoned 7A Environmental Protection (Habitat and Catchment) under LEP 2000 and proposed to be zoned E2 Environmental Conservation under LEP 2013. This proposal is supported by a Vegetation Management Plan (VMP) that seeks to rehabilitate the land The sensitive parts of the land are to be retained and will be preserved in perpetuity under the E2 zone.

The proposal is consistent with this Direction.

Direction 2.2 Coastal Protection Zones: The objective of this direction is to implement the principles in the NSW Coastal Policy and requires a planning proposal to include provisions that give effect to and are consistent with:

(a) the *NSW Coastal Policy: A Sustainable Future for the New South Wales Coast 1997*, and
(b) the *Coastal Design Guidelines 2003*, and
(c) the manual relating to the management of the coastline for the purposes of section 733 of the *Local Government Act 1993* (the *NSW Coastline Management Manual 1990*).

Comment: The proposal is consistent with these policy documents as it incorporates the following:

- management of environmental hazards;
- protection of sensitive areas;
- connection with existing urban areas;
- consistency with settlement strategies for the creation of compact towns;
- conservation of habitat links and habitat areas; and
- efficient connection to services, including transport, water and sewer services.

The proposal is consistent with this Direction.

Direction 3.4 Integrating Land Use and Transport: The objective of this direction is to ensure that urban structures, building forms, land use locations, development designs, subdivision and street layouts achieve the following planning objectives:

(a) improving access to housing, jobs and services by walking, cycling and public transport, and

(b) increasing the choice of available transport and reducing dependence on cars, and

(c) reducing travel demand including the number of trips generated by development and the distances travelled, especially by car, and

(d) supporting the efficient and viable operation of public transport services, and

(e) providing for the efficient movement of freight.

A planning proposal must locate zones for urban purposes and include provisions that give effect to and are consistent with the aims, objectives and principles of:

(a) *Improving Transport Choice – Guidelines for planning and development* (DUAP 2001), and

(b) *The Right Place for Business and Services – Planning Policy* (DUAP 2001).

Comment: The proposal provides the following measures to integrate land use and transport planning in accordance with the DUAP documents:

- Land is located with 500m of main arterial road for transport;
- Land is connected to available pedestrian and cycleway networks;
- Proposal provides opportunity to make land part of a pedestrian cycle network; and
- Land adjoins an existing business zone.

The proposal is consistent with this Direction.

Direction 4.1 Acid Sulfate Soils: The objective of this direction is to avoid significant adverse environmental impacts from the use of land that has a probability of containing acid sulfate soils.

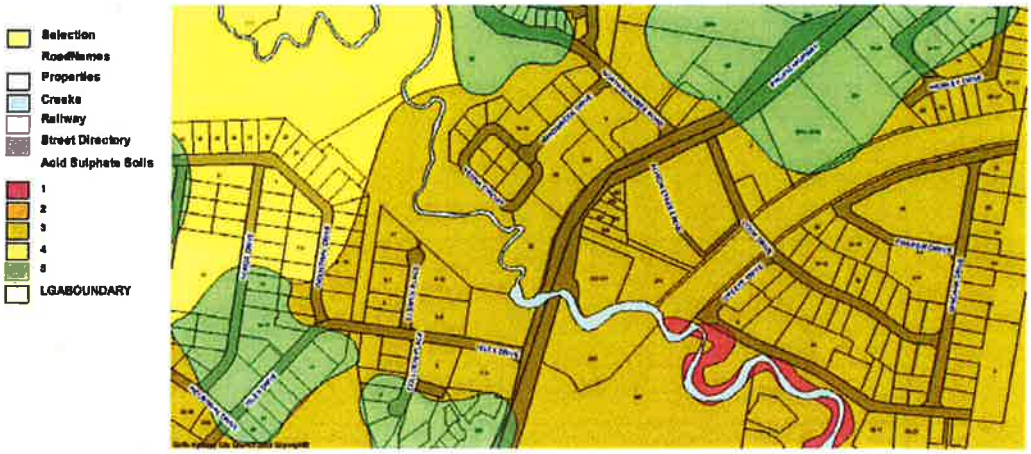


Figure 11 : Potential Acid Sulfate Soils Risk (source: CHCC GIS)

Comment: As stated earlier the subject land has a very low risk of containing acid sulphate soils as the land is within Class 3 of the acid sulphate soils risk maps as shown above. Given that the land is to be filled to provide a building platform, no adverse impacts from the development of the land in terms of groundwater quality or watertable issues are anticipated. It is to be noted that Acid Sulfate Soils risks are required to be taken into account by the Provisions of Clause 23 of LEP 2000 for any development application for the land.

Direction 4.3 Flood Prone Land:

Under this Direction a planning proposal must include provisions that give effect to and are consistent with the NSW Flood Prone Land Policy and the principles of the Floodplain Development Manual 2005 (including the Guideline on Development Controls on Low Flood Risk Areas). The Direction sets out a number of performance measures and rules relating to flood protection, flood risk and general flood management. The Direction allows a planning proposal to be inconsistent with this direction where the provisions of the planning proposal that are inconsistent are of minor significance.

Comment: These matters are addressed in the Key Issues section below.

Direction 4.4 Planning for Bushfire Protection: The objectives of this direction are:

(a) to protect life, property and the environment from bush fire hazards, by discouraging the establishment of incompatible land uses in bush fire prone areas, and

(b) to encourage sound management of bush fire prone areas.

A planning proposal must:

(a) have regard to Planning for Bushfire Protection 2006,

(b) introduce controls that avoid placing inappropriate developments in hazardous areas, and

(c) ensure that bushfire hazard reduction is not prohibited within the APZ.

A planning proposal must, where development is proposed, comply with the following provisions, as appropriate:

(a) provide an Asset Protection Zone (APZ) incorporating at a minimum:

  (i) an Inner Protection Area bounded by a perimeter road or reserve which circumscribes the hazard side of the land intended for development and has a building line consistent with the incorporation of an APZ, within the property, and

  (ii) an Outer Protection Area managed for hazard reduction and located on the bushland side of the perimeter road,

(b) for infill development (that is development within an already subdivided area), where an appropriate APZ cannot be achieved, provide for an appropriate performance standard, in consultation with the NSW Rural Fire Service. If the provisions of the planning proposal permit Special Fire Protection Purposes (as defined under section 100B of the Rural Fires Act 1997), the APZ provisions must be complied with,

(c) contain provisions for two-way access roads which links to perimeter roads and/or to fire trail networks,

(d) contain provisions for adequate water supply for fire fighting purposes,

(e) minimise the perimeter of the area of land interfacing the hazard which may be developed,

(f) introduce controls on the placement of combustible materials in the Inner Protection Area.

Comment: These matters are addressed in the Key Issues section below.

Direction 5.1 Implementation of Regional Strategies: The objective of this direction is to give legal effect to the vision, land use strategy, policies, outcomes and actions contained in regional strategies. Planning proposals must be consistent with a regional strategy released by the Minister for Planning.

Comment: As stated above the proposal is consistent with the Mid North Coast Regional Strategy; the proposal provides for a logical extension of an existing business centre and is in keeping with the objectives of providing additional employment opportunities in close proximity to new release areas.

The proposal is consistent with this Direction.

Direction 5.4 Commercial and Retail Development along the Pacific Highway,

A planning proposal that applies to land located on "within town" segments of the Pacific Highway must provide that:

- *new commercial or retail development must be concentrated within distinct centres rather than spread along the highway,*
- *development with frontage to the Pacific Highway must consider impact the development has on the safety and efficiency of the highway.*

Note: For the purposes of this paragraph, "within town" means areas which, prior to the draft local environmental plan, have an urban zone (e.g. "village", "residential", "tourist", "commercial", "industrial", etc) and where the Pacific Highway speed limit is less than 80km/hour (a)to facilitate the provision of public services and facilities by reserving land for public purposes, and to facilitate the removal of reservations of land for public purposes where the land is no longer required for acquisition.

Comment: This proposal provides for an extension of the existing business zone; the proposal does not provide for 'ribbon development'. Given the scale of buildings to be built on the adjoining "Bunnings" land to the west of the subject land, any buildings on the subject land will be well screened from the Highway. The land has access to a signalised intersection (Pacific Highway/Cook Drive) and will have no adverse impact upon the safety and efficiency of the highway.

The proposal is consistent with this Direction.

Section 7

Key Issues

The key strategic and development issues to consider in relation to this proposal concern:

- Land use compatibility;
- Flooding impacts;
- Vegetation and bushfire management;
- Economic impacts; and

7.1 Land Use Compatibility

As stated above the land lies on the lower part of the catchment of Newports Creek; a catchment which extends from the Boambee State Forest to the airport before connecting with the Boambee Creek catchment. The southern boundary of the land is defined by the meandering Newports Creek and on the opposite side of the creek from the subject land are the Coffs Harbour Health Campus (Hospital) and a private medical centre and associated car parking areas. The northern boundary of the land is defined by Cook Drive and on the opposite side of Cook Drive from the subject land is the forested surplus road corridor and a number of metal fabricators.

The eastern boundary is defined by O'Keefe Drive and on the opposite side of this road from the subject land is a range of light industrial uses including a metal fence manufacturer and panel beaters workshop. To the west of the subject land is a large site under construction to be used as a large hardware retail and wholesale outlet ("Bunnings") and immediately to the west of this land is the Pacific Highway.

Figure 12: Subject land and surrounding land uses

It is expected that upon the subject land being zoned for business purposes it will be developed for a building with a height of 1-2 storeys setback a minimum of 3m form the bushland on the site and setback approximately 6m from the front boundary. A building of this scale and with these setbacks would be in keeping with the existing character of this area which is dominated by trade service buildings.

The expected use of any building on the site is to be for either a light industrial use or a bulky goods retail use. The land is located in a noise tolerable area with the traffic noise from the nearby Pacific Highway being the dominant noise source. As stated above the uses adjoining the land are generally industrial in nature and are not sensitive to noise generating activities. Moreover, the development of the "Bunnings" store to the immediate west of the land is also a noise tolerable use.

The current 'best and highest use' for a dwelling house under the existing zoning is considered to be incompatible with the surrounding noisy industrialised environment.

In terms of traffic generation the highest potential traffic generating use would be a bulky good retail premises. As a tenant has not been nominated at this point in time it is difficult to accurately estimate the trip generation rates in the absence of a nominated tenant. Nevertheless, research has shown that bulky goods rates can vary from 2.11to 6.6 vehicle trips per hour per 100 m2 of gross floor area, with rates decreasing as the size of stores increases. If we assume an average between these two figures (i.e. 4.35 trips per hour), the development, with a gross floor area of 1394m2, is likely to generate an additional 60 vehicle trips per hour.

Cook Drive has capacity to accommodate this additional traffic load without any significant change in the level of service of the road. It being noted that the Cook Drive and Pacific Highway intersection is being upgraded with an improved alignment with North Boambee Road; this is being carried out as part of the "Bunnings" redevelopment. This will significantly improve the function and efficiency of this intersection for vehicles to ingress and egress Cook Drive.

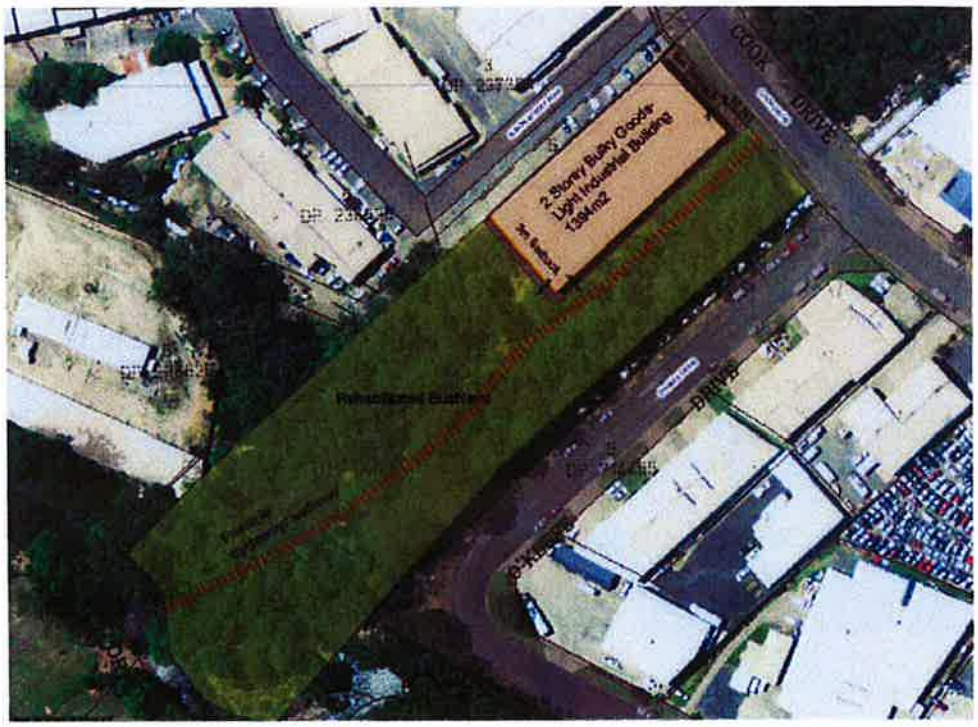


Figure 13: Building Envelope

In terms of the natural environment the proposal is expected to result in an improvement in the existing bushland on the site and any development of the balance of the land for a light industrial use or bulky goods use is expected to be more compatible with the ecological values of the land than the current 'best and highest' use for a dwelling house; residential uses often have greater impacts upon bushland from accidental fires, domestic pets, dumping of garden refuse; weed invasion from gardens; and general lower level of bushland interface management.

In summary the proposed rezoning provides for a more compatible land use strategy for the subject land than the current zoning which allows for a dwelling house on the land as the 'best and highest' use. A dwelling house would not be compatible in terms of the surrounding industrial land use functions, noise and environmental management of the balance of the land. Conversely a bulky goods or light industrial building would be compatible with the site and surrounding area.

7.2 Flooding Impacts

Cardno Pty Ltd was engaged to address the potential flood impacts from the rezoning and development of the land; a full copy of their report is included in Appendix B. The following are the main findings and conclusions from their report:

- *The flood impact assessment than development of the cleared area on Lot 13 Cook Drive by filling to a level higher than the 100 yr ARI flood level would:*
  - *Have nil impact on 5 yr ARI and 10 yr ARI flood levels, depths, velocities, velocity x depth and provisional flood hazard;*
  - *Have a local impact on 100 yr ARI flood levels, depths and velocities within the drainage reserve located between the Bunnings site and the planned development but no discernible impact on velocity x depth and provisional flood hazard.*
  - *Reduce the freeboard to the finished floor level on the adjacent Bunnings site from 1.25m to 1.14m which remains far in excess of Council's adopted freeboard requirement of 0.5 m.*
- *Council's adopted freeboard requirement of 0.5 m means that the floor level of any development on Lot 13 Cook Drive would be only inundated by events in excess of a 500 yr ARI event.*
- *It is expected that the impact of development of the cleared area on Lot 13 Cook Drive would in a 200 yr ARI flood would be comparable to the assessed impacts in the 100 yr ARI flood and would not inundate the planned development on Lot 13 Cook Drive or the Bunnings development.*
- *Under existing conditions the PMF would inundate planned development on Lot 13 Cook Drive and it is expected that the planned development would have minimal impact in the PMF.*
- *The proposed finished floor level for the Bunnings Warehouse is 6.0 m AHD which is higher than the PMF under existing conditions adjacent to Lot 13 Cook Drive.*

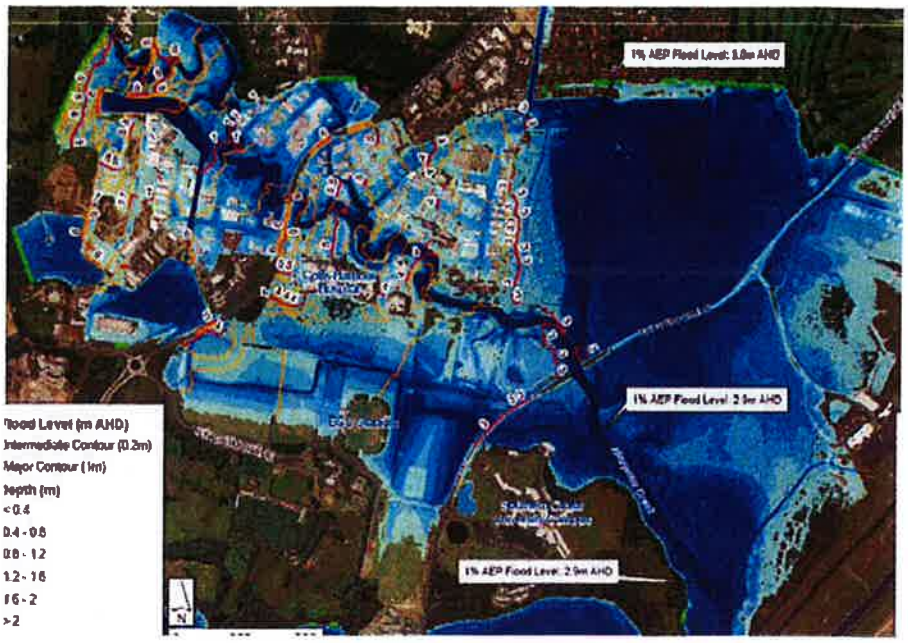


Figure 14:1% AEP Flood Event (source: Cardno Flood Study)

- *The planned development of the Bunnings site would partially shield the planned development on Lot 13 Cook Drive from flooding in the PMF.*

- *The site survey and the flood levels assessed in 2011 WMAwater Flood Study disclose that the site is sufficiently elevated such that flood of the site is not influenced by sea level rise.*

- *Council's adopted freeboard requirement of 0.5 m means that the floor level of any development on Lot 13 Cook Drive based on the current estimated 100 yr ARI flood level would be only experience shallow inundation in a 100 yr ARI event in the future if the 100 yr ARI rainfall intensity was to increase by 30%.*

- *The increase in freeboard which would be required to maintain a 0.5m freeboard under conditions of future climate change would be around 0.1 m, 0.2 m or 0.3 m for 10%, 20% or 30% increases in the 100 yr ARI 9 hour rainfall intensity respectively.*

- *It was concluded in the March 2013 assessment that the 5 yr ARI and 10 yr ARI flood levels adjacent to the site are unchanged.*

- *It was also noted that local increases in the 100 yr ARI flood level are confined to Lot 13 Cook Drive while local decreases of up to 0.02m are estimated east of Cook Drive, this is due to the planned filling of the development site on Lot 13 Cook Drive reducing the discharge of floodwaters in a 100 yr ARI flood from west to east through Lot 13; there were nil assessed impacts on properties west of the site.*

- *Bunnings also reviewed the March 2013 assessment and advised on 1 July 2013: On the above basis we have no objections to flood impacts of the development as outlined in your report.*

- *There are negligible impacts on adjacent properties except the Bunnings site and Bunnings do not object to the assessed impacts on their site.*

As can be seen by this flood analysis the subject land can be developed under the proposed zoning without creating an unacceptable flood risk.

7.3 Vegetation and Bushfire Management

The proposal is for the retention of the existing native vegetation on the subject land. The management of this vegetation presents issues in terms of the long term management of the land and potential bushfire threat. The Coffs Coast Bush Regeneration Ltd was engaged to prepare a Vegetation Management Plan (VMP) and Holiday Coast Bushfire Solutions was engaged to prepare a bushfire hazard assessment report to address these issues. Refer Appendices C and D. The following is a summary of their reports:

Coffs Coast Bush Regeneration Ltd:

- *The native vegetation on this property is described as containing the following vegetation types under the CHCC Class 5 Vegetation Mapping system:*
  - *Broad-leaved Paperbark - Swamp Oak – Willow Bottle Brush Forested Wetland on Floodplain.*
  - *Blackbutt - Turpentine - Pink Bloodwood Grassy Dry Open to Tall Open Forest.*
  - *Turpentine – Sydney Blue Gum –Tallowwood Sheltered Wet Shrubby Forest of Metasedimentary Hinterland Foothills and Escarpment.*
  - *Wet Shrubby Forest of Metasedimentary Hinterland Foothills and Escarpment.*

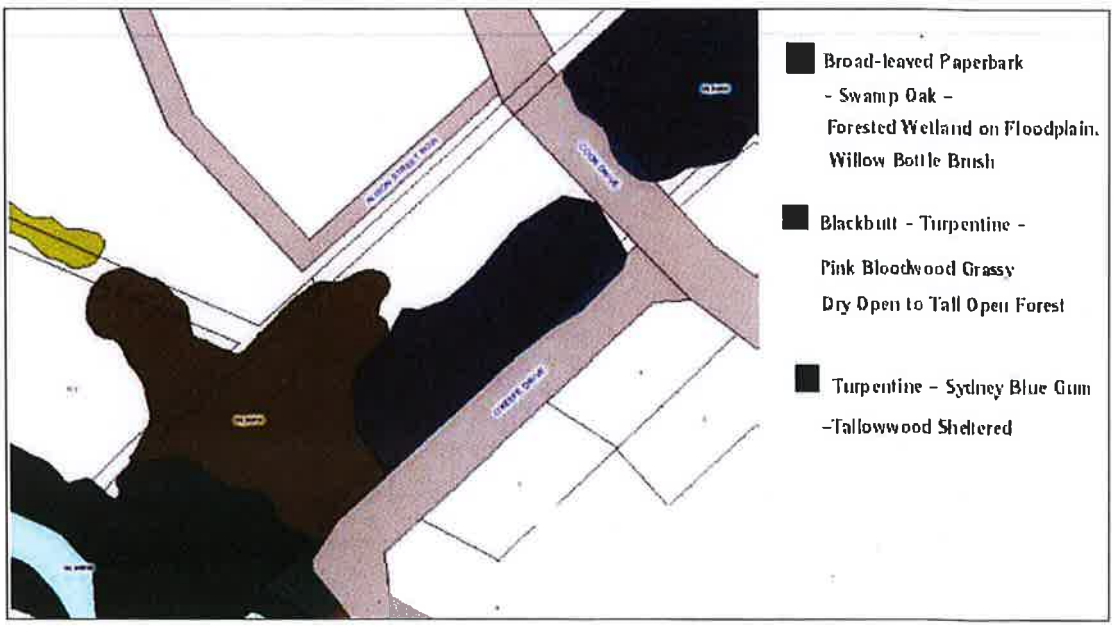


Figure 15: Vegetation Types (source: CHBRG)

- *Elements of vegetation within the subject site fall within the categories of "Swamp Sclerophyll Forest on Coastal Floodplain" and "Subtropical Floodplain Forest" which are both Endangered Ecological Communities within the NSW North Coast Bioregion (listed on the Threatened Species Conservation Act 1995.*

- *A search of the NSW NPWS Wildlife Atlas revealed 50 threatened flora species with the potential to occur within the site, being recorded within a 5 kilometre radius of the site.*

- *During site vegetation surveys:*

    - *No Schedule 1 plant species under the Threatened Species Conservation Act 1995(NSW) were encountered.*
    - *No plant species from Schedule 2 under the Threatened Species Conservation Act 1995(NSW) were encountered.*
    - *No threatened flora species from Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) were encountered.*
    - *No Rare plant species from the ROTAP (Rare or Threatened Australian Plants) list were encountered.*

- *Although no Rare or Threatened Australian Plant (ROTAP) was located the following species may be present:*

    - *Senna acclinis (Native Cassia)*
    - *Marsdenia longiloba*
    - *Tylophora woollsii*
    - *Niemeyera whitei (Rusty Plum)*

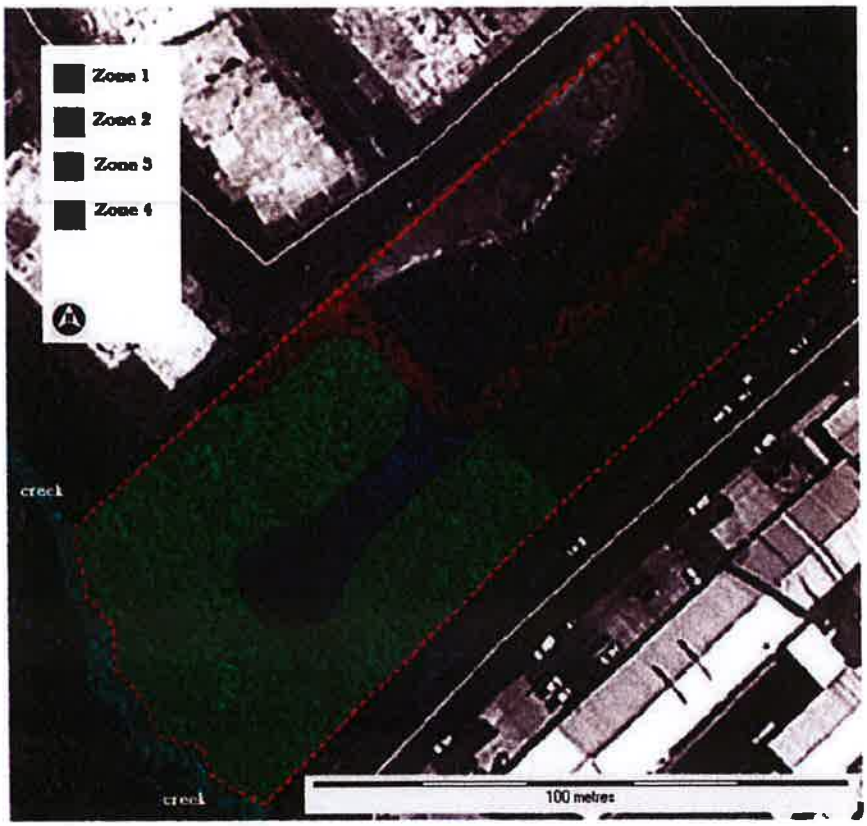


Figure 16: Vegetation Management Zones (source: CHBRG)

The report divided the site into 4 zones and for each zone the report provided an outline of the resilience of the vegetation; proposed restoration techniques; potential threatening processes and mitigation strategies; and a works program.

With the adoption and implementation of the VMP, the ecological values of the land will not only be protected but will be enhanced through rehabilitation. The proposed rezoning will provide a financial incentive for these works to occur, whereas under the existing zoning and development of a dwelling house it is unlikely that an owner of a single dwelling house would have the financial capacity to carry out these works.

Holiday Coast Bushfire Solutions

- *The subject property has been identified as bushfire-prone land by the Coffs Harbour City Council's Bushfire Prone Land Map, an extract of which is provided below.*

Figure 17: Bushfire Prone Land

- *The swamp sclerophyll forest remaining on the property imposes significant bushfire constraints on potential future development opportunity.*

- *It is recommended that the proposal be approved subject to the following provisions:*

    - *The site is unsuitable for developments that are either a Special Fire Protection Purpose (including preschools, hospitals and nursing homes and assembly buildings as defined in the BCA) or of a nature such as bulk stores of flammable material (including timber yards and the like).*

    - *The existing cleared area be maintained free of bushfire hazard vegetation whilst ever a structure exists on the site.*

- *Any future building on the site should be constructed with the south-western and south-eastern facades having a fire resistance level determined by Specification C1.1 of the BCA, where the line of the unmanaged vegetation is determined to be the fire source feature.*

The rezoning will provide an incentive for the land to be developed for a use (i.e. bulky goods or light industrial) that provides for better fire safety protection than the likely development of the land under the current zoning (i.e. single dwelling house or a dual occupancy). The proposed rezoning provides greater opportunity for a structure with greater fire protection to be provided on the land; fire walls, sprinkler systems, hose reels and purpose built fire exits and the like are required to be provided for commercial and industrial buildings.

In summary, the proposed rezoning and development of the land for a bulky goods building or light industrial building provides considerable benefits from an ecological and bushfire management perspective than the current zoning; the current zoning is likely to result in the development of a single dwelling house on the land.

7.4 Economic Impacts

Consideration needs to be given to the direct economic impacts in terms of the supply and demand for business land in the local government area (LGA); capital investment and employment potential; and impact upon the Central Business District (CBD), being the prime business centre in the LGA.

The Planning Proposal is for the rezoning of the cleared parts of the land to B5 Business Development. The cleared parts of the land are defined by those parts of the land outside the drip line of the forested areas and fitting within a rectangular shaped area (measuring 34m x 82m) with an area of 2788m2.

Under the B5 zoning the land will be subject to the floor space ratio and height control provisions of LEP 2013. The maximum floor space ratio and building height limits applying to the adjoining 'Bunnings' land, which is to be rezoned to B5, under LEP 2013 is 0.5:1 and 11m, respectively. By applying these controls to the subject land, it is expected that a one to two storey building with a floor area of 1,394m2 (i.e. 0.5 x 2,788m2) will be developed on part of the development pad established on the land; the balance of the land will be used for access, parking and deliveries.

Under the B5 zoning the following uses are to be permitted under the proposed land use table:

Permitted without consent
Building identification signs; Home-based child care; Home businesses; Home Occupations.

Permitted with consent
Backpackers' accommodation; Bulky goods premises; Child care centres; Dwelling houses; Garden centres; Hardware and building supplies; Hotel or motel accommodation; Kiosks; Landscaping material supplies; Light industries; Passenger transport facilities; Plant nurseries; Respite day care centres; Roads; Rural supplies; Serviced apartments; Take away food and drink premises; Timber yards; Vehicle sales or hire premises; Warehouse or distribution centres
Any other development not specified in item 2 or 4

Given the size of the land and its location, the most likely 'best and highest' use for the land would be for a bulky goods premises or a light industrial premises. The economic impact should therefore be considered in light of the use of the land for either of these uses.

The proposal will provide for 1394m2 of land zoned for Business Development (i.e. B5) which represents less than 0.4% of the total reported retail floor space in Coffs Harbour and less than 1.2% of the total bulky goods retail floor space. This additional floor space is not of sufficient size to have any discernible impact upon the existing role and function of the business centres in the hierarchy or the general supply and demand for bulky goods land, but would make a small contribution at the local level to the provision of additional bulky goods retail space in the South Coffs area.

In terms of industrial land, the projections are for an additional 50 ha to the year 2030 and the floorspace demand for light industrial uses under the Business Lands Strategy for the Coffs Harbour Industrial area is for 26,623m2 by 2031 (Precinct Level Adjustment). This proposal could meet part of this demand.

As stated earlier in the report, the Our Living City Settlement Strategy outlines significant growth around the South Coffs Harbour area including the North Boambee Valley Release Area (849 possible dwellings), South Coffs Release Area (477 possible dwellings) and Boambee Rural Residential Release Area (23 possible dwellings). These new dwellings in these release areas will increase demand for bulky goods items and light industrial uses associated with the housing construction industry. The subject land is strategically placed to provide for the trade service needs of the housing construction industry being located close to the Pacific Highway and within 2km of theses future housing areas.

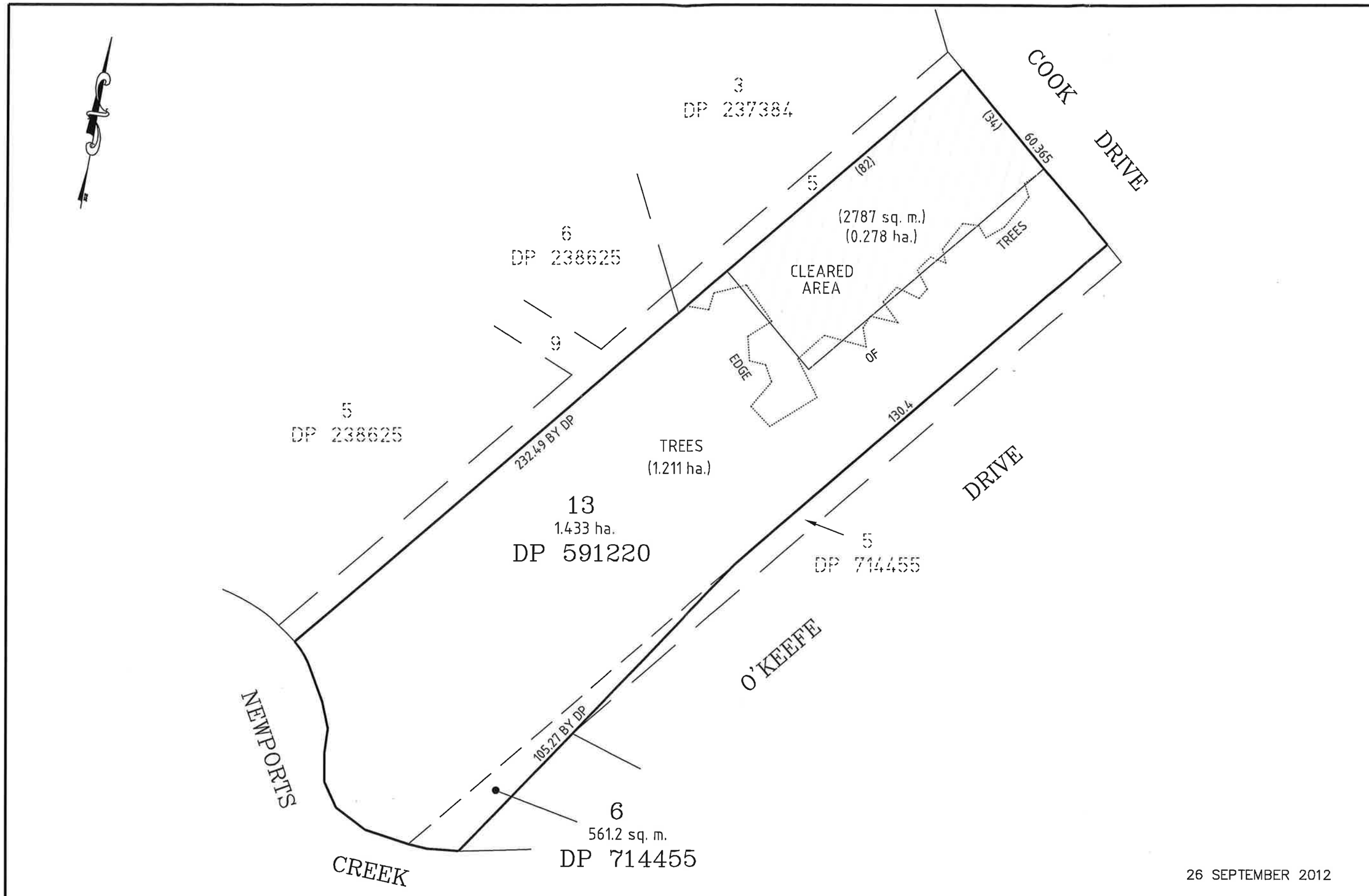
In terms of capital investment, the proposal is expected to result in a development with a construction cost in the order of $2.8 million that will assist in an economic boost for the local economy. The construction phase will provide employment opportunities for builders, plumbers, electricians, painters, landscapers, utility technicians, plasterers, fabricators and other contractors. The proposal will also provide post construction jobs that will further assist the local economy.

The proposal is not expected to have any significant impact upon the primacy of the CBD. The primacy of the CBD is derived from the collective functions of civic services, retail outlets, recreation facilities, and entertainment facilities. The CBD has the largest commercial area in the Local Government Area and it has the Regional Art Gallery, City library, Council Administration Centre, large Swimming Centre, extensive retail areas and some high density housing. The City Centre also has the farmer's market and other festivals and is to be embellished with an upgraded City Park and Performance Centre in the future.

Bulky goods retail premises supplement the City Centre's role, but are a minor part of its function as a major regional centre. Bulky goods retailing is appropriately located on the periphery of City Centres where land parcels are larger and access is easier for the loading and unloading of goods and the warehousing of goods. The City Centre does not derive its regional status or its primacy from bulky goods retail services, despite some of these services being located within it.

The proposal provides for 1394m2 of bulky goods or light industrial floor space will serve the local trade services market and is not of such a scale to influence the wider CBD market.

Appendix A



26 SEPTEMBER 2012

FILE No. : 6254 PLAN No. : 2	REDUCTION RATIO 1:1000	DRIP LINE SURVEY LOT 13 DP 591220 and LOT 6 DP 714455 COOK DRIVE, COFFS HARBOUR
DATUM SURVEYED : FIELD BOOK :	DESIGNED : DRAWN :	

I G EVISON & PARTNERS
CONSULTING SURVEYORS
2 SEMAPHORE STREET
EMERALD BEACH 2456
Ph. 0408 655191

Appendix B

Cardno
Shaping the Future

Our Ref: NA49913119:BCP/bcp
Contact: Dr Brett C. Phillips

4th September 2013

Cardno (NSW/ACT) Pty Ltd
ABN 95 001 145 035

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PO Box 19
St Leonards New South Wales 1590
Australia

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International: +61 2 9496 7700

Web: www.cardno.com.au

The Manager
Bennell & Associates
38 Ocean View Road
ARRAWARRA HEADLAND NSW 2456

Attention: Mr Rick Bennell

Dear Rick,

ADDENDUM FLOODING ADVICE FOR PROPOSED DEVELOPMENT ON LOTS 13 AND 6 COOK DRIVE, COFFS HARBOUR

The findings from our assessment of the potential impact of the proposed development of Lots 13 and 6 Cook Drive, Coffs Harbour were documented in a letter report dated 19 March 2013.

On 16 May 2013 Coffs Harbour City Council provided comments on this flooding advice as follows:

A preliminary flood assessment has been prepared to investigate the possibility of a rezoning on the above lots from an 'Environmental' to an 'Industrial' zoning. The suitability of the rezoning needs to be assessed against council's flood policy and State Government requirements for rezoning.

The State Governments Section 117 Ministerial Directive, Direction No: 15 – Flood Prone Land states the following: -

- *A draft LEP shall not rezone land within the flood planning areas from Environmental to Industrial zones.*

The State Government S117 Directive do allow for inconsistencies with the above subject to the rezoning being in accordance with a flood risk management plan, the Floodplain Development Manual and associated flood assessment and controls.

Issues with the flood assessment and flood considerations that need to be addressed to be in accord with the Floodplain Development Manual and flood controls are listed below: -

- *The flood advice is based on the Bunning's site being filled and developed as per the development consent. The flood advice is not valid until the development of the Bunning's site is completed as there is no guarantee that the work will progress;*

- *If you want to progress the rezoning prior to the development of the Bunning's site then you will need to provide flood assessment for both the existing conditions and developed conditions of the Bunning's site and satisfy flooding constraints for both cases;*
- *Need to assess the whole range of flood events this includes events larger than the 1% AEP (100 year) event. i.e. need to look at 200 year and Probable Maximum Flood events;*
- *Possible impacts of climate change and sea level rise;*
- *The flood advice shows increases of 0.1m on adjoining properties council generally requires impacts to be less than 0.015m on adjacent properties*

Each of these issues is discussed as follows.

1. DEVELOPMENT OF BUNNINGS SITE

It was concluded from the March 2013 flood impact assessment than development of the cleared area on Lot 13 Cook Drive (refer Figure 2) by filling to a level higher than the 100 yr ARI flood level would:

- Have nil impact on 5 yr ARI and 10 yr ARI flood levels, depths, velocities, velocity x depth and provisional flood hazard;
- Have a local impact on 100 yr ARI flood levels, depths and velocities within the drainage reserve located between the Bunnings site and the planned development but no discernible impact on velocity x depth and provisional flood hazard.
- Reduce the freeboard to the finished floor level on the adjacent Bunnings site from 1.25 m to 1.14 m which remains far in excess of Council's adopted freeboard requirement of 0.5 m.

Bunnings also reviewed the March 2013 assessment and advised on 1 July 2013: *On the above basis we have no objections to flood impacts of the development as outlined in your report* (refer to attached copy of the email advice from Bunnings).

Council provided the following comments:

- *The flood advice is based on the Bunning's site being filled and developed as per the development consent. The flood advice is not valid until the development of the Bunning's site is completed as there is no guarantee that the work will progress;*
- *If you want to progress the rezoning prior to the development of the Bunning's site then you will need to provide flood assessment for both the existing conditions and developed conditions of the Bunning's site and satisfy flooding constraints for both cases;*

At Council's request a re-assessment was undertaken of potential impact of the proposed development of Lots 13 and 6 Cook Drive, Coffs Harbour in the absence of the Bulky Goods Warehouse. The events wgich were assessed included the 5 yr ARI 2 hour storm burst, 5 yr ARI 9 hour storm burst, 10 yr ARI 2 hour storm burst, 10 yr ARI 9 hour storm burst and the 100 yr ARI 9 hour storm burst.

The only event which disclosed any impacts was the 100 yr ARI 9 hour storm burst. The impact of stand-alone development of Lots 13 and 6 Cook Drive, Coffs Harbour is given in **Figure 43**. A comparison of **Figures 42** and **43** discloses that the impacts of development are very similar.

Based on the view expressed previously by Bunnings it is concluded that the assessed impacts in Figure 43 do not adversely affect any planned development on the Bunnings site.

2. EXTREME FLOODS

Council provided the following comment:

- *Need to assess the whole range of flood events this includes events larger than the 1% AEP (100 year) event. i.e. need to look at 200 year and Probable Maximum Flood events;*

WMAwater were engaged by Coffs Harbour City Council to prepare a Flood Study for Boambee- Newports Creeks and released a report in 2011. The 2011 WMAwater flood study estimated design flood behaviour under existing conditions for a range of flood magnitudes up to and including the PMF event (20%, 10%, 5%, 1%, 0.5%, 0.2% AEP and PMF events). The flood level contours estimated by WMAwater in the 1% AEP, 0.5% AEP, 0.2% AEP and PMF events are given in **Figures 44 – 47**. Indicative flood levels in the vicinity of the eastern and western sides of the fill platform on Lots 13 and 6 Cook Drive, Coffs Harbour were estimated from **Figures 44 – 47** and are summarised in **Table 1**.

Table 1 Indicative Flood Levels on Lot 13 Cook Drive, Coffs Harbour

Event	Flood Level (m AHD)	Difference (m)	Flood Level (m AHD)	Difference (m)
1% AEP (100 yr ARI)	4.55		4.65	
0.5% AEP (200 yr ARI)	4.65	0.10	4.75	0.10
0.2% AEP (500 yr ARI)	4.85	0.30	4.95	0.30
PMF	5.45	0.90	5.55	0.90

It is noted that Council's adopted freeboard requirement of 0.5 m means that the floor level of any development on Lot 13 Cook Drive would be only inundated by events in excess of a 500 yr ARI event. Consequently it is expected that the impact of development of the cleared area on Lot 13 Cook Drive would in a 200 yr ARI flood would be comparable to the assessed impacts in the 100 yr ARI flood and would not inundate the planned development on Lot 13 Cook Drive or the Bunnings development.

It is also noted that under existing conditions the PMF would inundate planned development on Lot 13 Cook Drive and it is expected that the planned development would have minimal impact in the PMF. It is noted that the proposed finished floor level for the Bunnings Warehouse is 6.0 m AHD which is higher than the PMF under existing conditions adjacent to Lot 13 Cook Drive. It would be expected therefore that the planned development of the Bunnings site would partially shield the planned development on Lot 13 Cook Drive from flooding in the PMF.

3. EXTREME FLOODS

Council provided the following comment:

- *Possible impacts of climate change and sea level rise;*

In October 2007 the then NSW Department of Environment and Climate Change (DECC) released a guideline titled "Practical Consideration of Climate Change".

As discussed in the guideline, climate change is expected to have adverse impacts upon sea levels and rainfall intensities, both of which may have significant influence on flood behaviour at specific locations.

Combining the relevant global and local information indicates that sea level rise on the NSW coast is expected to be in the range of 0.18 m to 0.91 m by between 2090 and 2100.

The site survey and the flood levels assessed in 2011 WMAwater Flood Study disclose that the site is sufficiently elevated such that flood of the site is not influenced by sea level rise.

DECC, 2007 recommends in part that the following sensitivity analyses are undertaken:

- Rainfall intensities. Increases of:
  - 10% in peak rainfall and storm volume
  - 20% in peak rainfall and storm volume
  - 30% in peak rainfall and storm volume

Previous hydrological and hydraulic assessments have identified the 9 hour storm burst as the critical storm burst for flooding downstream of the Pacific Highway in the vicinity of the site. Consequently an analysis of 9 hour rainfall intensity was undertaken to assess the indicative equivalent ARI of a 10%, 20% or 30% increase in the 100 yr ARI rainfall intensity under current conditions. It was estimated that a 10%, 20% or 30% increase in the 100 yr ARI rainfall intensity under current conditions is broadly equivalent to a 180 yr ARI, 340 yr ARI and 500 yr ARI event respectively.

It is noted that Council's adopted freeboard requirement of 0.5 m means that the floor level of any development on Lot 13 Cook Drive based on the current estimated 100 yr ARI flood level would be only experience shallow inundation in a 100 yr ARI event in the future if the 100 yr ARI rainfall intensity was to increase by 30%. Based on **Table 1** the increase in freeboard which would be required to maintain a 0.5 m freeboard under conditions of future climate change would be around 0.1 m, 0.2 m or 0.3 m for 10%, 20% or 30% increases in the 100 yr ARI 9 hour rainfall intensity respectively.

4. FLOOD LEVEL IMPACTS

Council provided the following comment:

- *The flood advice shows increases of 0.1m on adjoining properties council generally requires impacts to be less than 0.015m on adjacent properties*

It was concluded in the March 2013 assessment that the 5 yr ARI and 10 yr ARI flood levels adjacent to the site are unchanged. It was also noted that local increases in the 100 yr ARI flood level are confined to Lot 13 Cook Drive while local **decreases** of up to 0.02 m are estimated east of Cook Drive. This is due to the planned filling of the development site on Lot 13 Cook Drive reducing the discharge of floodwaters in a 100 yr ARI flood from west to east through Lot 13. There were nil assessed impacts on properties west of the site.

Bunnings also reviewed the March 2013 assessment and advised on 1 July 2013: *On the above basis we have no objections to flood impacts of the development as outlined in your report* (refer to attached copy of the email advice from Bunnings).

It is concluded there are negligible impacts on adjacent properties except the Bunnings site and Bunnings do not object to the assessed impacts on their site.

We trust that the additional assessments and analysis described above fully address the issues raised by Council and we would be pleased to further discuss our findings with you upon your request.

Yours faithfully

Brett C. Phillips

.....

Dr Brett C. Phillips
Director, Water Engineering
for **Cardno**

Brett C. Phillips

From: Philip Drew <PDrew@bunnings.com.au>
Sent: Monday, 1 July 2013 5:38 PM
To: Brett C. Phillips
Cc: Andrew O'Neill
Subject: Coffs Harbour - FIA Lots 13 and 6 - Cook Drive

Good afternoon Brett,

I have reviewed your report dated 19 March 2013 (your ref 489021) and considered the impacts upon the Bunnings property located generally to the north of the subject site, regarding the proposed development upon Lot 13 to fill a "pad" area of some 2,800m2 adjoining Cook Drive.

I note your assessment concludes there will be:

- Nil impact on 5 and 10 year ARI local flood levels, velocities, velocity x depth and provisional flood hazard
- A localised impact of up to +110mm on 100 yr flood level (largely contained to the adjoining drainage reserve), and that that the resultant 100yr flood level is still 1.14metres BELOW the proposed Bunnings floor level (being RL6.0 AHD).
- The proposed emergency egress from the future development on Lot 13 will need to negotiate water on Cook Drive less than 0.4m2/sec which represents a safe pathway for pedestrians and vehicles

On the above basis we have no objections to flood impacts of the development as outlined in your report.

regards,

Philip Drew
Development Approvals Manager

Bunnings Group Limited
11 Shirley Street, Rosehill NSW 2142
Locked Bag 30, Granville NSW 2142
Phone: (02) 9846-7334
Fax: (02) 9846-7530
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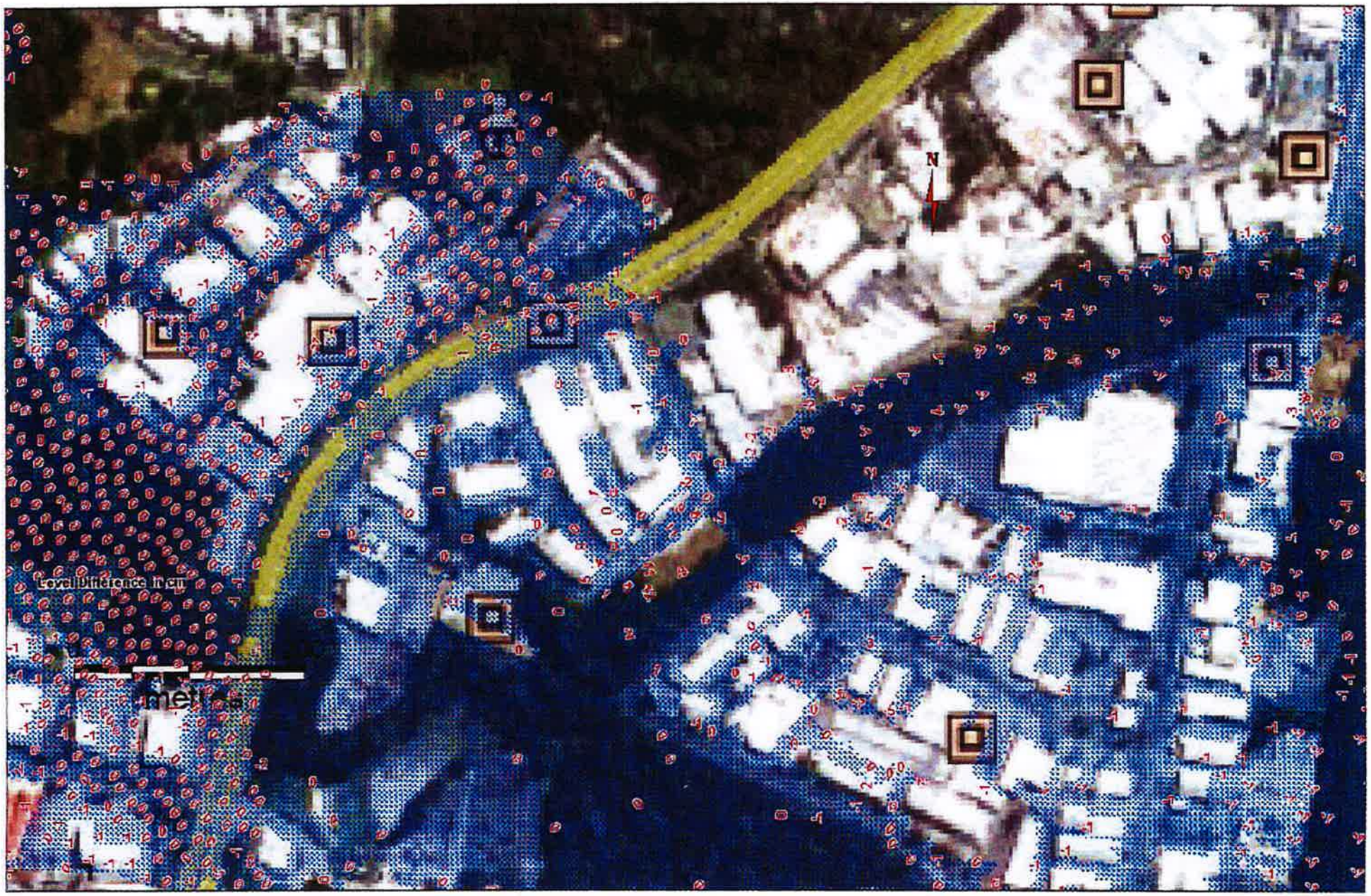

Figure 43 100 yr ARI Flood Level Differences (9 hour Storm) - Future - Existing Conditions

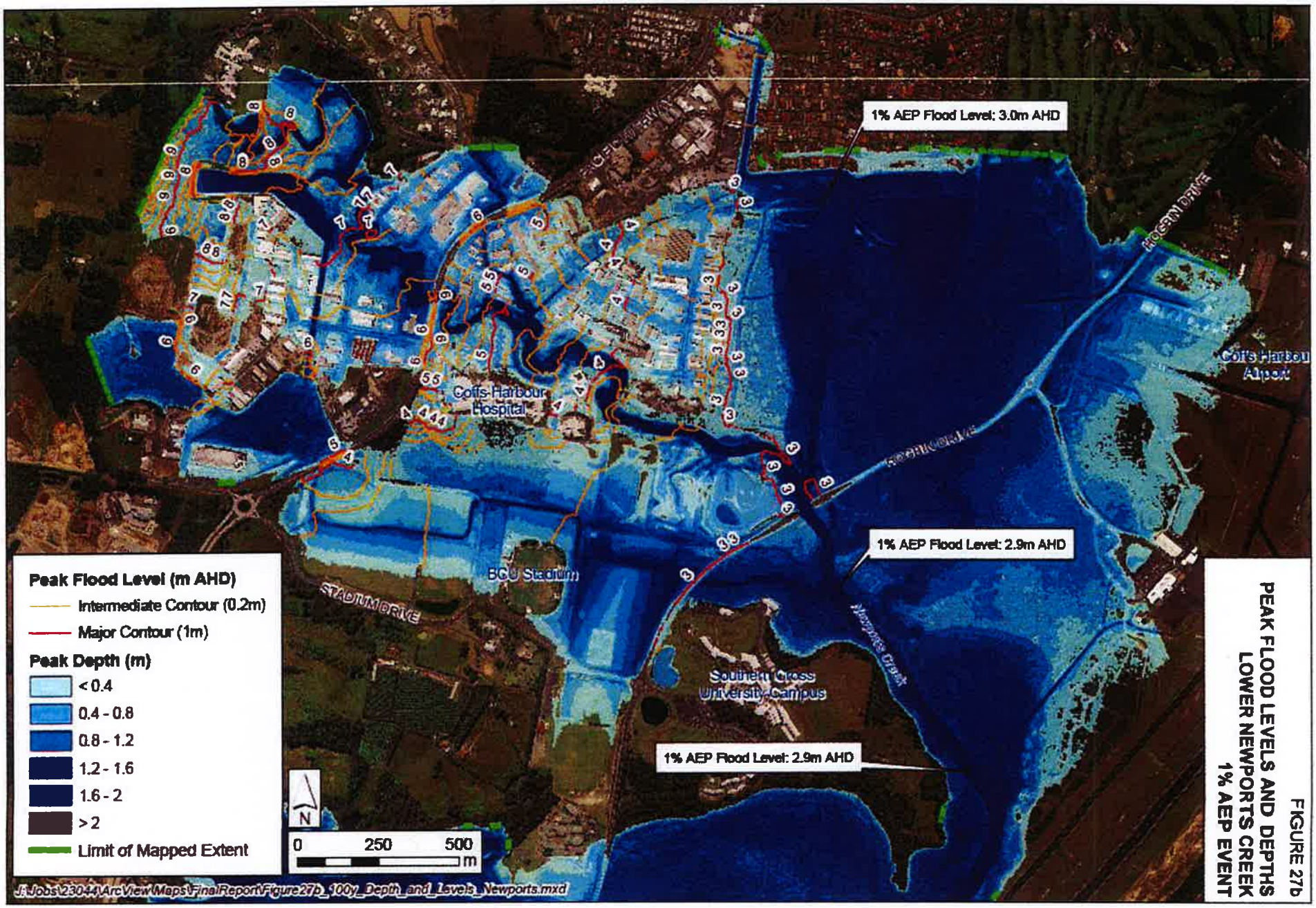

Figure 44 1% AEP Flood Level Contours (after 2011 WMAwater)

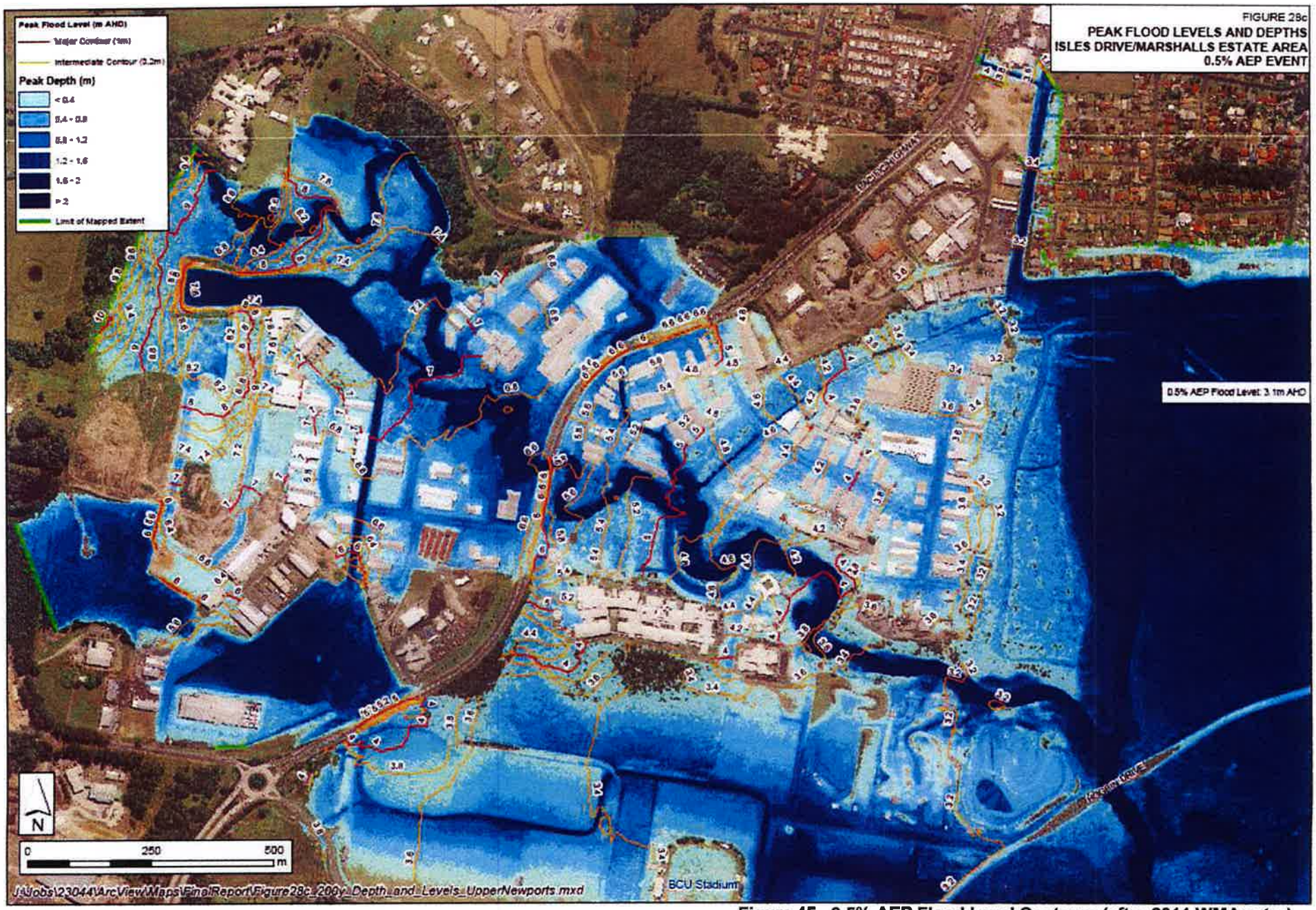

Figure 45 0.5% AEP Flood Level Contours (after 2011 WMAwater)

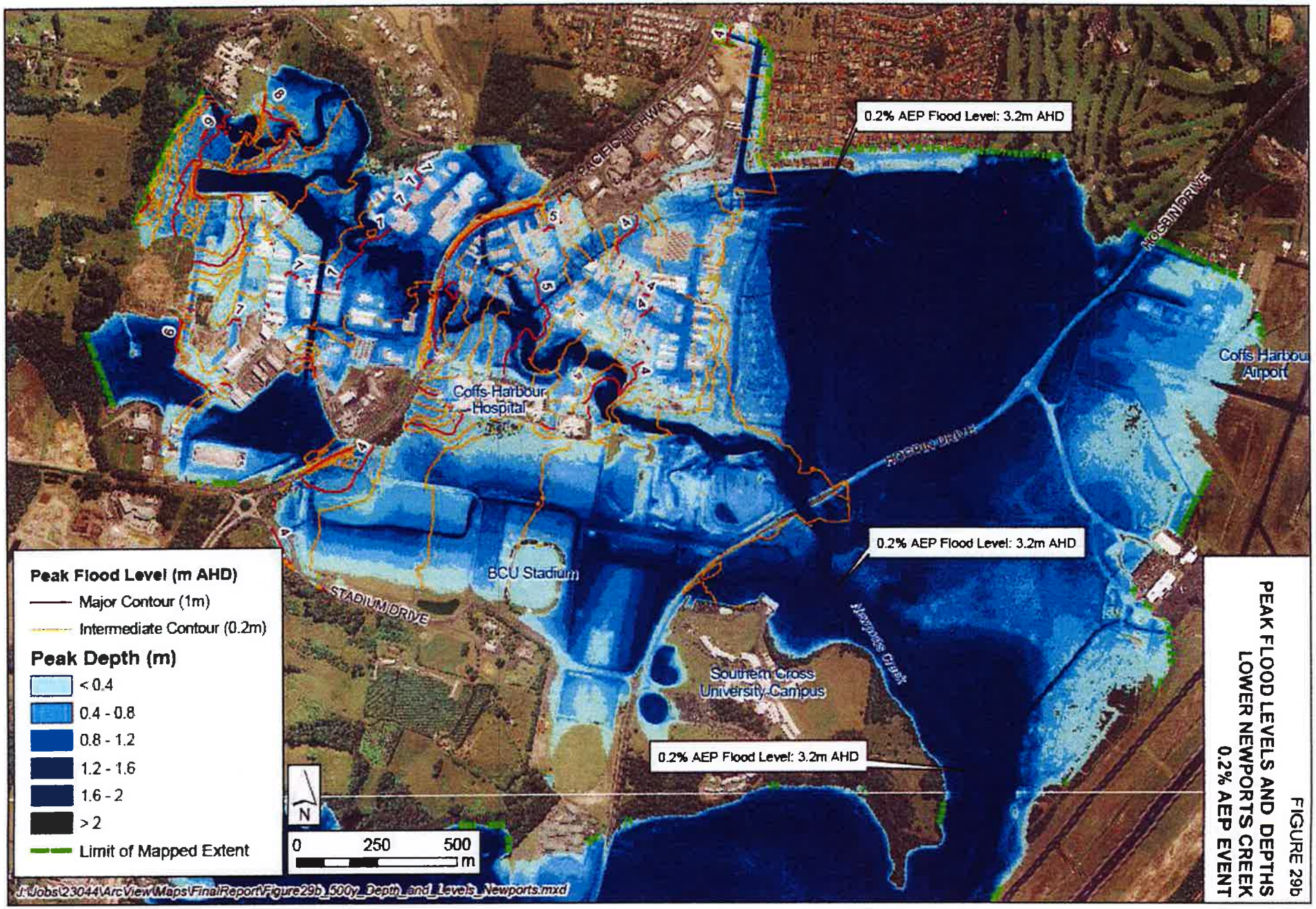

Figure 46 0.2% AEP Flood Level Contours (after 2011 WMAwater)

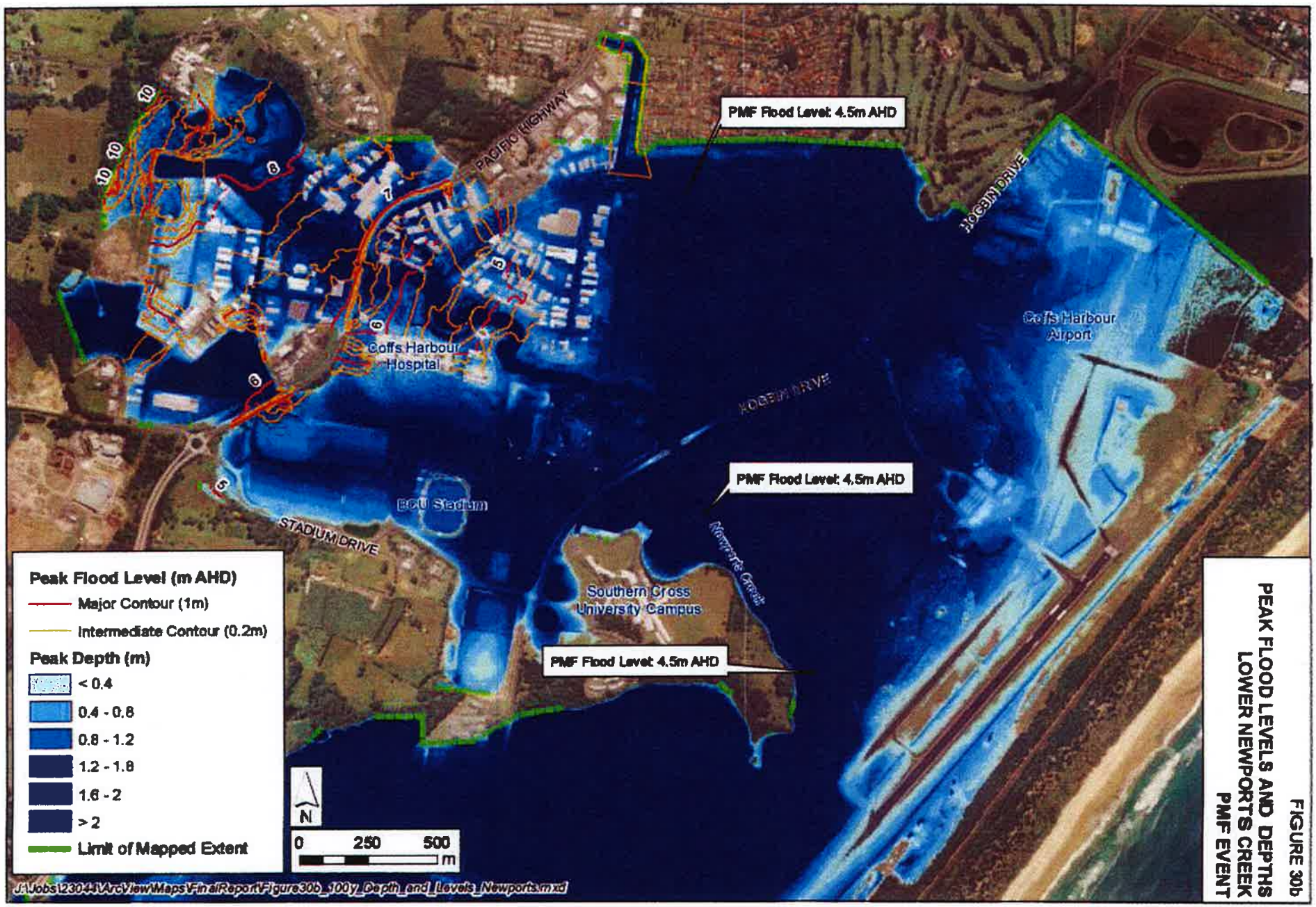

Figure 47 PMF Flood Level Contours (after 2011 WMAwater)

Cardno
Shaping the Future

Our Ref: 489021:BCP/bcp
Contact: Dr Brett C. Phillips

19th March 2013

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Web: www.cardno.com.au

The Manager
Bennell & Associates
38 Ocean View Road
ARRAWARRA HEADLAND NSW 2456

Attention: Mr Rick Bennells

Dear Rick,

FLOODING ADVICE FOR PROPOSED DEVELOPMENT ON LOTS 13 AND 6 COOK DRIVE, COFFS HARBOUR

In response to your recent request, we are pleased to provide the following findings from our assessment of the potential impact of the proposed development of Lots 13 and 6 Cook Drive, Coffs Harbour.

1. BACKGROUND

1.1 Site Location

The subject site is Lots 13 and 6 Cook Drive, Coffs Harbour (refer **Figure 1**).

1.2 Previous Flooding Assessments

Bunnings Group Limited has gained approval to construct a Bulky Goods Warehouse on a site that fronts onto the Pacific Highway and Cook Drive in Coffs Harbour. The site is bounded by Cook Drive, the Pacific Highway, a drainage channel (tributary of Newports Creek) and a reserve adjacent to O'Keefe Drive. The site includes Lot 3 DP237384 and Lot 6 DP238625 and is adjacent to Lots 13 and 6 Cook Drive, Coffs Harbour.

It is proposed to demolish the existing buildings and construct a new commercial development comprising bulky goods retail space, loading facilities, an above-ground car park area and access roadways. It is also proposed to fill much of the site so that the warehouse floor is above the 100 yr ARI flood level.

Coffs Harbour City Council's current adopted 100yr flood level for the site is around 5.3 m AHD. Council's adopted freeboard requirement is 500 mm. The proposed finished floor level is 6.0 m AHD.

Figure 1 Locality Plan (after Google Earth, Accessed 16 January 2013)

In addition, the NSW Roads and Traffic Authority (RTA) intend to upgrade the Cook Drive / Pacific Highway intersection, and realign Cook Drive to intersect with North Boambee Road. This proposed RTA upgrade has been integrated with the proposed development.

1.2.1 Existing Conditions

WMAwater were engaged by Coffs Harbour City Council to prepare a Flood Study for Boambee- Newports Creeks and released a report in 2011. The WMAwater, 2011 flood study estimated design flood behaviour under existing conditions for a range of flood magnitudes up to and including the PMF event (20%, 10%, 5%, 1%, 0.5%, 0.2% AEP and PMF events).

As part of Cardno's 2012 assessment of the flood impact of the proposed Bunnings development, we inspected the existing watercourse that runs along the western and south western boundaries of the site and its representation in the 2011 floodplain model highlighted a series of issues that warranted further assessment of existing conditions (Cardno (NSW/ACT), 2012). .

Sensitivity testing was undertaken to progressively assess the impact of:

- Reducing the size of the Pacific Highway culverts;
- Replacing the ALS data with detail survey within the 2D domain;
- Changing the adopted roughness value for the watercourse; and
- Representing the watercourse in the 1D domain.

It was concluded from a review of the results that:

- Reducing the size of the Pacific Highway culverts would have a negligible impact on 100 yr ARI flood levels with local decreases of up to 0.04 m on the immediate downstream side of the Pacific Highway and local increases of up to 0.02 m on the upstream side of the Pacific Highway;
- Replacing the ALS data with detail survey of the watercourse within the 2D domain has a significant impact on 100 yr ARI flood levels with incremental local decreases of up to around 0.20 m on the immediate downstream side of the Pacific Highway and incremental local increases of up to 0.01 m on the upstream side of the Pacific Highway;
- Changing the adopted roughness value for the watercourse has a significant impact on 100 yr ARI flood levels with incremental local decreases of up to around 0.10 m on the immediate downstream side of the Pacific Highway and no incremental local increases on the upstream side of the Pacific Highway; and
- Representing the watercourse in the 1D domain has a moderate impact on 100 yr ARI flood levels with incremental local decreases of up to around 0.04 m on the immediate downstream side of the Pacific Highway and no local increases on the upstream side of the Pacific Highway.

Overall the implementation of all changes (Run 5) had a significant impact on 5 yr ARI, 10 yr ARI and 100 yr ARI flood levels within the Bunnings site and adjoining properties. The reductions in the 100 yr ARI flood levels range from up to 0.30 m adjacent to the Pacific Highway to around 0.05 m on the south eastern boundary of the site. There were no changes in the 100 yr ARI flood levels on the upstream side of the Pacific Highway.

It was observed from the results given in the 2011 flood study that the predicted flood levels for the November 1996 flood are similar to the estimated 100 yr ARI flood levels. Consequently a comparison of observed and the predicted flood levels for the November 1996 flood in the vicinity of the site were compared with the Run 5 results.

It was concluded that Run 5 improves the agreement with observed levels in the vicinity of the Pacific Highway with the level of agreement around the same south of the site.

It was also concluded that the implementation of all changes (Run 5) has a significant impact on the estimated 5 yr ARI flood levels within and downstream of the site. Local reductions in the flood level of up to 0.7 m is estimated in the watercourse as well as the removal of overland flows down a number of overland flowpaths downstream of the site.

The impact of the implementation of all changes (Run 5) also has a significant impact on the estimated 10 yr ARI flood levels within and downstream of the site. Local reductions in the flood level of up to 0.6 m is estimated in the watercourse as well as reduced overland flows down a number of overland flowpaths downstream of the site.

Based on discussions with Council it was agreed that the Run 5 representation of the floodplain in the vicinity of development site should be adopted as the benchmark for any assessment of the impacts of the proposed development on flooding.

The Run 5 floodplain model of Existing Conditions was run to estimate the peak flood level contours, depths, velocities velocity x depth and flood hazards under the 5 yr ARI, 10 yr ARI and 100 yr ARI events. It was found that the critical storm burst durations for the 5 Yr ARI and 10 yr ARI flood levels upstream of the Pacific Highway was 2 hours while the 9 hour storm burst is critical for the 5 Yr ARI, 10 yr ARI and 100 yr ARI flood levels downstream of the Pacific Highway.

1.2.2 Future Conditions

Based on the outcomes of wide range of assessments a proposed final configuration (Option F) was formulated for the Bunnings site[1].

The key features of the adopted Option F configuration include installation of:

- 3 x 1050 mm diameter RCPs under the Pacific Highway;
- The removal of the concrete control weir upstream of the culverts previously proposed;
- Extension of these 3 x 1050 mm diameter RCPs all the way from the Pacific Highway to a surcharge chamber on the southern boundary of the site;
- The surcharge chamber would be a special structure with 3 x 1050 mm diameter RCPs coming in and a single 1050 mm diameter RCP discharging directly to the creek with the remaining flows surcharged onto the surface;
- The diversion system outfall is located around 20 m downstream of the current outfall of the 750 mm diameter RCP. This outfall is angled to the creek to direct outflows down the creek;
- Rip rap protection at the outfall to control scour; and
- Filling of the residual lot east of the re-aligned Cook Drive to a level above the 100 yr ARI flood level.

The floodplain model of Future Conditions under Option F was run to estimate the peak flood level contours, depths, velocities velocity x depth and flood hazards under the 5 yr ARI, 10 yr ARI and 100 yr ARI events. The results are given in Cardno (NSW/ACT), 2012.

2. OBJECTIVE

Figure 2 is the site plan showing the drip line of the trees and a concept envelope of the land the landowner is seeking Council's support to rezone. The land is currently zoned for environmental protection purposes and Council has advised that it will need to be demonstrated that the land can be developed for industrial purposes (ie. a building pad above the flood level) taking into account the flood prone nature of the land and Council's policies with respect to flood prone land.

The flood issues and objectives identified by Council for the adjacent Bunnings site included:

- Impacts over a range of flood events. The site and general surrounding area experience problems in 5 year ARI and the 100 year ARI is the standard for assessment and setting of minimum floor levels.
- Impacts upstream of site.
- Impacts adjacent to site.
- Impacts downstream of site.
- Minimum floor level for building.
- Car parking design and finished level with assessment of pedestrian safety and vehicle stability.
- Show the site has safe pedestrian and vehicle egress in a 100 year ARI event.
- Contain flows in watercourses as much as practical

The objective of the study is to undertake an assessment of the site and the proposed development in relation to flooding and Council's policies with respect to flood prone land.

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[1] Cardno (NSW/ACT) 2012) "Addendum to Flood impact Assessment for Proposed Bunnings Warehouse, Coffs Harbour, *Letter Report*, prepared for Bunnings Group Limited, 16 November 2012.

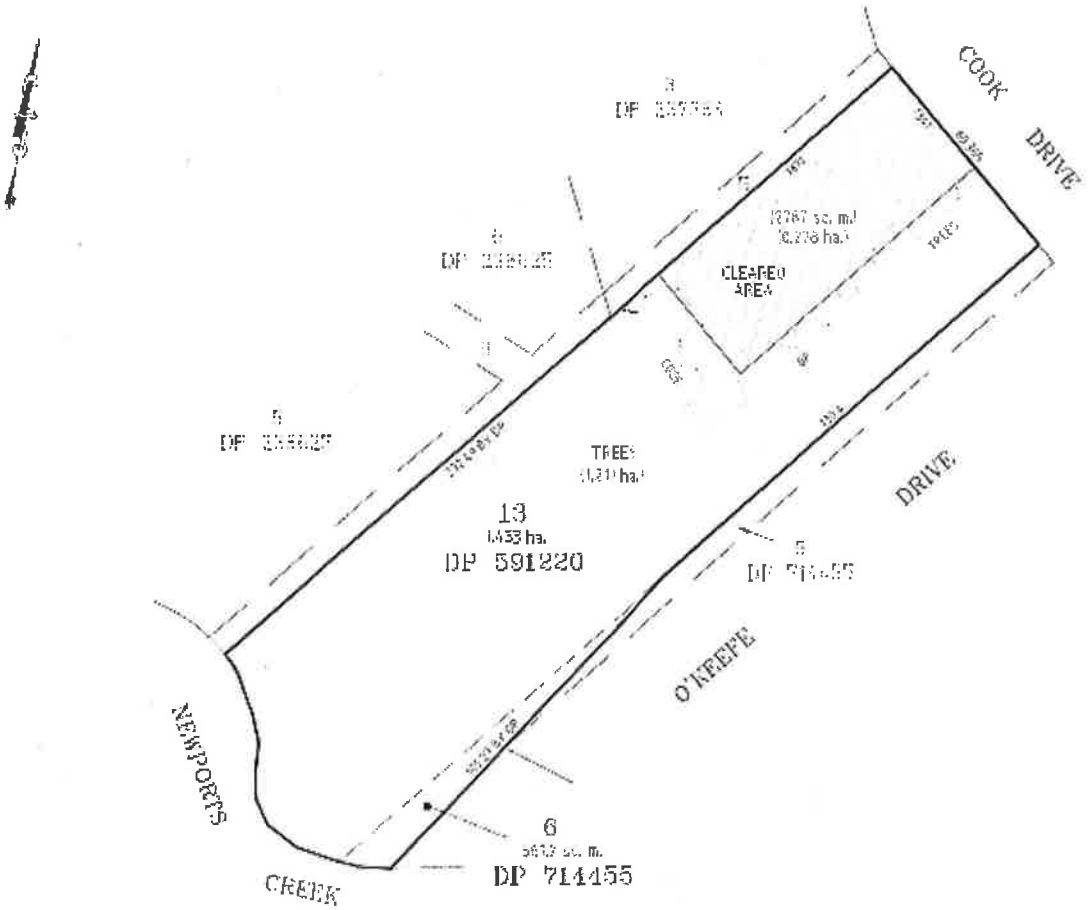


Figure 2 Lot Layout (after IG Evison & Partners, 26 September 2012)

3. OUR APPROACH

Our assessment was undertaken using the models assembled to assess the flooding impacts of proposed development on the adjacent Bunnings site.

Our approach was as follows:

3.1 Study Inputs

The inputs to the study comprised the:

(i) A copy of the floodplain models assembled for the assessment of flooding impacts of proposed development on the adjacent Bunnings site;

(ii) A copy of the footprint of the concept envelope of the land the landowner is seeking Council's support to rezone (provided by Bennell & Associates);

(iii) Copies of relevant reports (already held).

3.2 Tasks

The tasks included:

(i) De-archiving the previous floodplain models, re-running the model and comparing the results to previous results;
(ii) Modifying the Option F Future Conditions model to include filling of the concept envelope on Lot 13;
(iii) Running the modified floodplain model to assess the impacts in a 5 yr ARI, 10 yr ARI and 100 yr ARI and assessing the impacts.

4. HYDRAULICS

On the basis that DA approval has been already given for the proposed Bulky Goods Warehouse the adopted benchmark condition for the assessment of potential impact of the proposed development of Lots 13 and 6 Cook Drive, Coffs Harbour was with the Bulky Goods Warehouse in place ie. Option F

4.1 Benchmark Conditions

4.1.1 Flood Level Contours

The estimated peak flood level contours for the 5 yr ARI 2 hour storm burst and 10 yr ARI 2 hour storm burst and 100 yr ARI 9 hour storm burst are given in **Figures 3, 8** and **13** respectively.

4.1.2 Flood Depths

The estimated peak flood depths for the 5 yr ARI 2 hour storm burst and 10 yr ARI 2 hour storm burst and 100 yr ARI 9 hour storm burst are given in **Figures 4, 9** and **14** respectively.

4.1.3 Flood Velocities

The estimated peak flood velocities for the 5 yr ARI 2 hour storm burst and 10 yr ARI 2 hour storm burst and 100 yr ARI 9 hour storm burst are given in **Figures 5, 10** and **15** respectively.

4.1.4 Flood Velocity x Depth

When considering pedestrian and vehicular stability, three velocity x depth criteria were identified as follows:

Velocity x Depth	Comment
≤ 0.4 m^2/s	This is typically adopted by Councils as a limit of stability for pedestrians
0.4 – 0.6 m^2/s	Unsafe for pedestrians but safe for vehicles if overland flood depths do not exceed around 0.3 m
> 0.6 m^2/s	This is typically adopted by Councils as a limit of stability for vehicles

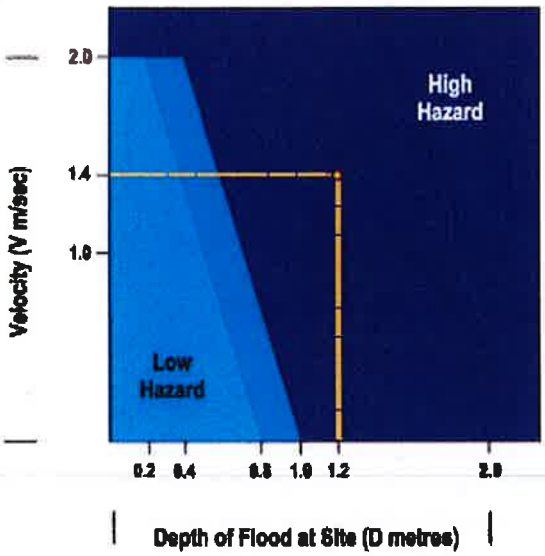
The estimated peak flood velocity x depths for the 5 yr ARI 2 hour storm burst and 10 yr ARI 2 hour storm burst and 100 yr ARI 9 hour storm burst are given in **Figures 6, 11** and **16** respectively.

4.1.5 Flood Hazard

Experience from studies of floods throughout NSW and elsewhere has allowed authorities to develop methods of assessing the hazard to life and property on floodplains. This experience has been used in developing the NSW Floodplain Development Manual to provide guidelines for managing this hazard. These guidelines are shown schematically below.

To use the diagram, it is necessary to know the average depth and velocity of floodwaters at a given location. If the product of depth and velocity exceeds a critical value (as shown below), the flood flow will create a **high hazard** to life and property. There will probably be danger to persons caught in the floodwaters, and possible structural damage. Evacuation of persons would be difficult.

By contrast, in **low hazard** areas people and their possessions can be evacuated safely by trucks. Between the two categories a transition zone is defined in which the degree of hazard is dependent on site conditions and the nature of the proposed development.



Provisional Hazard Categories
(after Figure L2, NSW Government, 2005)

This calculation leads to a provisional hazard rating. The provisional hazard rating may be modified by consideration of effective flood warning times, the rate of rise of floodwaters, duration of flooding and ease or otherwise of evacuation in times of flood.

The estimated flood hazards for the 5 yr ARI 2 hour storm burst and 10 yr ARI 2 hour storm burst and 100 yr ARI 9 hour storm burst are given in **Figures 7, 12** and **17** respectively.

4.2 Future Conditions

The Future Conditions were based on the Bulky Goods Warehouse development in combination with filling of part of Lot 13 Cook Drive, Coffs Harbour (as identified in **Figure 2** – refer "Cleared Area").

4.2.1 Flood Depths

The estimated peak flood depths for the 5 yr ARI 2 hour storm burst and 9 hour storm burst, 10 yr ARI 2 hour storm burst and 9 hour storm burst and 100 yr ARI 9 hour storm burst are given in **Figures 18, 22, 26, 30** and **34** respectively.

4.2.2 Flood Velocities

The estimated peak flood velocities for the 5 yr ARI 2 hour storm burst and 9 hour storm burst, 10 yr ARI 2 hour storm burst and 9 hour storm burst and 100 yr ARI 9 hour storm burst are given in **Figures 19, 23, 27, 31** and **35** respectively.

4.2.3 Flood Velocity x Depth

The estimated peak flood velocity x depths for the 5 yr ARI 2 hour storm burst and 9 hour storm burst, 10 yr ARI 2 hour storm burst and 9 hour storm burst and 100 yr ARI 9 hour storm burst are given in **Figures 20, 24, 28, 32** and **36** respectively.

4.2.4 Flood Hazard

The estimated flood hazards for the 5 yr ARI 2 hour storm burst and 9 hour storm burst, 10 yr ARI 2 hour storm burst and 9 hour storm burst and 100 yr ARI 9 hour storm burst are given in **Figures 21, 25, 29, 33** and **37** respectively.

5. FLOOD IMPACT ASSESSMENT

The impacts of the proposed development on Lot 13 Cook Drive on the flood levels in the 5 yr ARI 2 hour storm burst and 9 hour storm burst, 10 yr ARI 2 hour storm burst and 9 hour storm burst and 100 yr ARI 9 hour storm burst are given in **Figures 38** to **42** respectively.

It was concluded from a comparison of the Benchmark and Future Conditions results that the planned development on Lot 13 Cook Drive has nil impact on 5 yr ARI and 10 yr ARI flood levels, depths, velocities, velocity x depth and provisional flood hazard.

In a 100 yr ARI event the planned development on Lot 13 Cook Drive has a local impact on flood levels, depths and velocities within the drainage reserve located between the Bunnings site and the planned development (refer Figure 2). There is no discernible impact on velocity x depth and provisional flood hazard.

Figure 42 discloses a local impact on the 100 yr ARI flood level of up to 0.11 m in an area where the 100 yr ARI flood level is around 4.75 m AHD (refer Figure 13). On the basis that the proposed finished floor level for the Bunnings Warehouse is 6.0 m AHD this reduces the freeboard to the finished floor level on the Bunnings site from 1.25 m to 1.14 m which remains far in excess of Council's adopted freeboard requirement of 0.5 m. It is also noted that local increases in the 100 yr ARI flood level are confined to Lot 13 Cook Drive while local decreases of up to 0.02 m are estimated east of Cook Drive. This is due to the planned filling of the development site on Lot 13 Cook Drive reducing the discharge of floodwaters in a 100 yr ARI flood from west to east through Lot 13 (refer **Figure 35**).

The proposed development would address the flood issues and objectives typically identified by Council as follows:

Council Issue / Objective	How Flood Issue / Objective has been Addressed
Impacts over a range of flood events. The site and general surrounding area experience problems in 5 year ARI and the 100 year ARI is the standard for assessment and setting of minimum floor levels.	The range of flood events assessed included the 5 yr ARI, 10 yr ARI and 100 yr ARI events.
Impacts upstream of site.	The proposed development is estimated to locally increase 100 yr ARI flood levels on Lot 13 by up to 11 cm. This reduces the freeboard to the finished floor level on the Bunnings site from 1.25 m to 1.14 m which remains far in excess of Council's adopted freeboard requirement of 0.5 m. The 5 yr ARI and 10 yr ARI flood levels upstream of the Pacific Highway are unchanged.
Impacts adjacent to site.	The proposed development is estimated to locally lower 100 yr ARI flood levels by up to 2 cm east of the site. The 5 yr ARI and 10 yr ARI flood levels adjacent to the site are unchanged.
Impacts downstream of site.	The proposed development is estimated to have nil impact on 5 yr ARI, 10 yr ARI and 100 yr ARI flood levels downstream of the site.
Minimum floor level for building.	The floor level for any building constructed on the area that is planned to be filled on Lot 13 Cook Drive would be 5.3 m AHD
Show the site has safe pedestrian and vehicle egress in a 100 year ARI event.	If pedestrians or vehicles were to exit the site via an entrance onto Cook Drive with a view to travelling to the Pacific Highway and evacuating north along the Pacific Highway then these pedestrians or motorists would need to traverse flows spilling down Cook Drive. The estimated velocity x depth of these spilling flows is less than 0.4 m^2/s which would be considered safe for pedestrians and vehicles.
Contain flows in watercourses as much as practical	The intent of the proposed works would be to contain flows in watercourses as much as practical.

6. CONCLUSIONS

It is concluded from the flood impact assessment than development of the cleared area on Lot 13 Cook Drive (refer Figure 2) by filling to a level higher than the 100 yr ARI flood level would:

- Have nil impact on 5 yr ARI and 10 yr ARI flood levels, depths, velocities, velocity x depth and provisional flood hazard;
- Have a local impact on 100 yr ARI flood levels, depths and velocities within the drainage reserve located between the Bunnings site and the planned development but no discernible impact on velocity x depth and provisional flood hazard.
- Reduce the freeboard to the finished floor level on the adjacent Bunnings site from 1.25 m to 1.14 m which remains far in excess of Council's adopted freeboard requirement of 0.5 m.

We would be pleased to further discuss our findings with you upon your request.

Yours faithfully

Brett C. Phillips

.....

Dr Brett C. Phillips
Director, Water Engineering
for **Cardno**

Appendix C

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Eco Restoration Specialists

Vegetation Management Plan

Lot 13 DP 591220 and Lot 56 DP 714455 Cook Drive Coffs Harbour 2450

July 2013

Personnel

This Vegetation Management Plan was prepared by Ricky Crane of Coffs Coast Bush Regeneration Ltd, accredited member of the Australian Association of Bushland Regenerators (AABR)

Acknowledgements

Document Tracking

Revision History					
Version	Date	Author		Reviewer	
		Name	Initials	Name	Initials
DRAFT	24/7/13	Rick Crane	RC	"	RC

Client Issue							
Issue	Version	Draft/Final	Date Sent	Distributed To	Copies	Media	Delivery
1	1	Draft	24/7/13	Rick Bennell	1	elec	email

Disclaimer

This report has been prepared for the use of the stated client and for the specific purpose described in the introduction and is not to be used for any other purpose or by any other person or corporation. Coffs Coast Bush Regeneration accepts no responsibility for any loss or damage suffered howsoever arising to any person or corporation who may use or rely on this report in contravention of the terms of this disclaimer.

Due consideration has been given to site conditions and to appropriate legislation and documentation available at the time of preparation of the report. As these elements are liable to change over time, the report should be considered current at the time of preparation only.

The report relies on information supplied by the client and on findings obtained using accepted survey and assessment methodology. While due care was taken during field survey and report preparation, Coffs Coast Bush Regeneration accepts no responsibility for any omissions that may have occurred due to the nature of the survey methodology.

Conclusions to the report are professional opinions and Coffs Coast Bush Regeneration cannot guarantee acceptance or consent of the relevant determining/ consent authorities. Subsequent requests for further work or information will be subject to additional fees.

Introduction

Background

This Vegetation Management Plan (VMP) has been prepared by Coffs Coast Bush Regeneration (CCBR) following a request from Bennell and Associates consultant for Jim and Margaret Auld owners of the subject property at Lot 13 DP 591220 and Lot 6 DP 714455 which is situated at Cook Drive Coffs Harbour.

This VMP has been prepared to support a rezoning application to allow development on the cleared part of this land. This VMP is to provide strategies for vegetation management on the site and to fulfil Coffs Harbour City Council's (CHCC) requirements for VMP preparation.

CCBR shall provide the land holder/ land manager with a copy of this VMP and undertake a site inspection with the landholder prior to initial works programme being implemented to explain or clarify the requirements of the works programme.

CCBR shall provide a report (Statement of Completion) upon satisfactory completion of the Initial works described in this VMP. CCBR shall also provide to CHCC yearly reports throughout the five year Follow-up Works period.

It is the responsibility of the developer/landowner to ensure that the works programme and recommendations detailed in this VMP are undertaken by suitably qualified personnel.

Aim

- Creation of self-sustaining vegetation communities.
- To provide improved habitat connectivity by restoration of habitat corridors.
- To reduce the presence and spread of environmental/noxious weeds in the local area.
- Enhance the visual amenity of the site

Objectives

- To retain, rehabilitate and enhance existing native vegetation with weed control.
- To map proposed areas requiring weed control.
- To outline the methodology for removal of environmental/noxious weeds and ongoing management detailing the Initial and Follow up Maintenance works required.
- Provide table of costing for all works.

Site Description

Site Location

The property is located approximately 2. 8 kilometres southwest of Coffs Harbours CBD on Cook Drive, Coffs Harbour NSW 2450.

Latitude 30°18'51 76"S, Longitude 153°05'45 48"E

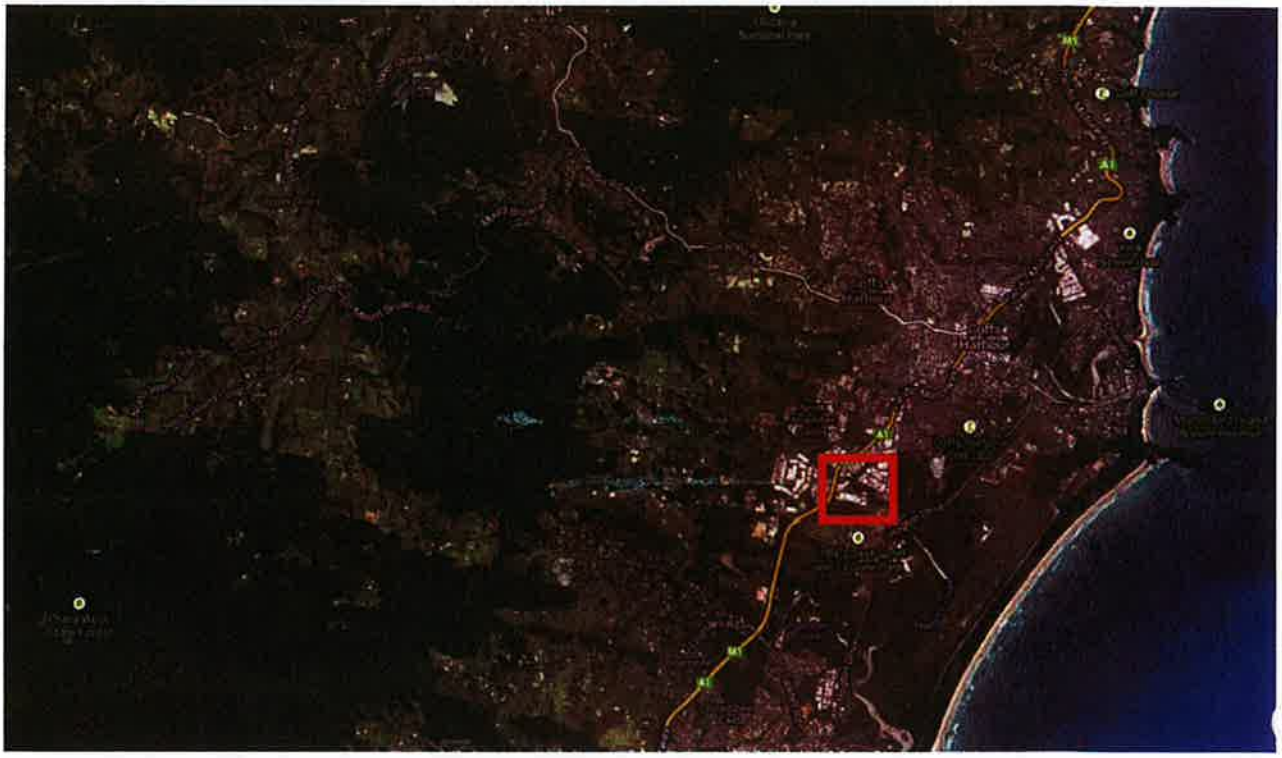


Figure 1. Site Location

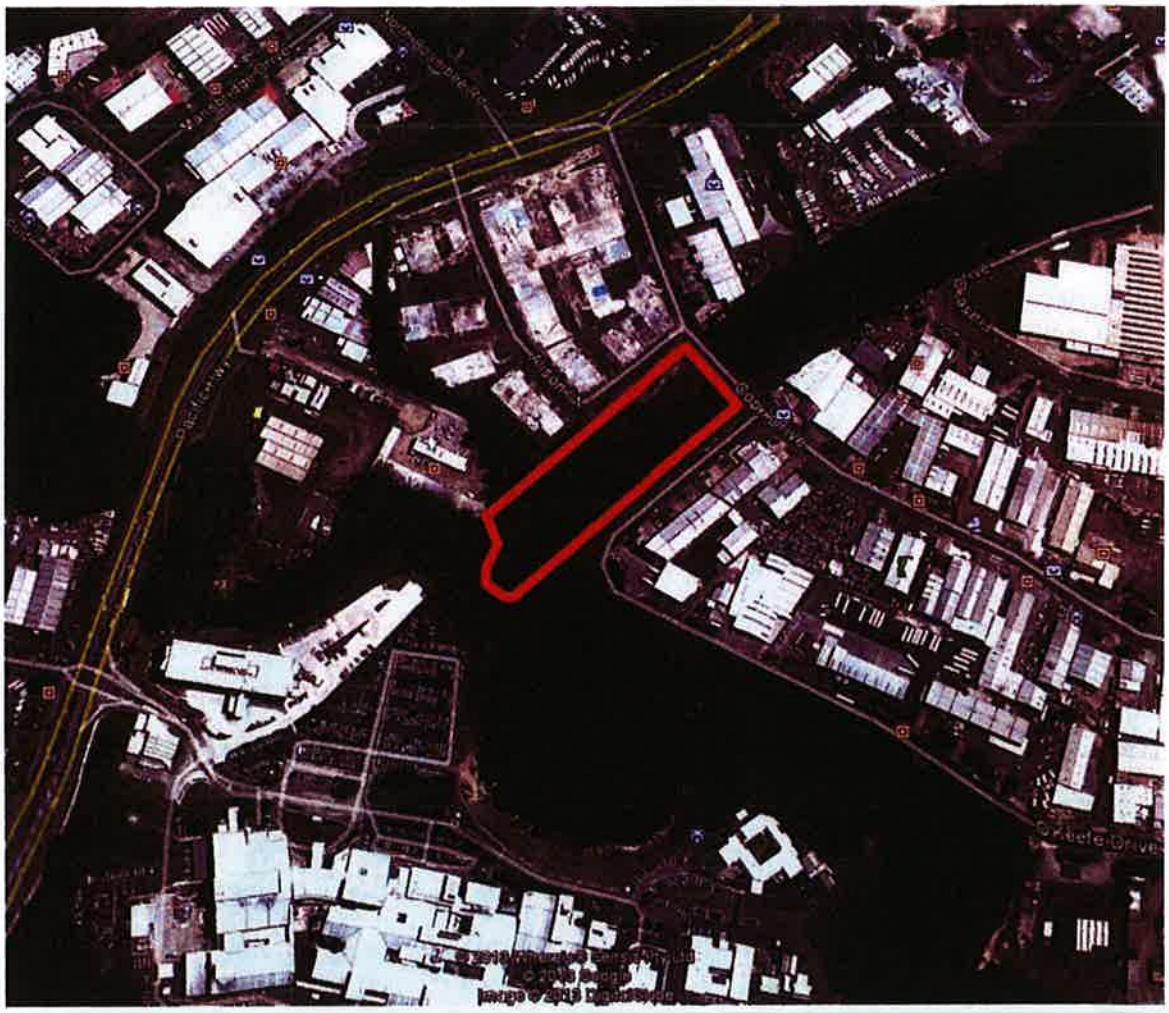


Figure 2. Detailed property location

Site Details

The site known as Lot 13 DP 591220 and Lot 6 DP 714455 is a property owned by Jim and Margaret Auld. It has a total area of approximately 1.2 hectares and is bounded to the north by Cook Drive.

The area covered by this VMP is north of the creek that divides the property; this area shall be referred to as the subject site (see Site Plan Appendix 1 for detail).

Development Outline

The proposal is for a rezoning application to allow development on the cleared part of this land.

The subject land is zoned 7A Environmental Protection (Appendix 3 – Coffs Harbour City Council LEP 2000 Land Zoning) under the provisions of the Coffs Harbour City Local Environmental Plan 2000.

Mapped Koala Habitat is present throughout the majority of the site and is deemed to be Primary Koala Habitat under the Koala Plan of Management (KPoM, 2000).

Site History

The subject site appears to have been utilised as a storage and/or waste area in the past. Scrap metal including car parts, building waste and machinery parts are found across the site.

Most of the subject site seems to have remained without major disturbance in the recent past with moderately resilient vegetation covering much of the site.

Figure 3. Building waste in zone 1

Landforms, geology and soils

Geology

Holocene clayey and silty alluvium (generally <1m total thickness) overlying Pleistocene mottled grey estuarine clays, which were deposited in all major coastal inlets in the Coffs Harbour area. (Leitch, E.C., Neilson, M.J., Hobson, E., 1971) or (Leitch et al 1971)

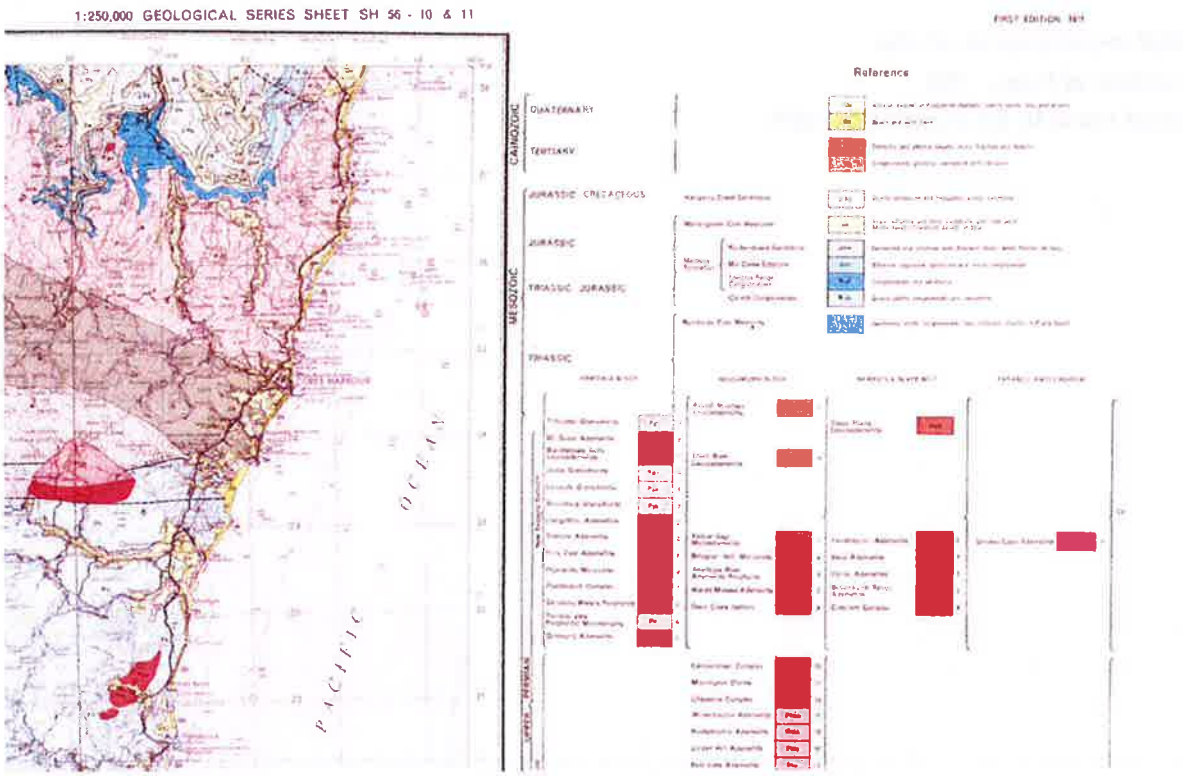


Figure 4: Detail from 1:250,000 Geological Series Dorrigo Sheet (source *www.geoscience.gov.au)*

Soil Type

The property is located on soil type: "*Newports Creek*" (np) Milford (1999).

The Newports Creek soil landscape possesses the following qualities:

- **Topography:** low, level to gently undulating coastal back barrier floodplains on Pleistocene estuarine sediments. Local relief <5m slopes, < %2 elevation.
- **Soils:** deep poorly drained Yellow Podsolic soils and humic clays.
- **Qualities and limitations:** Strongly to very strongly acid, strongly sodic (localised) strongly saline(localised) with high aluminium potential, low to very low wet bearing strength, slow deep topsoil permeability, high topsoil organic matter and low fertility.

Project Summary

Total area of retained vegetation-Approximately 1.1ha
Area of revegetation-1000m2

Total requirements of site
Number of trees- 100
Weed mass to be removed-100%

Assessment of Existing Vegetation

Vegetation Communities

The native vegetation on this property is described as containing the following vegetation types (Figure 4) under the CHCC Class 5 Vegetation Mapping system:

1. **(CH_FW 01) Broad-leaved Paperbark - Swamp Oak – Willow Bottle Brush Forested Wetland on Floodplain.**
2. **(CH_DOF 01) Blackbutt - Turpentine - Pink Bloodwood Grassy Dry Open to Tall Open Forest.**
3. **(CH_WSF 03) Turpentine – Sydney Blue Gum –Tallowwood Sheltered Wet Shrubby Forest of Metasedimentary Hinterland Foothills and Escarpment.**

On ground assessments of the vegetation communities onsite found the vegetation represented by these map units to contain the following species composition:

Broad-leaved Paperbark - Swamp Oak – Willow Bottle Brush Forested Wetland on Floodplain.

- Canopy species-Dominated by Swamp Mahogany *(Eucalyptus robusta)*.
- Mid stratum layer- Dominated by Willow Bottlebrush (*Callistemon salignus)*.
- Ground layer- dominated by Saw Sedge (Gahnia clarkei).

Blackbutt - Turpentine - Pink Bloodwood Grassy Dry Open to Tall Open Forest.

- Canopy species-Dominated by Tallowwood *(Eucalyptus microcorys)* and Blackbutt (*E. pilularis)* with Pink Bloodwood (*Corymbia intermedia)*, White Mahogany (*E. acmenioides*), Red Mahogany (*E. resinifera*) and Turpentine (*Syncarpia glomulifera*) also present.
- Mid stratum layer- contains Willow Bottlebrush (*Callistemon salignus*) with other rainforest tree species such as Forest Maple (*Cryptocarya rigida*), Guioa (*Guioa semiglauca*) and Cheese Tree *(Glochidion ferdinandi)*.
- Ground layer- contains Rasp Fern (*Doodia aspera*), Gristle Fern (*Blechnum cartilagenium*), Ottochloa (*Ottochloa gracillima) and* Common Ground Fern *(Calochlaena dubia)*.

Turpentine – Sydney Blue Gum –Tallowwood Sheltered Wet Shrubby Forest of Metasedimentary Hinterland Foothills and Escarpment.

- Canopy species-Dominated by Tallowwood *(Eucalyptus microcorys)* with Flooded Gum *(Eucalyptus grandis)* and Brush Box *(Lophostemon confertus)*.
- Mid stratum layer- is dense with diverse rainforest trees and vines including Yellow Pear Fruit *(Mischocarpus pyriformis)*, Murrogun *(Cryptocarya microneura)*, Muellers Walnut (Endiandra muelleri) and Water Vines *(Cissus* sp.).
- Ground layer- is sparse with rainforest tree regeneration amongst small vines and ferns.

Figure 5. Forested Wetland (Swamp Sclerophyll EEC) within Zone 1 of the subject site

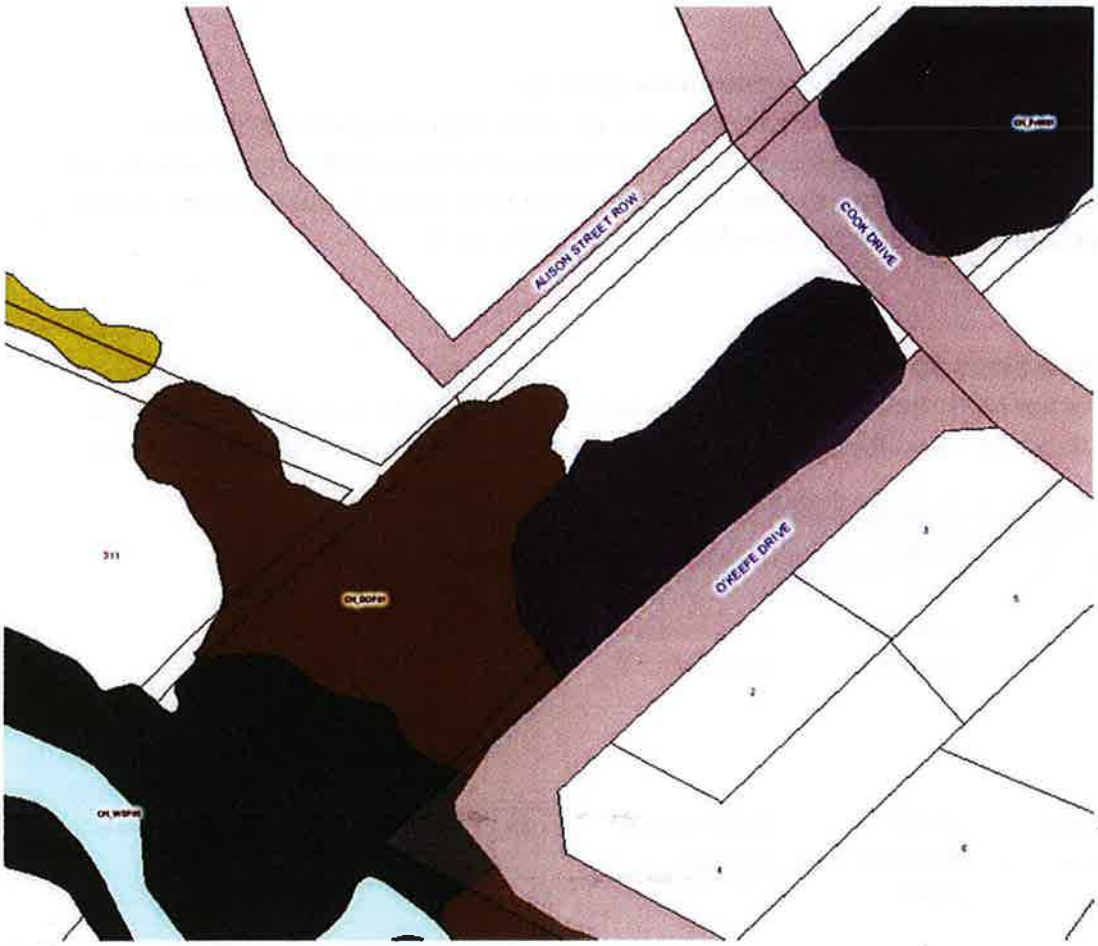


Figure 6: Vegetation Communities
(According to CHCC Fine Scale class 5 Vegetation Mapping)

(CH_FW 01) Broad-leaved Paperbark - Swamp Oak – Willow Bottle Brush Forested Wetland on Floodplain.

(CH_DOF 01) Blackbutt - Turpentine - Pink Bloodwood Grassy Dry Open to Tall Open Forest.

(CH_WSF 03) Turpentine – Sydney Blue Gum –Tallowwood Sheltered Wet Shrubby Forest of Metasedimentary Hinterland Foothills and Escarpment.

Conservation Significance

Endangered Ecological Communities (EEC's)

Elements of vegetation within the subject site fall within the categories of "Swamp Sclerophyll Forest on Coastal Floodplain" and "Subtropical Floodplain Forest" which are both Endangered Ecological Communities within the NSW North Coast Bioregion (listed on the Threatened Species Conservation Act 1995 (TSC Act).

Threatened Flora Species

A search of the NSW NPWS Wildlife Atlas revealed 50 threatened flora species with the potential to occur within the site, being recorded within a 5 kilometre radius of the site.

	Common name	Scientific name	NSW status	Comm. status
Plantae Flora Apiaceae	Mountain Angelica	^^Gingidia montana	E1,P,3	E
Apocynaceae	White-flowered Wax Plant	Cynanchum elegans	E1,P	E
	Slender Marsdenia	Marsdenia longiloba	E1,P	V
	Milky Silkpod	Parsonsia dorrigoensis	V,P	E
	Cryptic Forest Twiner	Tylophora woollsii	E1,P	E
Araceae	Stinky Lily	^^Typhonium sp. aff. brownii	E1,P,3	
Asteliaceae	Silver Sword Lily	Neoastelia spectabilis	V,P	V
Casuarinaceae	Dwarf Heath	Allocasuarina	E1,P	E

	Casuarina	defungens		
Corynocarpaceae	Glenugie Karaka	Corynocarpus rupestris subsp. rupestris	V,P	V
Cyperaceae	Square-stemmed Spike-rush	Eleocharis tetraquetra	E1,P	
Ebenaceae	Red-fruited Ebony	Diospyros mabacea	E1,P	E
Euphorbiaceae	Sand Spurge	Chamaesyce psammogeton	E1,P	
Fabaceae (Caesalpinioideae)	Rainforest Cassia	Senna acclinis	E1,P	
Fabaceae (Faboideae)	Coast Headland Pea	Pultenaea maritima	V,P	
	Silverbush	Sophora tomentosa	E1,P	
Fabaceae (Mimosoideae)	Newry Golden Wattle	Acacia chrysotricha	E1,P	
Haloragaceae	Tall Velvet Sea-berry	Haloragis exalata subsp. velutina	V,P	V
Lauraceae	Crystal Creek Walnut	Endiandra floydii	E1,P	E
	Rusty Rose Walnut	Endiandra hayesii	V,P	V
Lindsaeaceae	Slender Screw Fern	^^Lindsaea incisa	E1,P,3	

Menispermaceae	Tinospora Vine	Tinospora smilacina	E1,P	
Myrtaceae		Kardomia silvestris	E1,P	
	Peach Myrtle	Uromyrtus australis	E1,P	E
Orchidaceae	Spider orchid	^Dendrobium melaleucaphilum	E1,P,2	
	Rough Doubletail	^Diuris praecox	V,P,2	V
	Veined Doubletail	^Diuris venosa	V,P,2	V
	Yellow-flowered King of the Fairies	^Oberonia complanata	E1,P,2	
	Red-flowered King of the Fairies	^Oberonia titania	V,P,2	
	Brown Fairy-chain Orchid	^Peristeranthus hillii	V,P,2	
	Southern Swamp Orchid	^Phaius australis	E1,P,2	E
	Lady Tankerville's Swamp Orchid	^Phaius tancarvilleae	E1,P,2	E
	Ravine Orchid	^Sarcochilus fitzgeraldii	V,P,2	V
Poaceae	Floyd's Grass	Alexfloydia repens	E1,P	

	Hairy Jointgrass	Arthraxon hispidus	V,P	V
Polygonaceae	Tall Knotweed	Persicaria elatior	V,P	V
Proteaceae	Nightcap Oak	^Eidothea hardeniana	E1,P,2	CE
	Big Nellie Hakea	^^Hakea archaeoides	V,P,3	V
	Red Boppel Nut	Hicksbeachia pinnatifolia	V,P	V
	Rough-shelled Bush Nut	Macadamia tetraphylla	V,P	V
Rhamnaceae	Scant Pomaderris	Pomaderris queenslandica	E1,P	
Rubiaceae	Trailing Woodruff	Asperula asthenes	V,P	V
Rutaceae	Scented Acronychia	Acronychia littoralis	E1,P	E
	Orara Boronia	Boronia umbellata	V,P	V
	Headland Zieria	Zieria prostrata	E1,P	E
	Low growing form of Z. smithii, Diggers Head	Zieria smithii	E2	
Santalaceae	Austral Toadflax	Thesium australe	V,P	V
Sapindaceae	Small-leaved Tamarind	Diploglottis campbellii	E1,P	E

Sapotaceae	Rusty Plum, Plum Boxwood	Niemeyera whitei	V,P	
Simaroubaceae	Moonee Quassia	Quassia sp. Mooney Creek	E1,P	E
Winteraceae	Fragrant Pepperbush	Tasmannia glaucifolia	V,P	V

Table 1: Threatened species within 5 km radius according to the NSW NPWS Wildlife Atlas.

During site vegetation surveys:

No *Schedule 1* plant species under the *Threatened Species Conservation Act 1995(NSW)* were encountered.

No plant species from *Schedule 2* under the *Threatened Species Conservation Act 1995(NSW) were* encountered.

No threatened flora species from Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) were encountered.

No Rare plant species from the ROTAP (Rare or Threatened Australian Plants) list were encountered.

Although no Rare or Threatened Australian Plant (ROTAP) was located the following species may be present:

- *Senna acclinis* (Native Cassia)
- *Marsdenia longiloba*
- *Tylophora woollsii*
- *Niemeyera whitei* (Rusty Plum)

Senna acclinis could be confused with the exotic *Senna pendula.*

The same confusion could occur between *Marsdenia longiloba* and the exotic weed Moth Vine *Araujia hortorum*. The later having a milky sap and the former a clear sap, although there are other native Marsdenia sp. that are not ROTAP yet have a milky sap as the exotic Moth Vine.

It is recommended that any persons undertaking weed control activities in the Eucalypt Open Forest of the study area be informed of the presence of potential habitat for the threatened species *Marsdenia longiloba, Niemeyera whitei, Senna acclinis* and *Typhonium sp aff brownii* and be able to demonstrate an ability to recognise these species in the field.

Conservation Status

- Contains two EEC's 'Swamp Sclerophyll' and 'Subtropical Coastal Floodplain'.
- Mapped as Sub-regional Corridor and Key Habitat in the CHCC LGA as identified by: 'Scotts, D. (2003) Key habitats and corridors for forest fauna'.
- Protected by SEPP 14 Coastal Wetlands.
- Protected by SEPP 44 Koala Habitat.
- Primary Koala habitat (CHCC KPoM 2000).

Restoration Methodology

Outline

The aim of Bushland Regeneration work is to restore native vegetation, degraded by weed infestations, to a healthy intact and diverse ecosystem or to re-establish an area devoid of native vegetation.

To achieve this, two approaches may be taken:

- **Natural Regeneration:** - weed control is carried out but no planting of native species takes place relying on the inputs of seed from surrounding bushland (brought in by birds or other fauna, wind and water). It requires some form of native canopy to be present on the site. It also requires that there be a healthy area of bushland in close proximity or adjacent to the site.

- **Revegetation:** - planting of native species on site approximately 2- 3 metres apart. This is most applicable to areas that have severe weed infestations or that are devoid of native vegetation (eg grass paddocks)

A restoration works programme has two distinct phases that comprises a weed control component and, if applicable to the site, revegetation.

- **Primary treatment**: - Initial treatment of area.

  Weed control is undertaken to assist natural regeneration or in conjunction with revegetation. Weed control may involve control of all weed species present within the site or may be a staged process where a percentage is retained within the initial phase and controlled in subsequent secondary stages (e.g. canopy weed species). Low priority weed species may not require any control until the secondary phase(s). Revegetation in the initial works phase will generally focus on the planting of canopy and midstorey species with understory species generally planted after canopy establishment.

- **Secondary treatment**- Follow up work- consolidation of initial works.

  The aim is for this work to be timed as to prevent germinating weeds from reaching seeding stage as well as reducing the competition for natural regeneration or revegetation that has taken place following the initial works. To be most effective Follow-up work must be undertaken on a regular basis.

  Also may involve the completion of staged weed removal that was initiated in the primary control phase or control of low priority weed species.

It may take up to 10 years before the native vegetation is stable enough to out compete weed species/ and or the weed seed bank has been exhausted.

Replacement of any revegetation plantings that did not survive is required in this phase and also may involve planting of supplementary groundcover species.

Weed Control

Overview

The weed control works that are presented in this VMP have been designed to address a range of requirements and issues that exist across the subject site. All works shall be carried out following the guidelines and techniques as recommended by the Australian Association of Bushland Regenerators (AABR).

Due to the abundance of native vegetation of medium and high ecological value and the possible presence of undetected threatened species (*Senna acclinis, Marsdenia longiloba, Neimeyera whitei*) environmentally sensitive weed control techniques are required.

Machinery and Powerspray units shall **not be used** for the control of weeds at this site.

All weed species present are listed in *Appendix 6.* Profiles of the weed species and control techniques are included in *Appendix 7.*

Initial Works Programme

The initial weed control programme shall target all weeds outlined for each of the Management zone categories.

During the initial phases of the weed control works, Tobacco Bush (*Solanum mauritianum*) shall be considered as a pioneer species and left untreated to assist with natural regeneration. Wild Tobacco shall be treated as a native pioneer species until the native vegetation is established and providing an intact canopy cover, at which time it may then be controlled.

Follow-up Works Programme

Follow up weed control works shall include the continued suppression and removal of identified weed species for each zone. Any opportunistic weed species not already identified shall be incorporated into the follow up weed control works for treatment.

Follow up works shall involve continued weed control targeting the main weed species and any opportunistic weeds.

This shall involve the periodic manual removal and spot spraying of weeds (before seed set). Follow up work shall involve regular weed control and this shall take place every 8 weeks for 2 years and thereafter every 4 months for the following 3 years.

Newly emerging weeds may be species that are not currently occurring on this site. Weed species that are present in the local area and therefore may germinate on the site in the future and shall require control are outlined in *Appendix 7*.

Natural Regeneration

- Natural regeneration shall be assisted by not targeting, within the scope of the weed control programme, specific exotic species that assist natural regeneration (e.g. Tobacco Bush and annuals such as Farmers Friends and Ragweed)

Koala Habitat

The CHCC Koala Plan of Management (KPoM) has identified most of the subject site as Primary Habitat, and therefore any operations under development must comply with the KPoM directions of habitat restoration.

Commercial Availability of Local Provenance

The commercial availability of some species is an issue as there is a limited diversity of species available (unless of course specifically propagated for a particular project).

This is especially relevant for Eucalypt species that, unlike rainforest species, cannot be held in nurseries for extended periods of time prior to planting. Many groundcover species are not commercially available.
Possible solutions to lack of commercial availability of required species include:

- Project planning to be undertaken over a longer period of time to allow for the collection of local provenance seed and its propagation. This would require landholders/ land managers/developers being made aware of this requirement.
- Purchase of non provenance sources.
- Reduce the diversity of species planted initially and enrich over time(with associated follow up works) as species propagated from locally sourced seed become available.

Promote natural regeneration

Initial weed control work will target ground, mid-storey and canopy weed species. The weed control program addresses the required treatments for the suppression of the targeted weed species and will result in promoting natural regeneration to occur with the aim of establishing a more self-sustaining environment.

Monitoring

Monitoring will be undertaken in conjunction with the Follow-up Works Programme, and will comprise the following:

- Check for survival rates.
- Check soil moisture and undertaken watering if required.
- Check for encroaching weeds and native vines to ensure seedling growth is not adversely affected. Vine species shall be cut back to a reasonable distance.

Vegetation Management Strategy

Vegetation Management Zones

The site has been divided into 4 "Vegetation Management Zones" that are displayed on the Site Map in Appendix 1.

Zone 1: is located in the north east corner of the site. It is occupied by the swamp sclerophyll vegetation and is zoned 7A. Dominant canopy species are Swamp Mahogany; midstorey/understorey is dominated by Willow Bottlebrush and Saw Sedge with occasional environmental weeds.

Zone 2: is located in the south-western corner of the subject site. Dominant canopy species are Tallowwood and Blackbutt. Midstorey/understorey contains rainforest tree species interspersed with low densities of environmental weeds including Cocos Palm and Broad Leaved Paspalum.

Zone 3: is located along the northern and western edges of zone 1 and zone 2. This zone is a thin strip of dense environmental weeds containing Lantana, Senna, Guinea Grass, Paspalum sp., Crofton Weed and Japanese Sunflower among others.

Zone 4: is located in a band that stretches down into the centre of zone 2 and is occupied by dense Broad Leaved Paspalum. Dominant canopy species are Tallowwood and Blackbutt.

Management Zone 1

Outline

Resilience

The vegetation in this area is dominated by Swamp Mahogany forested wetland. This vegetation is intact and resilient with a dense canopy of native species however it is a narrow strip exposed on three sides and shall remain under pressure from weed invasion especially in the vicinity of the edges. Environmental weeds present are diverse and well distributed throughout the zone however their densities are generally low.

Restoration Techniques

The zone shall require all environmental weeds to be controlled with regular follow up undertaken to achieve eradication. This shall be achieved by qualified Professional Bushland Regenerators (PBRs) sweeping through the zone with the aim of treating all individuals of environmental weeds located within the zone.

Sensitive weed control undertaken at regular intervals shall allow for the retention of site resilience by carefully treating environmental weeds without harming native vegetation.

Methods to be used shall involve manual removal, cut and paint technique, stem injection and foliar application of herbicide.

Follow up weed control shall be undertaken at regular intervals and aim at controlling environmental weeds at the seed ling stage. Undertaken over a 5 year period this follow up weed control shall allow for the eradication of all environmental weeds from the zone.

Restoration Goals

- Control and eventual eradication of all environmental weeds.
- Increase in site resilience.

Threatening Processes

- Shade tolerant environmental weeds such as Asparagus Fern, Cocos Palm and Broad Leaved Paspalum continuing to disperse throughout the zone and impeding the regeneration of native vegetation and thus restricting the development of site resilience.

Mitigation Strategies

- The site shall be subject to a weed control programme utilising regular waves of targeted weed control to eradicate all environmental weeds from the site.

Figure 7. Resilience Swamp Sclerophyll vegetation in Zone 1, showing Cocos Palm in foreground.

Initial Works

Initial works required include weed control and revegetation works

Weed Control and Site Preparation

This shall involve the control of all Environmental and Noxious weeds in this zone as shown in *Table 2* and listed in *Appendix 6*.

Botanical Name	Common Name	Legal or Risk Status	Population Structure
Syagrus romanzoffiana	*Cocos Palm*	Med. Risk Env. weed	Lightly scattered across zone
Lantana camara	Lantana	Class 3 noxious	Lightly scattered across zone
Senna pendula	Senna	Med. Risk Env. weed	Lightly scattered across zone
Paspalum mandiocanum	Broad-leaf Paspalum	Med. Risk Env. weed	Lightly scattered across zone
Asparagus aethiopicus	Asparagus Fern	WoNS	Lightly scattered across zone

Table2: Weed species present Zone 1

This shall involve treatments as outlined in *Table 3*. Detailed bushland regeneration weed control techniques including relevant herbicides and application rates are given in *Appendix 7*.

Technique	Species	Life Stage	Comments	Optimal Control Period
Cut & Paint	Senna	Mature		Prior to flowering in April
	Cocos Palm	Juvenile		
	Lantana	sapling		
Direct Inject	Cocos Palm	mature		
Manual Removal	Senna	seedlings		
	Lantana	Seedling/mature		
	Asparagus	mature	Remove where climbing on native seedlings	
	Paspalum	mature	Remove within 50cm from native grasses prior to spraying	Late Summer/ Autumn
Spraying	Paspalum	mature	Refer above	Late Summer/ Autumn
	Asparagus	mature		Before fruiting in Autumn

Table 3: Weed Control Requirements

Management Zone 2

Outline

Resilience

The vegetation in this area is Tallowwood/ Blackbutt dry open forest. This vegetation is intact and relatively resilient with a dense canopy of native species however it is suffering from a degree of weed infestation with woody weeds such as Senna and Lantana present and grasses especially Broad Leaved Paspalum requiring control. Weed densities are generally low.

Restoration Techniques

The zone shall require all environmental weeds to be controlled with regular follow up undertaken to achieve eradication. This shall be achieved by qualified Professional Bushland Regenerators (PBRs) sweeping through the zone with the aim of treating all individuals of environmental weeds located within the zone.

Sensitive weed control undertaken at regular intervals shall allow for the retention of site resilience by carefully treating environmental weeds without harming native vegetation.

Methods to be used shall involve manual removal, cut and paint technique, stem injection and foliar application of herbicide.

Follow up weed control shall be undertaken at regular intervals and aim at controlling environmental weeds at the seed ling stage. Undertaken over a 5 year period this follow up weed control shall allow for the eradication of all environmental weeds from the zone.

Restoration Goals

- Control and eventual eradication of all environmental weeds.
- Increase in site resilience.

Threatening Processes

- Shade tolerant environmental weeds such as Asparagus Fern, Cocos Palm and Broad Leaved Paspalum continuing to disperse throughout the zone and impeding the regeneration of native vegetation and thus restricting the development of site resilience.

Mitigation Strategies

- The site shall be subject to a weed control programme utilising regular waves of targeted weed control to eradicate all environmental weeds from the site.

Figure 8. Broad Leaved Paspalum in Zone 2

Initial Works

Initial works required include weed control and revegetation works

Weed Control and Site Preparation

This shall involve the control of all Environmental and Noxious weeds in this zone as shown in *Table 4* and listed in *Appendix 6.*

Botanical Name	Common Name	Legal or Risk Status	Population Structure
Syagrus romanzoffiana	*Cocos Palm*	Med. Risk Env. weed	Lightly scattered across zone
Lantana camara	Lantana	Class 3 noxious	Lightly scattered across zone
Senna pendula	Senna	Med. Risk Env. weed	Lightly scattered across zone
Paspalum mandiocanum	Broad-leaf Paspalum	Med. Risk Env. weed	Lightly scattered across zone
Asparagus aethiopicus	Asparagus Fern	WoNS	Lightly scattered across zone
Cinnamomum camphora	Camphor Laurel	High risk env. weed	Lightly scattered across zone

Table 4: Weed species present Zone 2

This shall involve treatments as outlined in *Table 5*. Detailed bushland regeneration weed control techniques including relevant herbicides and application rates are given in *Appendix 7*.

Technique	Species	Life Stage	Comments	Optimal Control Period
Cut & Paint	Senna	Mature		Prior to flowering in April
	Cocos Palm	Juvenile		
	Camphor Laurel	Juvenile		
	Lantana	sapling		
Direct Inject	Cocos Palm	mature		
	Camphor Laurel	mature		
Manual Removal	Senna	seedlings		
	Lantana	Seedling/mature		
	Asparagus	mature	Remove where climbing on native seedlings	
	Paspalum	mature	Remove within 50cm from native grasses prior to spraying	Late Summer/ Autumn
Spraying	Paspalum	mature	Refer above	Late Summer/ Autumn
	Asparagus	mature		Before fruiting in Autumn

Table 5: Weed Control Requirements

Management Zone 3

Outline

Resilience.

The vegetation in this area is dominated by environmental weeds. Canopy species of the native communities are present however this zone is an edge along the north west of zone1 and zone 2 and as such has exposure to drying and high light levels. This zone appears to have undergone recent disturbance. The vegetation is lacking in resilience and high densities of weed infestation are present with woody weeds such as Senna and Lantana present amongst grasses such as Broad Leaved Paspalum, Setaria, Torpedo Grass and Guinea Grass with Japanese Sunflower and Crofton weed also present.

Restoration Techniques

The zone shall require all environmental weeds to be controlled with regular follow up undertaken to achieve eradication. This shall be achieved by qualified Professional Bushland Regenerators (PBRs) sweeping through the zone with the aim of treating all individuals of environmental weeds located within the zone.

Sensitive weed control undertaken at regular intervals shall allow for the development of site resilience by carefully treating environmental weeds without harming native vegetation.

Methods to be used shall involve manual removal, cut and paint technique, stem injection and foliar application of herbicide.

Follow up weed control shall be undertaken at regular intervals and aim at controlling environmental weeds at the seed ling stage. Undertaken over a 5 year period this follow up weed control shall allow for the eradication of all environmental weeds from the zone.

Restoration Goals

- Control and eventual eradication of all environmental weeds.
- Canopy establishment.
- Understorey and midstorey development.
- Restoration of site resilience.

Threatening Processes

- Dense environmental weed infestation restricting the regeneration of native vegetation.
- Dense environmental weed infestation providing seed sources to disperse throughout the remainder of the site.

Mitigation Strategies

- Initial weed control shall remove all weeds in preparation for revegetation.
- Revegetation shall be undertaken to begin lowering light levels to aid in reducing the density of environmental weeds.
- Densely foliaged edge species compatible with the vegetation communities present shall be utilised to screen the edge.
- The site shall be subject to a weed control programme utilising regular waves of targeted weed control to eradicate all environmental weeds from the site.

Figure 9. Dense Crofton Weed in Zone 3

Initial Works

Initial works required include weed control and revegetation works

Weed Control and Site Preparation

This shall involve the control of all Environmental and Noxious weeds in this zone as shown in *Table 6* and listed in *Appendix 6.*

Botanical Name	Common Name	Legal or Risk Status	Population Structure
Syagrus romanzoffiana	*Cocos Palm*	Med. Risk Env. weed	Lightly scattered across zone
Lantana camara	Lantana	Class 3 noxious	Dense infestations throughout zone
Senna pendula	Senna	Med. Risk Env. weed	Dense infestations throughout zone
Paspalum mandiocanum	Broad-leaf Paspalum	Med. Risk Env. weed	Lightly scattered across zone with occasional dense infestations.
Asparagus aethiopicus	Asparagus fern	WoNS	Lightly scattered across zone
Cinnamomum camphora	Camphor Laurel	High risk env. weed	Lightly scattered across zone
Ageratina adenophora	Crofton Weed	Class 4 noxious	Scattered across zone
Tithonia diversifolia	Japanese Sunflower	Med. Risk Env. weed	Occasional dense infestations.
Philodendron sp.		Low Risk Env. weed	Localised infestation.
Megathursis maximus	Guinea Grass	Med. Risk Env. weed	Occasional dense infestations.
Panicum repens	Torpedo Grass	Med. Risk Env. weed	Occasional dense infestations.
Ipomoea purpurascens	Morning Glory	Med. Risk Env. weed	Small infestation
Melicope eleryana	Pink Euodia	Low Risk Env. weed	Occasional individuals
Koelruteria paniculata	Golden Rain Tree	Low Risk Env. weed	Occasional individuals
Setaria sphacelata	Setaria	Med. risk env. weed	Scattered across zone

Table 6: Weed species present Zone 3

This shall involve treatments as outlined in *Table 7*. Detailed bushland regeneration weed control techniques including relevant herbicides and application rates are given in *Appendix 7*.

Technique	Species	Life Stage	Comments	Optimal Control Period
Cut & Paint	Senna	Mature		Prior to flowering in April
	Cocos Palm	Juvenile		
	Camphor Laurel	Juvenile		
	Lantana	sapling		
Direct Inject	Cocos Palm	mature		
	Camphor Laurel	mature		
Manual Removal	Senna	seedlings		
	Lantana	Seedling/mature		
	Asparagus	mature	Remove where climbing on native seedlings	
	Paspalum	mature	Remove within 50cm from native grasses prior to spraying	Late Summer/ Autumn
Spraying	Paspalum	mature	Refer above	Late Summer/ Autumn
	Asparagus	mature		Before fruiting in Autumn

Table 7: Weed Control Requirements

Revegetation methodology

Revegetation shall been undertaken across the zone with the aim of closing the canopy whilst boosting diversity. Trees shall be planted at spacing of 3m centres throughout the zone.

Direct planting

It is an approximate area 500².

This shall involve the planting of 50 indigenous native tree species at plant spacings of 3 metre centres in all areas devoid of canopy. Planting shall be done following initial weed control as described above.

Detailed revegetation methodology.

Detailed site preparation and planting requirements are given in *Appendix 8.*

Revegetation Species

Species required shall be a mixture of Midstorey:

Midstorey Species		
Botanical Name	**Common Name**	
Acronychia oblongifolia	Common Acronychia	5
Acacia melanoxylon	Blackwood	10
Cryptocarya microneura	Murrogun	5
Elaeocarpus obovatus	Hard Quandong	5
Endiandra discolor	Rose Walnut	5
Eucalyptus microcorys	Tallowwood	10
Euroshinus falcattus	Ribbonwood	5
Syncarpia glomulifera	Turpentine	5

Table 8: Zone 3 revegetation species list

These native indigenous species shall:

- Be tubestock grown from local provenance seed (i.e. seed collected within a 50 kilometres radius of Coffs Harbour)
- Be planted using slow release fertiliser and water retention crystals,
- Have jute weed mats for weed control.
- Have large plastic tree guards installed for protection against Wallaby predation.
- Be watered on installation and depending on the soil moisture during the plant establishment phase, additional watering may be required.

Revegetation Follow up works

- Follow up weed control works shall include the continued suppression and removal of identified weed species in each Zone. Any opportunistic weed

species not already identified shall be incorporated into the follow up weed control works for treatment.
- Any plant losses shall be replaced.
- Emergent seedlings of native species introduced to the site by fauna, shall require monitoring and identification. Native species that are not consistent with the vegetation community shall be removed.
- It may be necessary to prune native vines that are in close proximity to native seedlings. Pruning of the vines will allow for uninhibited growth of the native seedlings, until such time as they are established.

Any revegetation plantings that die within the 5 year plan period shall be replaced within the scope of the Follow-up Works programme at the owner's expense.

Management Zone 4

Outline

Resilience

The vegetation in this area is dominated by the Tallowwood/Blackbutt dry open forest community. Canopy species are present however disturbance and increased light levels have allowed for the invasion of the zone by Broad Leaved Paspalum. The vegetation is somewhat resilient owing to the canopy species present although further reductions in light levels by revegetation would facilitate the eradication of Broad Leaved Paspalum and thus aid the enhancement of site resilience.

Restoration Techniques

The zone shall require Broad Leaved Paspalum to be controlled with regular follow up undertaken to achieve eradication. This shall be achieved by qualified Professional Bushland Regenerators (PBRs) sweeping through the zone with the aim of treating all Broad Leaved Paspalum located within the zone.

Sensitive weed control undertaken at regular intervals shall allow for the retention of site resilience by carefully treating environmental weeds without harming native vegetation.

Methods to be used shall involve manual removal, wick wiping and foliar application of herbicide.

The establishment of a dense layer of native grasses shall be encouraged by sensitive weed control. This ground layer shall aid in reducing large germinations from the seed bank and facilitate the eventual eradication of Broad Leaved Paspalum

Follow up weed control shall be undertaken at regular intervals and aim at controlling Paspalum before seeding in autumn. A minimum 5 year period of comprehensive follow up weed control shall be required to achieve the eradication of Broad Leaved Paspalum from the zone.

Restoration Goals

- Control and eventual eradication of Broad Leaved Paspalum.
- Canopy closure/consolidation.
- Understorey and midstorey development.
- Restoration of site resilience.
- Increased floristic diversity.
- Establishment of dense native ground cover.

Threatening Processes

- Dense Broad Leaved Paspalum infestation restricting the regeneration of native vegetation.
- Dense Broad Leaved Paspalum providing seed sources to disperse throughout the remainder of the site.

Mitigation Strategies

- Initial weed control shall remove Broad Leaved Paspalum in preparation for revegetation.
- Revegetation shall be undertaken to begin lowering light levels and aid in reducing the density of Broad Leaved Paspalum germination.
- Species compatible with the vegetation communities present shall be utilised to aid in boosting floristic diversity and developing site resilience. .
- The site shall be subject to a weed control programme utilising regular waves of targeted weed control to eradicate all environmental weeds from the site.

Figure 10. Zone 4: Dense Broad Leaved Paspalum infestation

Initial Works

Initial works required include weed control and revegetation works

Weed Control and Site Preparation

This shall involve the control of all Environmental and Noxious weeds in this zone as shown in *Table 9* and listed in *Appendix 6*.

Botanical Name	Common Name	Legal or Risk Status	Population Structure
Paspalum mandiocanum	Broad-leaf Paspalum	Med. Risk Env. weed	Lightly scattered across zone with occasional dense infestations.

Table 9: Weed species present Zone 4

This shall involve treatments as outlined in *Table 10*. Detailed bushland regeneration weed control techniques including relevant herbicides and application rates are given in *Appendix 7*.

Technique	Species	Life Stage	Comments	Optimal Control Period
Manual removal	Paspalum	Mature	Remove within 50cm from native grasses prior to spraying	Prior to flowering in April
Wick Wiping	Paspalum	mature	Where understorey of native grasses exists.	Late Summer/ Autumn
Spraying	Paspalum	mature	Refer above	Late Summer/ Autumn

Table 10: Weed Control Requirements

Revegetation methodology

Revegetation shall been undertaken across the zone with the aim of closing the canopy whilst boosting diversity. Trees shall be planted at spacing of 3m centres throughout the zone.

Direct planting

It is an approximate area 500².

This shall involve the planting of 50 indigenous native tree species at plant spacings of 3 metre centres in all areas devoid of canopy. Planting shall be done following initial weed control as described above.

Detailed revegetation methodology.

Detailed site preparation and planting requirements are given in *Appendix 9*.

Revegetation Species

Species required shall be a mixture of Canopy and Midstorey:

Midstorey Species		
Botanical Name	**Common Name**	
Acronychia oblongifolia	Common Acronychia	5
Acacia melanoxylon	Blackwood	20
Cryptocarya microneura	Murrogun	5
Eucalyptus microcorys	Tallowwood	10
Eucalyptus robusta	Swamp Mahogany	5
Euroshinus falcattus	Ribbonwood	5
Pittosporum undulatum	Sweet Pittosporum	5
Syncarpia glomulifera	Turpentine	5

Table 11: Zone 4 revegetation species list

These native indigenous species shall:

- Be tubestock grown from local provenance seed (i.e. seed collected within a 50 kilometres radius of Coffs Harbour)
- Be planted using slow release fertiliser and water retention crystals,
- Have jute weed mats for weed control.
- Have large plastic tree guards installed for protection against Wallaby predation.
- Be watered on installation and depending on the soil moisture during the plant establishment phase, additional watering may be required.

Revegetation Follow up works

- Follow up weed control works shall include the continued suppression and removal of identified weed species in each Zone. Any opportunistic weed species not already identified shall be incorporated into the follow up weed control works for treatment.
- Any plant losses shall be replaced.
- Emergent seedlings of native species introduced to the site by fauna, shall require monitoring and identification. Native species that are not consistent with the vegetation community shall be removed.
- It may be necessary to prune native vines that are in close proximity to native seedlings. Pruning of the vines will allow for uninhibited growth of the native seedlings, until such time as they are established.

Any revegetation plantings that die within the 5 year plan period shall be replaced within the scope of the Follow-up Works programme at the owner's expense.

Maintenance, Monitoring and Reporting

On ground maintenance of restoration/ revegetation works

- The subject site shall require a 5 year maintenance programme.
- Maintenance and Follow Up weed control shall be undertaken every 8 weeks for the first 2 years followed by every 4 months for the remaining 3 years.
- Depletion of the seed bank of Broad Leaved Paspalum shall be a priority across the site.

Monitoring

Monitoring will be undertaken in conjunction with follow up weed control works, and will comprise the following:

- Check for survival rates.
- Check soil moisture and undertaken watering if required.
- Check for encroaching weeds and native vines to ensure. seedling growth is not adversely affected. Vine species shall be cut back to a reasonable distance.
- Bag protection is in place correctly
- Check general health of plants – to estimate further fertiliser application requirements.
- Check for human disturbance of the plantings.

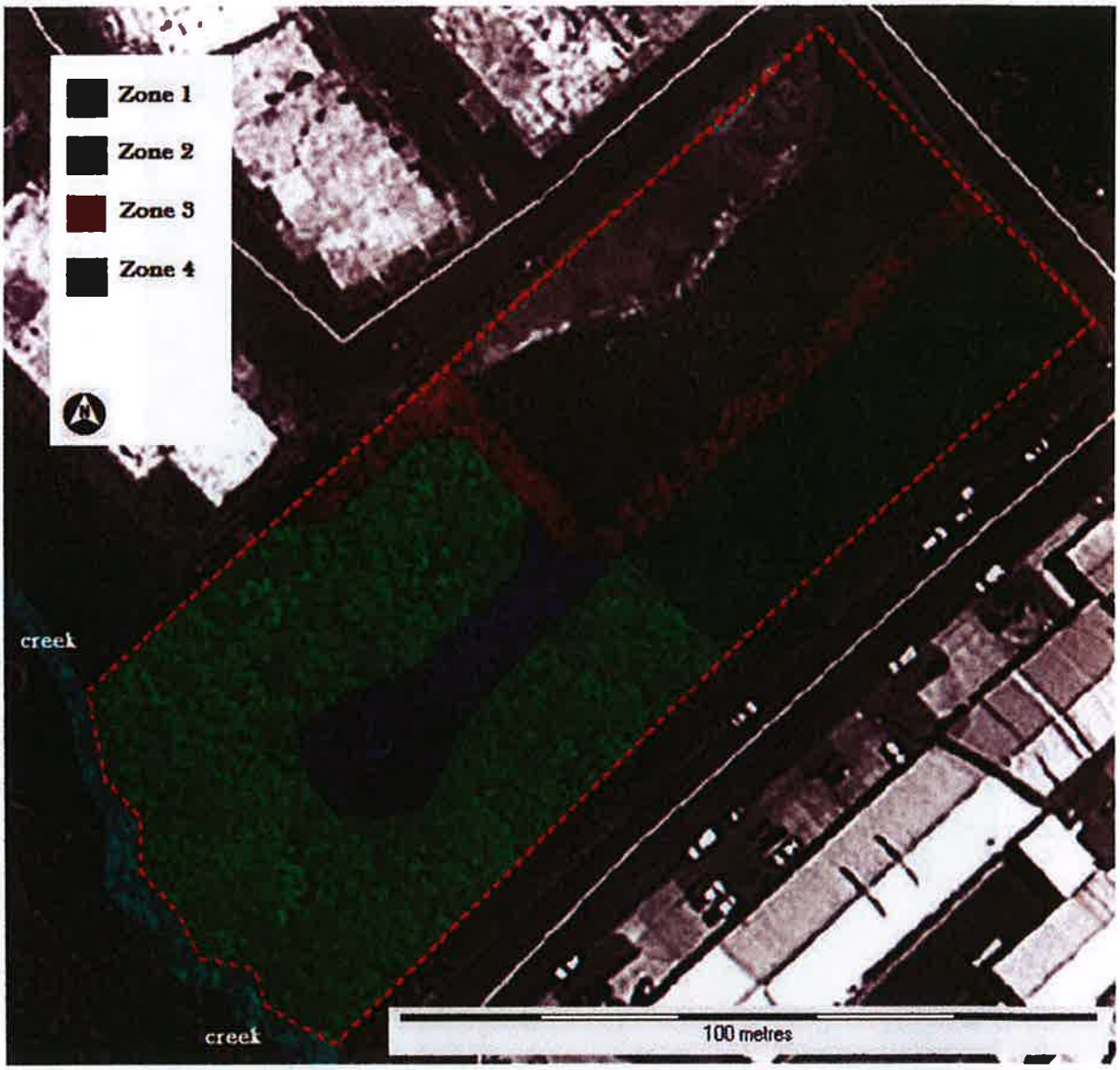
Reporting

- This VMP covers a 5 year period.
- CCBR shall provide a report (Statement of Completion) upon satisfactory completion of the Initial works described in this VMP.
- CCBR shall also provide to CHCC yearly reports throughout the five year Follow-up Works period.

Responsibility

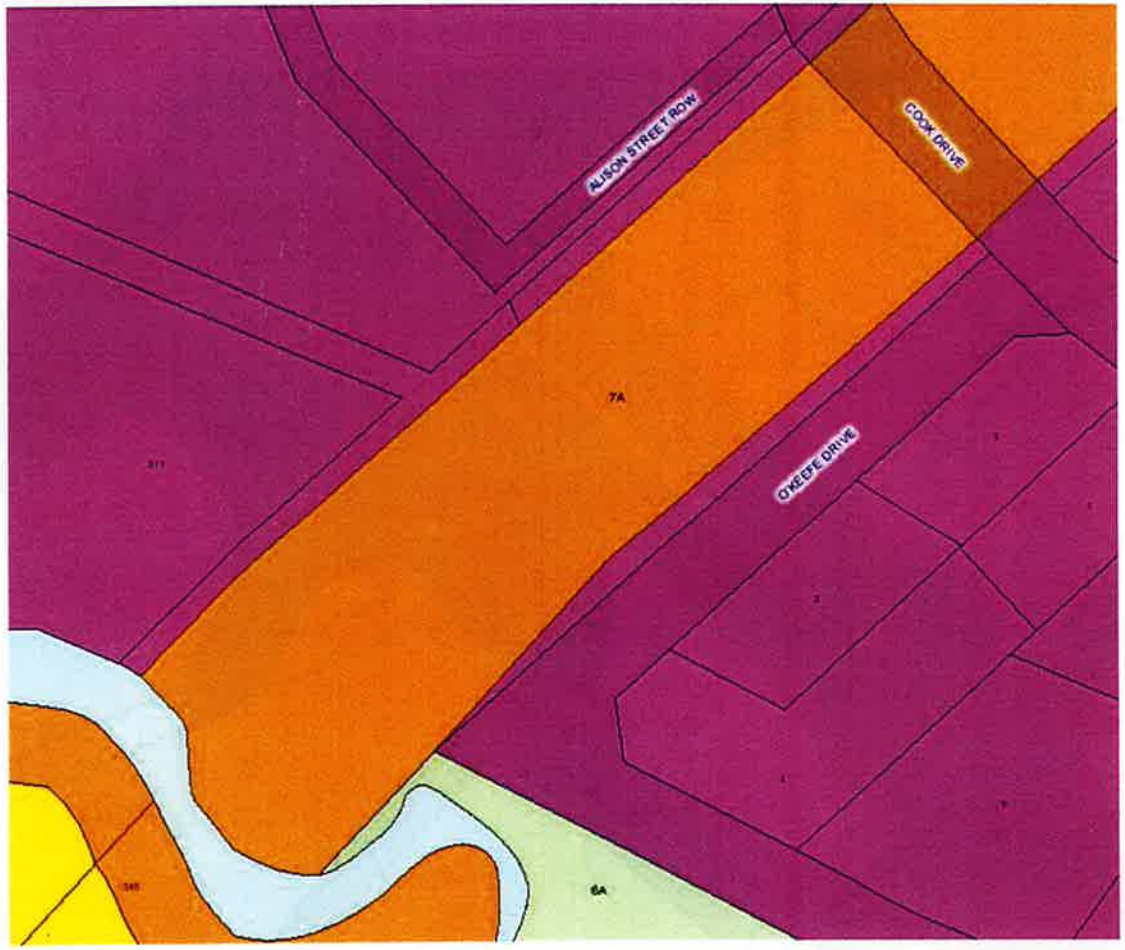
- It is the responsibility of the developer/landowner to ensure that the works programme and recommendations detailed in this VMP are undertaken by suitably qualified personnel.

Appendix 1: Site Plan

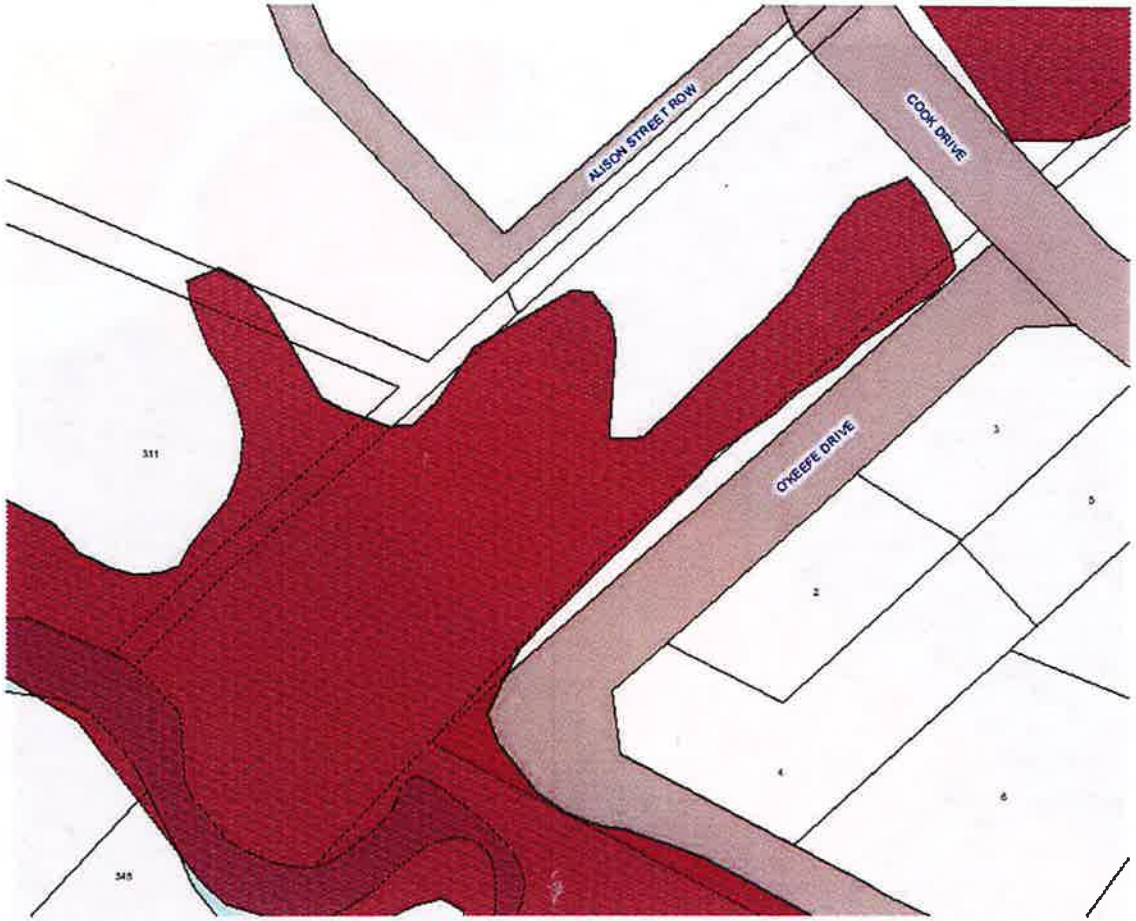


Appendix 2: Aerial Photo (with 10m contours)

Appendix 3: LEP Mapping



Appendix 4: Koala Habitat Mapping (CHCC KPoM)



Appendix 5: Native Indigenous Flora Species List

Plant Family	*Botanical Name*	Common Name	Habit
FERNS			
Aspleniaceae			
	Asplenium australasicum	Bird's Nest Fern	Epiphytic Fern
Adiantaceae			
	Adiantum hispidulum	Rough Maidenhair	Ground Fern
Blechnaceae			
	Blechnum cartiliagineum	Gristle Fern	Ground Fern
	Doodia aspera	Rasp Fern	Ground Fern
Cyatheaceae			
	Cyathea australis	Rough Tree Fern	Tree Fern
	Cyathea cooperi	Smooth Tree fern	Tree Fern
Dennstaedtiaceae			
	Calochlaena dubia	Soft Bracken Fern	Ground Fern
	Pteridium esculentum	Bracken Fern	Ground Fern
Polypodiaceae			
	Platycerium bifurcatum	Elk Horn Fern	Epiphytic Fern
	Platycerium superbum	Stag Horn	Epiphytic Fern
MONOCOTYLEDONS			
Araceae			
	Gymnostachys anceps	Settlers Flax	Sedge
Arecaceae			
	Archontophoenix cunninghamiana	Bangalow Palm	Feather Palm
Asteliaceae			
	Cordyline stricta	Narrow Leaved Palm Lily	Shrub
Cyperaceae			
	Cyperus difformis	Cyperus	Sedge

	Gahnia aspera	Rough Saw Sedge	Sedge
	Gahnia clarkei	Saw Sedge	Sedge
Dasypogonaceae			
	Lomandra hystrix	Mat Rush	Sedge
	Lomandra longifolia	Mat Rush	Sedge
Flagellariaceae			
	Flagellaria indica	Whip Vine	Vine
Juncaceae			
	Juncus usitatus	Common Rush	Rush
Phormiaceae			
	Dianella caerulea	Blue Flax Lilly	Flax
Poaceae			
	Entolasia stricta	Wiry Panic	Grass
	Imperata cylindrica	Blady Grass	Grass
	Oplismenus aemulus	Basket Grass	Grass
	Oplismenus imbecillis	Creeping Beard Grass	Grass
	Oplismenus undulatifolius	Creeping Beard Grass	Grass
	Ottochloa gracillima	Slender Shade Grass	Grass
Smilacaceae			
	Smilax australis	Austral Sarsaparilla	Vine
	Smilax glyciphylla	Sweet Sarsaparilla	Vine
Typhaceae			
	Typha orientalis	Broadleaf Cumbungi	Aquatic Perennial
DICOTYLEDONS			
Anacardiaceae			
	Euroschinus falcatus	Ribbonwood	Tree
Apiaceae			
	Centella asiatica	Pennywort	Herb
Apocynaceae			
	Marsdenia rostrata	Common Milk Vine	Vine
	Parsonsia straminea	Common Silk Pod	Vine
	Tabernaemontana	Banana Bush	Shrub

	pandacaqui		
Araliaceae			
	Polyscias sambucifolia	Elderberry Panax	Shrub
Asteraceae			
	Ozothamnus diosmifolius	Tick Bush	Shrub
Casuarinaceae			
	Allocasuarina littoralis	Black Oak	Tree
	Allocasuarina torulosa	Forest Oak	Tree
Celastraceae			
	Denhamia celastroides	Orange Boxwood	Tree
Commelinaceae			
	Commelina cyanea	Commelina	Herb
Convolvulaceae			
	Dichondra repens	Kidney Weed	Herb
Cunoniaceae			
	Callicoma serratifolia	Callicoma	Tree
	Schizomeria ovata	Crab-apple	Tree
Dioscoreaceae			
	Dioscorea transversa	Native Yam	Vine
Ericaceae			
	Trochocarpa laurina	Tree Heath	Tree
Elaeocarpaceae			
	Elaeocarpus reticulatus	Blueberry Ash	Tree
Euphorbiaceae			
	Claoxylon australe	Brittlewood	Tree
Eupomatiaceae			
	Eupomatia laurina	Bolwarra	Tree
	Eupomatia bennettii	Small Bolwarra	Shrub
Fabaceae			
Mimosoideae			
	Acacia fimbriata	Fringed Wattle	Tree
	Acacia melanoxylon	Blackwood	Tree

	Archidendron grandiflorum	Pink Lace Flower	Tree
Flacourtiaceae			
	Scolopia braunii	Flintwood	
Lamiaceae			
	Clerodendron floribundum	Smooth Clerodendron	Tree
Lauraceae			
	Cryptocarya microneura	Murrogun	Tree
	Cryptocarya rigida	Forest Maple	Tree
	Cryptocarya triplinervis	Three-veined Laurel	Tree
	Endiandra discolor	Rose Walnut	Tree
	Endiandra muelleri	Green Leaf Rose Walnut	Tree
	Endiandra virens	White Apple	Tree
	Litsea australis		Tree
	Neolitsea dealbata	White Bollygum	Tree
Lobeliaceae			
	Lobelia trigonocaulis	Forest Lobelia	Herb
	Pratia purpurascens	White Root	Herb
Luzuriagaceae			
	Eustrephus latifolius	Wombat Berry	Vine
	Geitonoplesium resinosum	Scrambling Lilly	Vine
Malvaceae			
	Seringia arborescens	Seringia	Shrub
Meliaceae			
	Synoum glandulosum	Scentless Rosewood	Tree
Menispermaceae			
	Stephania japonica	Snake Vine	Vine
Monimiaceae			
	Wilkiea huegeliana	Veiny Wilkiea	
Moraceae			
	Ficus coronata	Creek Sandpaper Fig	Tree

	Ficus rubiginosa	Port Jackson Fig	Tree
	Ficus watkinsiana	Strangler Fig	Tree
	Maclura cochinchinensis	Cockspur Thorn	Vine
Myrtaceae			
	Angophora costata	Smooth-barked Apple	Tree
	Callistemon salignus	Willow Bottlebrush	Tree
	Corymbia intermedia	Pink Bloodwood	Tree
	Eucalyptus grandis	Flooded Gum	Tree
	Eucalyptus microcorys	Tallowwood	Tree
	Eucalyptus pilularis	Blackbutt	Tree
	Eucalyptus robusta	Swamp Mahogany	Tree
	Lophostemon confertus	Brush Box	Tree
	Lophostemon suaveolens	Swamp Box	Tree
	Melaleuca styphelioides	Prickly Leaved Tea Tree	Tree
	Rhodamnia rubescens	Scrub Turpentine	Tree
	Syncarpia glomulifera	Turpentine	Tree
	Syzygium smithii	Lilly Pilly	Tree
	Syzygium oleosum	Blue Lilly Pilly	Tree
Oleaceae			
	Notelaea longifolia	Mock Olive	Tree
Phyllanthaceae			
	Breynia oblongifolia	Coffee Bush	Tree
	Glochidion ferdinandi	Cheese Tree	Tree
Pittosporaceae			
	Pittosporum revolutum	Hairy Pittosporum	Shrub
	Pittosporum undulatum	Sweet Pittosporum	Tree
Rhamnaceae			
	Alphitonia excelsa	Red Ash	Tree
Rousseaceae			
	Cuttsia viburnea	Cuttsia	Tree
Rubiaceae			
	Cyclophyllum	Coast Canthium	Tree

	longipetalum		
	Morinda jasminoides	Morinda	Vine
Rutaceae			
	Acronychia oblongifolia	Common Acronychia	Tree
Sapindaceae			
	Cupaniopsis anacardioides	Tuckeroo	Tree
	Dodonaea triquetra	Hop Bush	Tree
	Guioa semiglauca	Guioa	Tree
	Jagera pseudorhus	Foambark	Tree
	Mischocarpus pyriformis	Yellow Pear Fruit	Tree
Solanaceae			
	Duboisia myoporoides	Soft Corkwood	Tree
Uvulariaceae			
	Tripladenia cunninghamii	Tripladenia	Herb
Vitaceae			
	Cissus antarctica	Kangaroo Grape	Vine
	Cissus hypoglauca	Water Vine	Vine
Violaceae			
	Viola hederacea	Native Violet	Herb

Appendix 6: Weed Species List

Botanical Name	Common Name	Noxious Weed Category
Ageratina adenophora	Crofton Weed	Class 4
Ageratum houstonianum	Blue Billy Goat Weed	Env.
Cinnamomum camphora	Camphor Laurel	Env.
Euodia elleryana	Pink Euodia	Env.
Hibiscus spp.	Hibiscus	Env.
Ipomoea indica	Morning Glory	Env.
Koelreuteria paniculata	Golden Rain Tree	Env.
Lantana camara	Lantana	Class 3
Paspalum urvillei	Giant Paspalum	Env.
Paspalum mandiocanum	Broadleaf Paspalum	Env.
Philodendron spp.	Philodendron	Env.
Asparagus aethiopicus	Ground Asparagus	WoNS
Senna pendula var glabrata	Senna	Env.
Syagrus romanzoffiana	Cocos Palm	Env.
Tithonia diversifolia	Japanese Sunflower	Env.

Appendix 8: Weed Profiles and Control Techniques

The weed species shown in Appendix 8 include those that are currently present on the site as well as those species that are not present at this point in time, but that do occur in the local area.

Weed Profiles

Weeds marked with an * although not currently listed on the CHCC environmental weed list are recognized as being bushland weeds by bushland regenerators/ ecologists.

***Ageratina adenophora* Crofton Weed** erect multi stemmed perennial herbs up to 1-2 metres high grows in full sun or shade but enjoys moist sites especially, and bare soil. Wind dispersed seeds. Forms dense cover inhibiting natural regeneration. **Class 4 noxious weed**
Control: manually remove or; spray seedlings with glyphosate; mature plants can be sprayed with Grazon (following manufacturers recommendations). Metasulfuron-methyl is also effective and results in less off target damage but is not registered for this weed.

***Ageratina riparia* Mistflower**
A scrambling perennial groundcover to 1m in height. White "mists" of flowers. Narrow, opposite toothed leaves. Mostly found in wet areas but not restricted to any soil or aspect. Forms dense mats preventing regeneration of native species. Leachate from leaves and plant litter have a harmful effect on other plants (Alleopathic). The many seeds are easily spread by wind and water. Roots form when stems hit the ground, forming a dense mat. Also spread by contaminated produce. **Class 4 noxious weed**
Control Methods: manually remove ; spray seedlings with glyphosate; mature plants can be sprayed with Grazon (following manufacturers recommendations). Metsulfuron-methyl is also effective and results in less off target damage but is not registered for this weed.

***Ageratum houstonianum* Blue Billy Goat Weed** erect or decumbent annual herb to 1 metre in height. Likes wet sites. Dispersal mechanisms wind, water, animals, machinery. Forms dense cover inhibiting natural regeneration. Mulch / plant out to reduce germination of seed Control manual removal or spray with glyphosate requires follow up.

***Andropogon virginicus* Whiskey Grass** A tufted erect brownish perennial grass with solid stems. Flower/ seed heads are long and narrow.
Control Methods: Spray (100:1)/ wick-wipe with glyphosate.

***Anredera cordifolia* Madeira Vine** Climber with soft fleshy leaves, aerial tubers forms on stems, flowers small greenish/ white and fragrant. Spreads when tubers drop to ground and regrow. Forms very thick infestations, often smothering trees, particularly in rainforest.
Control: Small plants spray with Metsulfuron-methyl and surfactant. Large plants need to be carefully scrape and painted with Metsulfuron-methyl (1g to 1 litre) or Glyphosate. Care needs to be taken as severing the stems will result in the drop of all aerial tubers. Large plants can also be treated by scraping and painting at ground level and then inserting the scraped portion of the stem into a small container of Metsulfuron-methyl (1g to 1 litre) and leave for several days.

***Araujia hortorum* Moth Vine** Climber with twining stems, 5-10m in height. Large grayish green leaves. White milky sap. White flower. Produces choko like fruit encasing feathery (airborne) seeds. Seed longevity high. Smothers native vegetation. Can be confused with the native moth vine (Marsdenia sp.) one of which is on the threatened species list.
Control: Hand remove ensuring all roots removed. Cut /scrape and paint with glyphosate. Bag and remove any fruit.

***Ardisia crenata* Ardisia** Small shrub. Lanceolate oblong dark glossy green leaves with slightly wavy margins. White sweet scented flowers followed by bright red berries. Can grow in full shade.
Control Can be difficult to remove manually due to long taproot. Cut and paint with glyphosate.

***Asparagus aethiopicus* Ground Asparagus** dense ground smothering spiny herb, preventing or discouraging regeneration. Can reach size of up to 2 metres wide Grows in dense shade but prefers areas of higher light. Prefers sandy soils of littoral rainforest. Short thick rhizome and forms mat of tuberous roots- can regrow from rhizome but not from tuberous roots. Produces long-lived bird attractive seed

Control Methods Hand pull small seedlings; manually remove larger plants by removing rhizome from plant no need to remove tuberous roots. Spray with Metsulfuron-methyl.

***Asparagus plumosus* Climbing Asparagus** climber with wiry stems, forms dense layer, which smother plants and inhibit regeneration. Produces bird attractive fruit and has woody rhizome that regrows.

Control Methods small infestation handpull seedlings, larger plants manually remove all rhizomes. Larger infestations cut and paint or cut and allow to reshoot before spaying regrowth. Spray with Metsulfuron-methyl.

***Baccharis halimifolia* Groundsel Bush** Shrub or small tree. Wind dispersed seeds over short distance. **Class 3 noxious weed**
Control Methods: small plants manual removal larger specimens cut and paint with glyphosate. Spray with Grazon at manufacturers recommended rate.

***Bidens pilosa* Farmers Friends** slender tall annual (or short lived perennial) herb of disturbed areas. Produces large amounts of seed with high longevity. Only germinates on bare soil mulch or plant out to reduce.
Control Methods: Manual removal or spray with glyphosate.

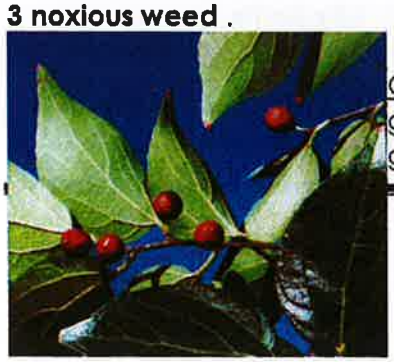
***Bromelia* sp.** Evergreen garden plant. Stem short and tubular. Leaves pale green arching form.
Control Methods Hand Remove.

***Canna indica* Canna Lily** Perennial erect herb with a rhizome. Large light green sheathing leaves. Red flower followed by viable black capsule.
Control Manually remove all of rhizome (difficult). Spray with Metsulfuron-methyl.

***Cardiospernum grandiflorum* Balloon Vine**

A climber with tendrils and stems up to 10m long. Leaves are bright green with 'biternate' arrangement with 3 sets of 3 leaves on each leaf stem. The stems and leaves are covered with soft hairs with the stem often having reddish ribs. Small, white flowers are present summer to autumn. The fruit/seed is a green, papery, inflated capsule, and is produced any time of year. Can grow vegetatively from stem fragments. Vigorous climber that can smother and kill native trees.
Control Methods: Seedlings can be manually removed.
For more mature plants cut, scrape and paint with herbicide (glyphosate). Alternatively cut stems allow to reshoot and then spray the regrowth with glyphosate.

***Celtis sinensis* Chinese Celtis** Deciduous tree to 15 metres. Green serrated leaves. Small reddish brown fruit. Serious environmental weed declared **Class 3 noxious weed** .



Control: Large specimens direct inject with glyphosate. Saplings cut and paint with glyphosate. Small plants hand remove.

***Cestrum parqui* Green Cestrum** Woody shrub up to 3 metres tall. Deep green glossy leaves. Flower greenish to yellow. Fruit a black berry. Class 3 noxious weed

Control methods: Hand weed small plants. Cut and paint larger specimens with glyphosate.

***Cinnamomum camphora* Camphor Laurel** large trees of spreading habit can grow up to 25-30 metres. Abundant seed production dispersed mainly by birds. Can also form dense stands by suckering
Control Methods Direct injection/ cut and paint with glyphosate.

***Chloris gayana* Rhodes Grass** erect tufted stoloniferous grass to 1.2 m high, perennial
Control Methods crown tuft with knife or mattock. Remove stolon, glyphosate in late spring early summer.

***Coffea arabica* Coffee Plant** Large shiny green leaves with wavy margins forms red berries (from which Coffee is produced). Seedlings germinate prolifically.
Control Manually remove or cut and paint with glyphosate.

***Colocasia esculenta* cv. Fontanesii Ornamental Taro**:Robust herb to 1m , large purple leaves (60 cm long 30 cm wide). Large underground tubers. Likes wet open sites. Can colonize sites densely and rapidly.
Control: manual removal (must remove all underground tubers). Can control with herbicide by spraying or injecting with Glyphosate & Metasulfuron-methyl mix ('Cut out'), but this is problematic as species usually inhabits areas that are waterways or wetlands.

***Conyza albida* Fleabane** Single stem, erect annual herb up to 1.5m high. On disturbed sites. Control methods Manual removal or spray with glyphosate.

***Cortaderia selloana* Pampas Grass**Large tussock grass to 2 metres width to 1 metre. Leaves to 2 metres in length and to 3.5cm wide, blue green above darker green below. Flower stem to 6 metres, large silvery white panicle to 80cm. Dense infestations can invade and replace native communities and also provide heavy fuel load for fires.
Control methods: Spray with glyphosate (75:1) with surfactant added. Alternatively to reduce risk of fire, brushcut then manually remove rhizome or spray regrowth

***Delairea odorata* Cape Ivy** vigorous, twining perennial herb with succulent stems many metres long. Forms dense mats smothering low vegetation. Spreads vegetatively, does not set seed in northern NSW.
Control Methods Manual removal or spray with Metasulfuron-methyl.

***Desmodium uncinatum* Velcro Weed**
Herb/scrambler that forms dense smothering mass. Trifoliate leaves. Leaves hairy upper surface with a silver stripe. Stem is densely hairy with hooked hairs. Flowers pink to mauve or white. Seeds contained in pods covered with hooked hairs.

Control Methods Hand remove minor infestations (including root system) bag and remove from site if seeding. Major infestations spray with Metasulfuron-methyl (*Brush-off*).

***Eriobotrya japonica* Loquat** Evergreen tree with dark glossy green foliage, hairy underneath. Fragrant yellow/white flowers borne on stiff woolly panicles. Yellow fruit.
Control Manually remove small seedlings. Mature specimens cut and paint or direct inject with glyphosate.

***Erythrina crista-galli* Cockscomb Coral Tree** Deciduous tree up to 6 metres in height. Prickles on trunks and branches. Flowers scarlet tube shaped held in clusters. Problem weed in north of NSW and Queensland.
Control Methods direct injection with glyphosate. Cut and paint saplings with Glyphosate. Spray seedlings with Glyphosate and surfactant.

***Erythrina x sykesii* Coral Tree** Deciduous tree, hybrid up to 15 metres in height. Easily re grows from sections of stem/ branches, suckers from large sections of roots.
Control Methods direct injection with glyphosate.

***Eucalyptus torelliana* Cadaghi** A native of North Queensland that has been planted for horticultural / plantation purposes in NSW where it has become an invasive species.
Control Methods: Large specimens direct inject (or remove totally in areas where falling branches may create a public safety issue). Seedlings may be sprayed with glyphosate or hand weeded.

***Gleditsia triacanthos* Honey Locust**
Deciduous tree to 10 metres. Flowers in spring producing golden yellow flowers. Stout spines present on branches and trunk. Compound bipinnate leaves. Seed pods 15-40 cm long enclosing large dark brown seeds. Grows readily from seed/ cuttings and suckers freely forming dense thickets. **Class 3 noxious weed**
Control Methods: Direct inject with undiluted glyphosate/ cut and paint smaller specimens.

***Gomphocarpus fruitcosus* Cotton Bush** erect perennial shrub with narrow dull green leaves. Exudes milky sap when damaged. Large green ovoid fruit covered in long silky hairs.
Control Manually remove. Cut and paint/ spray with glyphosate.

***Hedychium gardnerianum* Kahili Ginger** perennial herb to 2.5 metres high. Prefers damp areas on good soil. Large yellow orange flower with red filaments. Produces seed attractive to birds. Thick fleshy rhizome near soil surface.

***Hypoestes phyllostachya* Freckle Face/Polka Dot Plant** herbaceous garden/indoor plant that rapidly infests areas. Long thin dark green leaves with pink spots.
Control Methods Difficult to completely manually remove. Spray with Metasulfuron-methyl

***Inga paterna* Ice-Cream Bean** Evergreen tree to a height of 17 metres. Leaves compound and pinnate with 6-8 leaflets 15cm long with woolly undersurface. Flowers are white & pea shaped. The fruit are pods 15 cm long.
Control Methods: Hand remove small seedlings; cut and paint saplings; direct inject /frill larger specimens.

***Ipomoea cairica* Mile a Minute** Vigorous, perennial with trailing and twining stems. Palmate shaped leaf with pink- purple flowers. Produces seed spread by wind/ gravity, also spreads vegetatively
Control Methods Manual removal by gently pulling up runners, cut and paint larger stems. Spray with glyphosate during period of rapid growth.

***Ipomea indica* Morning Glory** A vigorous vine which can smother trees and whose stolons can penetrate and establish metres into native vegetation. It is widely naturalized in coastal districts of N.S.W.
Control Methods Manual removal by gently pulling up runners, scrape and paint larger stems. Spray with Glyphosate during period of rapid growth.

Koelreuteria paniculata **Golden Rain Tree** Deciduous tree with long pinnate leaves and large terminal panicles of yellow flowers.
Control Methods Cut and paint or direct inject with glyphosate.

Lantana camara **Pink/ Red Lantana** Perennial, scrambling thicket forming shrub to 3m high. Stems multi branched sprawling to 5m long with prickles. Can be vine like and climb trees. Grows best in fertile moist disturbed sites. Black fruit spread by birds. Red flowering form **Class 3 noxious weed** .
Control methods Manual removal of taproot, mechanical removal with follow up. Stems lying on ground may re shoot. Cut and paint base with glyphosate. Spray with glyphosate (Red form needs penetrant added)

Ligustrum lucidum **Large leaf Privet** can grow to large tree. Likes fertile moist sites. Can dominate rainforest and wet sclerophyll forest. Produces masses small berries spread by birds or water. Germinate in even shady conditions. Coppices from base. **Class 4 noxious weed**
Control methods small seedlings manually remove or spray with Metasulfuron-methyl. Cut and paint mature specimens with glyphosate. Direct inject mature specimens with glyphosate.

Ligustrum sinense **Small Leaf Privet** Large shrub small tree to 4m high. Moist fertile sites. Can slowly establish on undisturbed sites in shady conditions. Small berry with short viability spread by birds and water. Coppices from base and suckers from roots **Class 4 noxious weed**
Control methods small seedlings manually remove or spray with Metsulfuron-methyl. Cut and paint mature specimens with glyphosate. Direct inject mature specimens with glyphosate.

Lonicera japonica **Japanese Honeysuckle** Woody twining climber or small shrub with a dense smothering habit. Leaves dark green above lighter below. Flowers tubular 30mm long, white tuning yellow, sweetly fragrant. Fruit is a small black shiny berry, spread by birds. Can regrow from stem nodes.
Control methods Manual removal with care to remove all root forming nodes. Cut and paint or scrape and paint with glyphosate. Spray with herbicide (Metasulfuron-methyl) where no desirable vegetation may be damaged (or cut back then spray regrowth). Follow up needed for all techniques.

***Macfadyena unguis-cati* Cats Claw Creeper** Large woody vine to 30m+, distinguished by three tiny hooked claws on the end of tendrils. Leaves dark green with new foliage being red. From spring to summer, bright yellow flowers with orange lines are present. Produces seed capsule 15-45cm long containing winged seeds that are wind and water dispersed. Can germinate and grow in shade so can easily invade undisturbed bushland. Forms underground tubers. Grows rapidly and totally smother and kill mature trees.
Control Methods: Spray seedlings with glyphosate (100:1). Cut stems and apply glyphosate (undiluted), or pull young stems from tree and spray with glyphosate (100:1)can also drill an inject large stems with glyphosate (undiluted).

***Macroptilium atropurpureum* Siratro** Twining herb with stems 2-3 metres long. Dark purple pea like flower with long slender pods.
Control Methods Care must be taken when removing by hand due to large root system. Seed pod collection and disposal is important to ensure eradication. Scrape and paint with glyphosate is effective.

***Monstera deliciosa* Fruit Salad Plant** Evergreen vine to a height of 5 metres. Glossy large green perforated leaves with deeply incised margins. Flowers are greenish similar to that of an Arum Lily. Fruit are edible cob like spikes.
Control methods: Hand remove

***Nephrolepis cordifolia* Fishbone Fern** endemic to the far north coast of NSW and Queensland but has become an invasive species that develops dense infestations excluding endemic native vegetation. Erect fronds covered with brown spores on the back. Rhizomes are connected by wiry stolons.
Control Methods Manually remove by digging up entire plant including rhizomes and bag and remove from site (dispose of responsibly -garden waste dumping of this weed in bushland is a serious problem). Large infestations may be sprayed with Metasulfuron methyl.

***Ochna serrulata* Mickey Mouse Plant** Shrub 2-3 metres high. Dark green-toothed oblong leaves, new foliage bronze coloured. Conspicuous fruit with bright red sepals holding 5 glossy green fruit that ripens to black. Well-developed taproot, which can reshoot from considerable depth, makes control difficult.
Control Methods Hand remove small specimens (only when soil is moist to prevent root snapping. Scrape and Paint (glyphosate) is generally more effective than cut and paint. Better results achieved by painting bottom third of plant around entire circumference of stem with Starane mixed with diesel @ 5ml Starane to 100ml diesel. Small seedlings can be sprayed with Starane @ 65ml to 10L water.

***Paspalum urvillei* Giant Paspalum** tufted perennial grass, large up to 2.5m high. Distinguished by its long (up to 12cm) and more numerous racemes (12-20)
Control methods Manual removal for minor infestations/ major infestations spray with glyphosate.

***Paspalum mandiocanum* Broad Leaf Paspalum** tufted perennial, which can grow in moderately shady conditions. Can form extensive dense infestations inhibiting or preventing regeneration.
Control methods manual removal (remove crown and adventitious roots) for minor infestations or those surrounding young native specimens. For major infestations spray with glyphosate and follow up with mulching and planting's.

***Passiflora edulis* Edible Passionfruit** A climber with auxillary tendrils glossy green leaves trifoliate shape. Produces edable back/ purple/yellow fruit.
Control methods large specimens manually remove or cut and paint with glyphosate.

***Passiflora subpeltata* White Passionflower** A climber with axillary tendrils. Smothers plants and trees in forest edges and gaps, as well as disturbed sites. Grey/green leaves with waxy coating. Fruit spread by birds and animals. Reshoots from any root part left in ground.
Control methods large specimens manually remove or cut and paint with glyphosate. Spray with penetrant when young or cut and spray when reshoots

***Pennisetum clandestinum* Kikuyu** Rhizomatous and stoloniferous aggressive, creeping coarse perennial grass often mat-forming. Inhibits seedling growth and prevents regeneration.
Control methods Spray with weak rate glyphosate.

***Pennisetum purpureum* Barner Grass** A robust stoloniferous, perennial grass forming large bamboo like clumps to 7m high.

***Phoenix canariensis* Date Palm** characterized by numerous bright yellow spines that arm the short frond stalk.
Control Methods Cut and paint with glyphosate when small. Direct inject larger specimens

***Pinus* sp. (*P. radiata, P. elliottii*) Pine Tree** Evergreen with alternate needle like spreading leaves. Forms cones.
Control Methods Cut tree down or ringbark as cannot regrow from stump.

***Psidium cattleianum* Cherry Guava** Shrub or tree to 6 metres. Purplish red fruit. Has the ability n invade undisturbed native vegetation.
Control: Hand remove small seedlings. Cut and paint larger specimens with glyphosate (cutting close to the ground as possible).

***Rhaphiolepis indica* Indian Hawthorn**
Shrub 1 to 1.5 high. Dark green leathery leaves, slightly toothed. Small white flowers with red centers. Small bluish fruit.
Control Methods: Hand pull small seedlings. Cut and paint larger specimens with undiluted glyphosate.

***Rivina humilis* Coral Berry**
small shrub to 1 metre high. Dark green leaves. Produces small red globular berries
Control Manually remove or cut and paint with glyphosate (remove and bag any berries present). Spray with glyphosate.

***Rubus fruticosus* Blackberry**

A perennial scrambling shrub to 3m high. Class 3 noxious weed Hook-spined canes grow to 6m long. New plants form when they meet the ground. Fruit a segmented red berry ripening to black. The many fruits are eaten and spread by birds and foxes. May be confused with native Rubus species which are distinguished by lighter green leaves and finer thorns.

Control Methods: Spray with Metsulfuron-methyl at the manufacturer's recommended rate.

***Schefflera actinophylla* Umbrella Tree** Native of North Queensland, tree to 10m high often multi stemmed and sometimes epiphytic. Red fruit dispersed by birds. Adventitious roots form readily from stem segments left in contact with ground. Control methods Cut and paint or direct inject with glyphosate.

Schinus terebinthifolia Broad-leaf Pepper Tree

Tree to 16m in height with dense spreading crown. Dark glossy green leaves with prominent cream venation. Produces masses of red/pinkish berries in winter/spring. Leaves have a peppery smell when crushed. Has been known to cause allergic reactions in some people care needs to be taking when removing trees as to avoid inhaling toxins that may be released when cutting or wood chipping trunk and branches. Significant environmental weed with a serious large infestation at Sapphire. Class 3 noxious weed

Control Methods: Manually remove small seedlings, cut and paint saplings with glyphosate, larger trees direct inject with glyphosate.

***Senecio madagascariensis* (Fireweed)** Spreading herb up to 50cm high with bright yellow daisy like flowers present spring to autumn. Produces numerous white fluffy seeds. Commonly mistaken for a native fireweed Senecio lautus, which is found more commonly on dunes. Identiofication between the two involves counting the involucral bracts. Generally S. madagaascariensis has 20-21 bracts and S. lautua has 15-18 bracts.

Control Methods: Manually remove taking care not to place on ground as will re root(bag and remove from site). Spray with Bromoxynil 1.4-2.8L in 110-220L of water per hectare. Spray young, actively growing plants during autumn/winter.

Use low rate before flower budding, higher rate for early flowering. Will not be effective on mature plants in full flower.

***Senna pendula* var. *glabrata* (Eastern Cassia/Senna)** Large shrub to 3m. Can regrow from larger sections of taproot and main laterals. Seeds dispersed by birds, water, and gravity, germinate prolifically.
Control methods Cut and paint with glyphosate, direct inject larger specimens, spray large infestations of seedlings with glyphosate 9 hand remove small infestations)

***Sida rhombifolia* Paddy's Lucerne** Perennial erect herb to 1m. Grows in sunny or disturbed areas and on compacted soils. Strong deep taproot.
Control methods difficult to remove by hand especially in heavy soils. Cut and paint or spray with glyphosate.

Setaria palmifolia Palm Grass Tufted perennial grass to 1.5 metres high. Leaves 'pleated'. Flower a creamy white/yellow silky panicle to 80 cm long. Forms dense infestations especially near water courses.
Control: Small infestations dig out plant with mattock. Larger infestations spray with glyphosate. Care must be taken not to pollute watercourses

***Solanum mauritianum* Tobacco Bush** Perennial shrub or small tree to 4m, densely tomentose especially under surface, Produces fruits which are eaten by many native fauna. High seed longevity requires light for germination. In many cases can be left as part of a rainforest regeneration process as; provides shade which represses many annual weeds but allows growth of third stage pioneer species and attracts birds and bats which bring in native seeds from other areas.
Control Methods if removal is necessary cut and paint with glyphosate.

***Solanum seaforthianum* Brazillian Nightshade** Sprawling vigorous climber with light green divided leaflets. Flowers violet in colour with typical form of those in the Solanum family (e.g. similar to tomato/ potato flower). Produces masses of bright red berries that hang in bunches. Berries are bird attractive and this plant is therefore spread easily. Aggressively smothers native vegetation.
Control Methods: Hand remove or for larger vines scrape and paint with glyphosate.

***Sphagneticola trilobata* Singapore Daisy** A perennial creeper found on the edges of rainforests and coastal dunes. It has coarse bright green leaves. Flowers are yellow and daisy like. This weed re-shoots very easily and when well established can smoother other plants.
Control Method: Hand-pull small plants. Be sure to remove all parts of this plant from the site as they will re-shoot. Spray with metasulfuron-methyl.

Sporobolus fertilis **Giant Parramatta Grass** tufted perennial growing on poor or compacted soils and disturbed sites. Seed adheres to animals, vehicles, and water. Class 3 noxious weed
Control Methods small infestations hand remove or spot spray with glyphosate.

Syagrus romanzoffiana **Cocos Palm** Large Palm with drooping feathery type fronds. Produces masses of orange coloured fruit that hang in large panicles. Very attractive to fruit Bats which aid in the spread of the seed. Germinates readily.
Control Methods Larger specimens can be felled with no need to apply herbicide, as they will not regrow, direct injection with herbicide for specimens that are to be left in situ. Smaller specimens and seedlings need to be either cut and painted or manually removed (including the root system) as spraying herbicide is not effective.

Syngonium* sp. **Prayer Plant/ Arrowhead Vine Vigorous climber to 3 metres. Glossy spear shaped leaves dark to light green in colour (dependant on light levels where it grows). Can also have variegated leaves with a creamy colour towards the centre with light green edges. Forms roots at nodes. Can produce seedpods encasing bright red seeds when well established up a tree etc (not known if these are viable). Difficult to control due to its resistance to most herbicide sprays.
Control Methods: Spray with glyphosate at a rate of 50:1 with LI 700

***Tagetes minuta* Stinking Roger** Very erect annual herb, strongly aromatic, which grows on disturbed sites. Flowers February –April.
Control methods Small infestations hand remove, larger ones spray with glyphosate.

***Tecoma stans* Yellow bells** A shrub or small tree, often to 4m in height. Widely grown for its bright yellow trumpet-like flowers. Flowers between spring and summer producing yellow flowers with reddish lines at the base. Large pods contain many seeds that are easily spread by wind Class 3 noxious weed

Control Method: Hand-pull or foliar spray seedlings with herbicide. Cut and paint saplings. Frill or stem inject herbicide into sapwood of mature trees.

***Tithonia diversifolia* Japanese Sunflower** tall perennial herb 2-5 metres tall, large toothed leaves. Flowers April- June. Wind dispersed seeds long seed longevity.
Control Methods manually remove smaller plants. Cut and paint larger specimens (low to ground to avoid plant re shooting) or preferably drill and apply herbicide. Care must be taken as stems placed directly on the ground will commonly grow roots from nodes.

Tradescantia flumensis **Tradescantia (Wandering Jew)**
Perennial creeping succulent herb rooting well from well-defined nodes. Invasive weed grows vigorously, smothering low growing shrubs herbs and seedlings of native species, inhibits regeneration. Likes moist fertile sites can grow in dense shade or full sun. Spreads vegetatively.
Control methods manually rake and roll with repeated maintenance. Spray with glyphosate-repeated follow up required.

Triadica sebifera **(Chinese Tallow)**
A deciduous tree growing to a height of 12 metres. Flowers are yellowish and occur in elongated clusters. The fruit is a splitting capsule that exposes large, white seeds.
Control Methods: Hand-pull or foliar spray seedlings with herbicide. Cut and paint saplings (glyphosate). Direct inject mature trees (glyphosate).Class 3 noxious weed

***Verbena* sp. Purple Top** Tall, erect, perennial herb of sunny disturbed areas. Purple flower and square stem.
Control methods Weed manually infestations (rarely dense).

Weed Control Techniques

1) **Cut and paint**: This method applies to all woody shrubs, trees and some vines.
   i. cutting stem of plant as close to the ground as possible, also scraping sides lightly to reveal green tissue
   ii. apply chemical(usually undiluted glyphosate) immediately (within 15 seconds)

2) **Scrape and Paint** This method is applicable to many species of vines where it is desirable to treat the vine intact, particularly those with aerial tubers (e.g. Madeira Vine) or those that will propagate from segments.
   i. Scrape the stem **on one side of the stem only** for 20- 30 cm if possible
   ii. Apply herbicide immediately.

3) **Direct Inject** This method applies to all woody trees and shrubs with a diameter of about 6- 10cm or greater
   i. Make cuts into the trunk (as low down as possible) with a tomahawk. Make cuts the width of the blade at a slight angle. Or preferably make drill holes with cordless drill. Holes or cuts shall be angled downwards into the trunk to prevent herbicide escape.
   ii. Apply herbicide immediately into the cut or hole
   iii. Repeat this pattern in brickwork pattern around the circumference of the tree, or if using a drill holes approximately 10 cm apart 25mm deep.
   iv. Treat any visible lateral roots as per **i.**

4) **Spot Spraying** should be carried out using a knapsack sprayer to keep pressure/volume to a minimum. This is to ensure newly planted tubestock/ germinating natives are not affected by spray drift. Glyphosate is the main herbicide used, though some weed species require Metsulfuron methyl (*Brush-off*) for treatment. A combination of the two herbicides can be used for treatment in areas where there area combination of species that are susceptible to either glyphosate or Metsulfuron methyl. A marker dye and surfactant will improve control results.

5) **Chemical Crowning** This applies to those species which have a fleshy root system such as a rhizome or large bulbs (e.g. Asparagus Fern, Canna Lily)
   i. Gouge out sections of fleshy base with a knife
   ii. Apply undiluted herbicide.

6) **Manual Removal** Is the preferred method of control if practical. Especially useful in follow up work as mitigates any risk of off target damage to germinating or young native species

i. **Hand pulling** removal by hand (or with a mattock etc) of the plant including all tap and lateral roots. Is especially useful for smaller specimens; species with a bulb, corm or tuber; isolated grass specimens amongst native species.

ii. **Crowning** This method is applicable to weeds which have their growing points below the surface of the ground (corms, bulbs, rhizomes, clumped or fibrous root systems etc e.g. grasses, Asparagus Fern)

1. Grasp the stems or leaves and hold them tightly so that the base of the plant is visible
2. Insert a knife close to the base of the plant at a slight angle with the tip well under the root system
3. Cut through the roots close to the base
4. Remove the plant ensuring that the base of the plant where the roots begin is completely removed.

Noxious Weed Categories

Class 1: State Prohibited Weeds	These are noxious weeds that pose a potentially serious threat to primary production or the environment and are not present in the State or are present only to a limited extent. These are noxious weeds which must be eradicated from the land and the land must be kept free of the plant.
Class 2: Regionally Prohibited Weeds	These are noxious weeds that pose a potentially serious threat to primary production or the environment of a region to which the order applies and are not present in the region or are present only to a limited extent. These are noxious weeds which must be eradicated from the land and the land must be kept free of the weed.
Class 3: Regionally Controlled Weeds	These are noxious weeds which pose a serious threat to primary production or the environment of an area to which the order applies, are not widely distributed in the area and are likely to spread in the area or to another area. These are noxious weeds which must be fully and continuously suppressed and destroyed.
Class 4: Locally Controlled Weeds	These are noxious weeds that pose a threat to primary production, the environment or human health, are widely distributed and are likely to spread in the area or to another area. The growth and spread of these noxious weeds must be controlled according to the measures specified in the relevant management published by Council.
Class 5: Restricted Plants	These are noxious weeds that are likely, by their sale or sale of their seeds or movement within the State or an area of the State, to spread either within or outside the State. These noxious weeds are prohibited from sale.

Appendix 8: Revegetation Techniques

Clear away weed and exotic grass growth within a 500mm radius area where the plant is to be placed, by spot spraying with *Glyphosate* (following manufacturer's directions).

Dig and loosen soil (150mm deep and 75mm wide) to place tubestock in.

Plant sun-hardened tubestock ensuring root system is below ground level.

It is best to also use slow release fertiliser and "*rainsave*"' water crystals (following manufacturer's recommendations).

Place medium grade jute mat (370x 370mm) around each plant ensuring that the mat does not inhibit water filtration to plant.

Hardwood chips could be used as a suitable alternative to jute matting.

Course grade hardwood chips shall be used (minimum size of 20mm x 20mm x 3mm).

Hardwood chips would need to be 100mm deep with a radius of 500mm.

The cost of either material is equivalent however spreading hardwood chips is more labour intensive.

Plants shall be protected with large (1200x 500mm) plastic tree guards using 2 small hardwood stakes as support.

This will limit Swamp Wallaby (*Wallabia bicolor)* predation and facilitate follow up weed control when spot spraying.

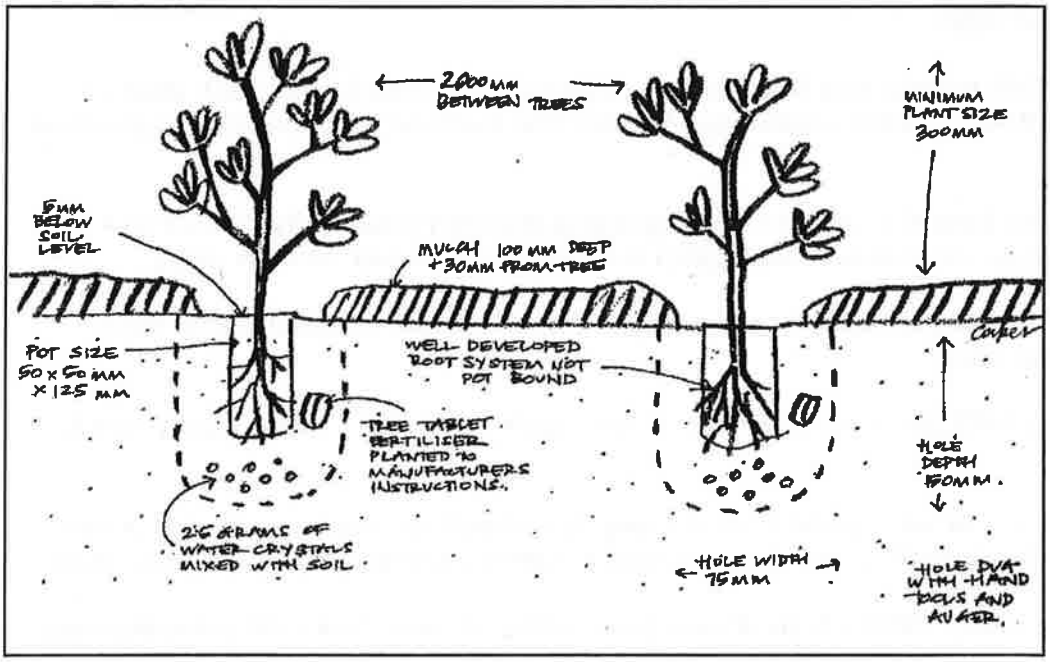
To maximize survival rates, planting should be under taken in the "wet season" (end of February to beginning May).

Generally, Spring and Summer are too hot and dry for undertaking Revegetation.

Plants will require watering directly after planting if the weather conditions are dry.

Follow up watering will also be required dependant on prevailing weather conditions.

Planting Diagram



Note: Although plant spacing is depicted as being at 2 metre intervals, this is only a general guide and the requirements for each site may vary.

Refer to the specifications given in the zone categories for the specified plant spacings. Jute weed matting may be used instead of hardwood chip.

Refer to specifications given in the zone categories.

Possible Suppliers for the Planting Program

- Coffs Coast Bush Regeneration Native Nursery Tel: 66536781
- Lacebark Native Nursery Tel: 6654 4373

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Acknowledgement:
Planting Diagram in Appendix 6 was supplied by Kirsty Cooper of Emerald Environmental.

Appendix D

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BUSHFIRE HAZARD ASSESSMENT REPORT

REPORT PREPARED IN RELATION TO:	**PROPOSED REZONING**
PROPERTY DESCRIPTION:	**LOTS 13 DP 591220 & LOT 6 DP 714455, COOK DRIVE COFFS HARBOUR.**
REPORT COMMISSIONED BY: (my Client)	**Rick Bennell, Bennell & Associates.**
	DATE ISSUED:

IMPORTANT NOTICE

Site inspections, and the results found herein, are carried out in accordance with the methodology as set out in the document ***"Planning for Bushfire Protection 2006"***.

The results of the site inspections and their correlation with ***PBP-2006*** are based on information provided by the "Reference Documents" and information provided by the Client (or his/her agents).

Holiday Coast Bushfire Solutions Pty Ltd will not be held liable for the omission to provide, or restrict access to, critical information (such as restrictions on property Title, easements, relevant consultant reports, etc) relevant to this development proposal.

The author of this Report, S. Ellis, is an Accredited Bushfire Consultant (through the National Certification Program administered by the Fire Protection Association of Australia), whose qualifications include Graduate Diploma in Design for Bushfire Prone Areas (UWS) and Certificate 2 & 3 in Firefighting Operations and Certificate 4 in Firefighting Supervision.

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Glossary

APZ	-	Asset protection zone. An area surrounding a development managed to reduce the bush fire hazard to an acceptable level. The APZ, consisting of an area maintained to minimal fuel loads and, for subdivision, comprising a combination of perimeter road, fire trail, rear yard or a reserve, so that a fire path is not created between the hazard and the building.
AS 3959	-	Australian Standard AS3959 Construction of buildings in bushfire-prone areas, Standards Australia, 2009, that outlines construction standards applicable to residential developments in bush fire prone areas.
BAL	-	Bushfire Attack Level – refer to CoBA below.
BCA	-	Building Code of Australia.
BPM	-	Bushfire protection measures. A range of measures (controls) available to minimise the risk arising from a bushfire. BPMs include APZs, construction standards, suitable access arrangements, water and utility services, emergency management arrangements and landscaping.
Bushfire hazard	-	The potential severity of a bushfire. Usually measured in terms of intensity (kW/m), the factors that influence a bush fire hazard include climate and weather patterns, vegetation (fuel quantity, distribution and moisture) and slope.
Bushfire-prone area / land	-	An area of land that can support a bushfire or is likely to be subject to bushfire attack. In general, a bushfire-prone area is an area mapped for a local government area that identifies the vegetation types and associated buffer zones. Bushfire prone land maps are prepared by local councils and certified by the Commissioner of the RFS.
Bushfire risk	-	Is the chance of a bushfire igniting, spreading and causing damage to assets of value to the community. Risk may be rated as being extreme, major, moderate, minor or insignificant and is related to the vulnerability of the asset.
CoBA	-	Category of Bushfire Attack. Either BAL-12.5, BAL-19, BAL-29, BAL-40, or BAL-FLAME ZONE. The degree to which a (proposed) building is subject to the modelled RHF from a potential bushfire. The CoBA determines the construction standards applicable.
Contagious Ignition	-	The ignition of one building by an adjoining flaming building (or material) other than by the direct ignition from the flaming bushfire hazard.
Defendable Space	-	An area within the APZ that provides an environment in which a person can undertake property protection after the passage of a bushfire with some level of safety.
D-T-S	-	Deemed to Satisfy (prescriptive requirements of either the BCA or ***PBP-2006***).

DE	-	Dwelling or Building Envelope. The foot print of a (proposed) structure.
FFDI	-	Forest fire danger index.
Flame Zone	-	The distance from a bushfire at which it is calculated for the purposes of this document that there is significantly increased likelihood for flame contact to a building. Determined by the calculated distance at which the radiant heat received by the proposed building exceeds 40kW/m^2 or calculated by the point of potential flame contact, whichever occurs first.
IFEG-2005	-	International Fire Engineering Guidelines (Edition 2005).
Infill Development	-	The development of land by the erection of or addition to a residential building (or buildings) which does not require the spatial extension of services including public roads, electricity, water or sewerage and is within an existing allotment.
Inner Protection Area	-	The inner component of an asset protection zone, consisting of an area maintained to minimal fuel loads and comprising a combination of perimeter road, fire trail, rear yard or reserve, so that a fire path is not created between the hazard and the building.
Outer Protection Area	-	The outer component of an asset protection zone, where fuel loads are maintained at a level (usually less than 8 t/ha) where the intensity of an approaching bushfire would be significantly reduced.
Required	-	Required by ***PBP-2006*** or other legislative requirements.
Setback	-	The distance required through planning provisions to separate a building from the bushfire hazard, street frontage or from adjacent buildings. In most cases the land within the setback will also be within the Flame Zone.

1.0 GENERAL DESCRIPTION OF LAND AND PROPOSAL

1.1 The Land

A site assessment was carried out by me on Wednesday 14th August 2013 for the purpose of preparing a Bushfire Risk Report as required by Section 117(2) (Ministerial Directions) of the *Environmental Planning and Assessment Act 1979*. At the time of the site assessment the subject land was vacant.

Figure 1: *aerial image showing general locality of subject property (© NSW Lands, 2013)*

The property is located within an established industrial area at South Coffs Harbour. The site has dual street frontage, the main frontage being to Cook Drive to the north, and O'Keefe Drive to the east.

Figure 2: *aerial image of property (© NSW Lands, 2013)*

Industrial lands front the property to the west, north and east. To the immediate south of the site is a riparian corridor along Newport Creek. This riparian corridor, along with the vegetation remaining on the site, forms a vegetation corridor that extends north-east from the site along a drainage channel and links with a large area of swamp forest adjacent to the golf course.

Bushfire prone land maps provide the trigger for the various development assessment provisions. The identification of bushfire-prone areas in NSW is required under section 146 of the *EP&A Act*. The NSW Rural Fire Service designates, through separate guidelines, what constitutes a bushfire-prone area and how it is to be mapped. Each Council then prepares a map in accordance with the guidelines and submits the map for approval by the NSW Rural Fire Service.

The subject property has been identified as bushfire-prone land by the Coffs Harbour City Council's Bushfire Prone Land Map, an extract of which is provided below.

Figure 3: *extract of Coffs Harbour City Council's BPLM (© CHCC, 2013)*

1.2 The Proposal

Holiday Coast Bushfire Solutions Pty Ltd has been engaged by the Client to provide a Bushfire Hazard Assessment Report *"to support a rezoning application to allow development on the cleared part of the land"*. The site is *"likely to be used for light industry or bulky goods retailing"*.

The proposal will be measured against the specific requirements outlined in s.117(2) (Ministerial Directions) of the EP&A Act 1979, as well as the general aims and objectives of ***PBP-2006***. Relevant extracts of these documents are provided below.

Section 117(2) of the Environmental Planning & Assessment Act 1979

4.4 Planning for Bushfire Protection

Objectives

(1) The objectives of this direction are:

(a) to protect life, property and the environment from bush fire hazards, by discouraging the establishment of incompatible land uses in bush fire prone areas, and

(b) to encourage sound management of bush fire prone areas.

Where this direction applies

(2) This direction applies to all councils that are required to prepare a bush fire prone land map under section 146 of the *Environmental Planning and Assessment Act 1979* (the EP&A Act), or, until such a map has been certified by the Commissioner of the NSW Rural Fire Service, a map referred to in Schedule 6 of that Act.

When this direction applies

(3) This direction applies when a council prepares a draft LEP that affects, or is in proximity to land mapped as bushfire prone land.

What a council must do if this direction applies

(4) In the preparation of a draft LEP a Council shall consult with the Commissioner of the NSW Rural Fire Service under section 62 of the EP&A Act, and take into account any comments so made,

(5) A draft LEP shall:

(a) have regard to *Planning for Bushfire Protection 2006*,

(b) introduce controls that avoid placing inappropriate developments in hazardous areas, and

(c) ensure that bushfire hazard reduction is not prohibited within the APZ.

(6) A draft LEP shall, where development is proposed, comply with the following provisions, as appropriate:

(a) provide an Asset Protection Zone (APZ) incorporating at a minimum:

(i) an Inner Protection Area bounded by a perimeter road or reserve which circumscribes the hazard side of the land intended for development and has a building line consistent with the incorporation of an APZ, within the property, and

(ii) an Outer Protection Area managed for hazard reduction and located on the bushland side of the perimeter road,

(b) for infill development (that is development within an already subdivided area), where an appropriate APZ cannot be achieved, provide for an appropriate performance standard, in consultation with the NSW Rural Fire Service. If the provisions of the draft LEP permit Special Fire Protection Purposes (as defined under section 100B of the *Rural Fires Act 1997*), the APZ provisions must be complied with,

(c) contain provisions for two-way access roads which links to perimeter roads and/or to fire trail networks,

(d) contain provisions for adequate water supply for firefighting purposes,

(e) minimise the perimeter of the area of land interfacing the hazard which may be developed,

(f) introduce controls on the placement of combustible materials in the Inner Protection Area.

Consistency

(7) A draft LEP may be inconsistent with the terms of this direction only if council can satisfy the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General) that the council has obtained written advice from the Commissioner of the NSW Rural Fire Service, to the effect that, notwithstanding the non-compliance, the NSW Rural Fire Service does not object to the progression of the draft LEP.

Planning for Bushfire Protection 2006

1.1 Introduction - *PBP 2006* objectives

(i) afford occupants of any building adequate protection from exposure to a bush fire;

(ii) provide for a defendable space to be located around buildings;

(iii) provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent direct flame contact and material ignition;

(iv) ensure that safe operational access and egress for emergency service personnel and residents is available;

(v) provide for ongoing management and maintenance of bush fire protection measures, including fuel loads in the asset protection zone (APZ); and

(vi) ensure that utility services are adequate to meet the needs of firefighters (and others assisting in bush fire fighting).

2.3 Preparation of LEPs and DCPs

LEPs and DCPs are the best way of strategically achieving bush fire protection objectives. Inclusion of bush fire planning provisions in an LEP:

• gives weight to bush fire management planning principles, ensuring they are considered at subdivision and construction stages;

• can allow for sufficient space to be incorporated into land use zones for setbacks and adequate access for firefighting and evacuation; and

• controls inappropriate land uses in BPAs.

LEP amendments that affect BPAs need to address the planning principles of PBP (see below). Where appropriate the proposed land uses must be considered with respect to bush fire protection (including appropriate setbacks).

If a proposed amendment to land use zoning or land use affects a designated BPA, then the section 117(2) Direction No 19 must be applied (section 117 of the EP&A Act provides for the Minister for Planning to direct a council, in relation to the preparation of a draft LEP, to apply the planning principles specified in that direction).

The section 117 Direction No 19 requires councils to:

• consult with the Commissioner of the RFS under section 62 of the EP&A Act, and to take into account any comments by the Commissioner; and

• have regard to the planning principles of PBP below (rezoning to residential land).

If a council proceeds with a draft LEP that does not comply with the provisions in the section 117 Direction, the council must obtain written advice from the Commissioner of the RFS to the effect that the RFS does not object to that non-compliance.

The requirement to review LEPs in accordance with the Standard LEP is an opportunity to consider appropriate uses on Bush Fire Prone Land as well as exempt and complying development provisions.

4.3.6 (f) Buildings of Class 5 to Band 10 of the BCA

The BCA does not provide for any bush fire specific performance requirements and as such AS3959 does not apply as a set of 'deemed to satisfy' provisions. The general fire safety construction provisions are taken as acceptable solutions, but the aim and objectives of PBP apply in relation to other matters such as access, water and services, emergency planning and landscaping/vegetation management.

In circumstances where the aim and objectives of PBP (section 1.1) are not met, then the construction requirements for bush fire protection will need to be considered on a case-by-case basis.

In many instances, these types of developments will require on-site parking and loading areas. In such cases, it is prudent to place these facilities in the most appropriate location in order to establish defendable space for fire fighting purposes.

2.0 VEGETATION ASSESSMENT

2.1 Vegetation Description

The procedure adopted for the site inspection followed the site assessment methodology of ***PBP-2006***. The methodology is outlined below.

A3.5 Site assessment methodology for determining Category of Bushfire Attack
Step 1: Determine vegetation formation types and sub-formations around the building (see Appendix 2), as follows: (i) Identify all the vegetation types within 140 metres of the site using Keith (2004); (ii) Classify the vegetation formations as set out in Table A2.1 in Appendix 2; and (iii) Convert Keith to Specht classifications using Table A3.5.1 of ***PBP-2006*** Addendum Appendix 3 (Figure 9 below). *The BCA (2010) uses Specht vegetation classifications while **PBP-2006** uses Keith.*
Step 2: Determine the distance between each vegetation formation identified (from the edge of the foliage cover) and the building.
Step 3: Determine the effective slope of the ground for each vegetation group (see Appendix 2) using the classes provided below. Slopes are classified as follows: (i) Upslopes are considered to be 0°. (ii) Greater than 0° but not greater than 5° downslope. (iii) Greater than 5° but not greater than 10° downslope. (iv) Greater than 10° but not greater than 15° downslope. (v) Greater than 15° but not greater than 20° downslope.
Step 4: Determine the relevant FDI for the council **area** in which the development is to take place from Table A2.3 in Appendix 2.
Step 5: Match the relevant FDI, appropriate vegetation, distance and effective slope classes to determine the bush fire attack levels using the relevant Table 2.4.3 of AS3959-2009.

David Keith's *Ocean Shores to Desert Dunes*	AUSLIG (1990) Pictorial Analysis (AS3959-2009)
Forests (Wet & Dry Sclerophyll)	*Forest*
Pine Plantations	
Forested Wetlands	
Woodlands (Grassy, Semi-Arid)	*Woodland*
Tall Heath (Scrub)	*Scrub*
Freshwater Wetlands	
Short Heath (Open Scrub)	*Shrubland*
Arid Shrubland	***Mallee/Mulga***
Alpine Complex (Sedgelands)	*Tussock Moorland*
Rainforest	***Rainforest***
Grassland	*Grassland*

Figure *4: Table A3.5.1 of PBP-2006*

A vegetation assessment was carried out to include a distance of 140 metres from the cleared area of the site, in all directions. It is determined that the general vegetation description is summarised as follows:

North - All of the land within the assessment area to the north is occupied industrial land except for the vegetation corridor along the drainage channel. The vegetation within this corridor is swamp sclerophyll forest, and is approximately 60m wide at the Cook Drive frontage.

East - All of the land within the assessment area to the east is occupied industrial land.

South - Immediately south cleared area of the site is unmanaged vegetation comprising swamp sclerophyll forest and both wet- and dry sclerophyll forest. The wet- and dry sclerophyll forest predominate along the Newport Creek riparian corridor. This corridor is narrow and irregular in shape, ranging from <20m wide to >150m wide.

Beyond the riparian corridor is the managed land within the North Coast Health Campus (Coffs Harbour Base Hospital).

West - All of the land within the assessment area to the west is occupied or vacant industrial land, no bushfire hazard vegetation was found.

2.2 Vegetation Classification

PBP-2006 requires the various vegetation formations to be classified in accordance with the system adopted by D. Keith (*Ocean Shores to Desert Dunes, 2004*), and converted to AUSLIG / Specht classifications using Table A3.5.1 of Addendum Appendix 3 of ***PBP-2006*** (Figure 12 above).

Table 1: Indicative Vegetation Classifications

ASPECT	David Keith's *Ocean Shores to Desert Dunes*	AUSLIG Pictorial Analysis
North	Forested wetland	*Forest*
East	Managed land	*Managed land*
South	Forested wetland and Forest	*Forest*
West	Managed land	*Managed land*

3.0 SLOPE

A slope assessment was carried out to include a distance of 100 metres from the cleared area of the site, in all directions. Slope was determined using a clinometer. The gradient that would most significantly influence bushfire behaviour varied and is summarised as follows:

Table 2: Summary of Effective Slope

ASPECT	VEGETATION CLASSIFICATION	SLOPE
North	*Forest*	0° slope, level ground
East	*Managed land*	N/A
South	*Forest*	0° slope, level ground
West	*Managed land*	N/A

4.0 BUSHFIRE ASSESSMENT MATTERS

4.1 Section 117(2) Ministerial Directions

The following sub-sections of this Report will be formulated from the requirements of the Ministerial Directions as stipulated in s.117(2) of the EP&A Act.

4.1.1 A draft LEP shall have regard to *PBP-2006*.

This Report will aim to address the requirements of the EP&A Act and ***PBP-2006*** as they relate to the bushfire constraints of the site.

It should be pointed out that ***PBP-2006*** is primarily concerned with residential development and *Special Fire Protection Purpose* (*SFPP*) developments. Apart from s.4.3.6(f), ***PBP-2006*** is essentially silent in relation to commercial or industrial land. Whilst these developments do not ordinarily accommodate residential uses, the bushfire-resilience of these types of developments should be no less important from a business-continuity and recovery perspective.

It could be argued that the quantity of firefighting resources required to protect or extinguish a commercial or industrial complex involved in a bushfire emergency event are greater than that required for residential purposes. Fuel loads in some industrial/manufacturing complexes could far exceed the fuel loads associated with residential development, and many industrial complexes also pose a significant hazardous material (HazMat) risk as well. ***PBP-2006*** seems to largely ignore these concerns.

Section 4.2 will address the objectives or ***PBP-2006*** in more detail.

4.1.2 A draft LEP shall introduce controls that avoid placing inappropriate developments in hazardous areas.

Refer to comments above.

An assumption is made that the term "*inappropriate developments*" refers to *SFPP* developments such as preschools, hospitals and nursing homes. The type of development proposed on the subject site would be consistent with the surrounding industrial zones (4A). The Clients have indicated that the future use of the site will likely "*be used for light industry or bulky goods retailing*".

4.1.3 A draft LEP shall ensure that bushfire hazard reduction is not prohibited within the APZ.

Any APZ management would be to maintain the existing clearing, or if permitted, could include some areas of the *forest* remaining on the property. All of the land subject to any possible future APZ management is located within the boundaries of the subject property. The responsibility of the APZ management would fall on the property owner, as a consent condition for any future development on the site.

Also refer to section 4.2.5 below.

4.1.4 For infill development (that is development within an already subdivided area), where an appropriate APZ cannot be achieved, provide for an appropriate performance standard, in consultation with the NSW Rural Fire Service. If the provisions of the draft LEP permit Special Fire Protection Purposes (as defined under section 100B of the *Rural Fires Act 1997*), the APZ provisions must be complied with.

The Clients have indicated that the future use of the site will likely "*be used for light industry or bulky goods retailing*". Therefore the future development is unlikely to be a *SFPP* development, and *ipso facto* the ***PBP-2006*** APZ provisions do not necessarily have to be complied with.

The proposal is in fact an infill development. The minimum APZs required for *forest* on an effective slope of 0° are provided in the following extract from *AS3959-2009 Construction of buildings in bushfire-prone areas*.

Vegetation classification	Bushfire Attack Levels (BALs)				
	BAL—FZ	BAL—40	BAL—29	BAL—19	BAL—12.5
	Distance (m) of the site from the predominant vegetation class				
	All upslopes and flat land (0 degrees)				
A. Forest	<16	16-<21	21-<31	31-<42	42-<100
B. Woodland	<10	10-<14	14-<20	20-<29	29-<100
C. Shrubland	<7	7-<9	9-<13	13-<19	19-<100
D. Scrub	<10	10-<13	13-<19	19-<27	27-<100
E. Mallee/Mulga	<6	6-<8	8-<12	12-<17	17-<100
F. Rainforest	<6	6-<9	9-<13	13-<19	19-<100
G. Grassland	<6	6-<8	8-<12	12-<17	17-<50

Figure 5: *extract of Table 2.4.3 of AS3959-2009*

The cleared area in the north-eastern corner of the site has the general dimensions of 82m x 34m. Factoring in the minimum APZ of 16m reduces the useable building envelope to 66m x 18m.

Appropriate APZ?

As provided above from *AS3959-2009 Construction of buildings in bushfire-prone areas*, the smallest APZ imposed for *forest* on flat ground is 16m (coinciding with a construction standard of BAL-40). However, the calculated flame length of the modelled bushfire behaviour is determined to be **19.8m**. Should any building be constructed within 19.8m of the unmanaged vegetation on the site, theoretically such building would be within the **Flame Zone**.

NBC Bushfire Attack Assessment Report V2.1

AS3959 (2009) Appendix B - Detailed Method 2

Print Date: 14/08/2013 **Assessment Date:** 14/08/2013

Site Street Address:	Cook Drive, Coffs Harbour
Assessor:	Steve Ellis; Holiday Coast Bushfire Solutions Pty Ltd
Local Government Area:	Coffs Harbour
Alpine Area:	No

Equations Used

Transmissivity: Fuss and Hammins, 2002
Flame Length: RFS PBP, 2001
Rate of Fire Spread: Noble et al., 1980
Radiant Heat: Drysdale, 1985; Sullivan et al., 2003; Tan et al., 2005
Peak Elevation of Receiver: Tan et al., 2005
Peak Flame Angle: Tan et al., 2005

Run Description: South-West

Vegetation Information

Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	0 Degrees	**Vegetation Slope Type:**	Level
Surface Fuel Load(t/ha):	25	**Overall Fuel Load(t/ha):**	35

Site Information

Site Slope	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m)	default	**APZ/Separation(m):**	16

Fire Inputs

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

Calculation Parameters

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

Program Outputs

Category of Attack:	FLAME ZONE	**Peak Elevation of Receiver(m):**	7.69
Level of Construction:	BAL FZ	**Fire Intensity(kW/m):**	43400
Radiant Heat(kW/m2):	40.53	**Flame Angle (degrees):**	51
Flame Length(m):	19.8	**Maximum View Factor:**	0.616
Rate Of Spread (km/h):	2.4	**Inner Protection Area(m):**	16
Transmissivity:	0.865	**Outer Protection Area(m):**	0

Figure 6: *Bushfire Attack Assessment Report (PBP-2006 methodology)*

For an appropriate "performance standard" to be achieved, the consent authority and the NSW Rural Fire Service should agree on how the appropriate APZ is to be quantified using a performance approach.

4.1.5 Contain provisions for two-way access roads which links to perimeter roads and/or to fire trail networks.

This provision is only able to be satisfied if the vehicle entry/exit area and parking areas were located within the APZ (either 16m, 19.8m or other quantified distance). If the perimeter road was required to loop around the future building, the potential building envelope would be further narrowed by at least 4.5m (2.5m fire appliance width + 1m working area + 1m working area).

It is my opinion that this requirement should not apply to this rezoning application as firefighting appliance access to the perimeter of the building would not be the operational strategy of the fire service. Firefighting appliance(s) would the staged on the public road where the water supply is located.

4.1.6 Contain provisions for adequate water supply for firefighting purposes.

Fire hydrants are located in Cook Drive and O'Keefe Drive.

4.1.7 Minimise the perimeter of the area of land interfacing the hazard which may be developed.

Due to the nature of the proposal, this measure is deemed not applicable in this circumstance.

4.1.8 Introduce controls on the placement of combustible materials in the Inner Protection Area.

This requirement would restrict anything combustible being located within the APZ (either 16m, 19.8m or other quantified distance) around the south-eastern and south-western building perimeters. Such a restriction would extend to vehicles as they are highly combustible.

4.2 Objectives of *PBP-2006*.

4.2.1 Afford occupants of any building adequate protection from exposure to a bushfire

Section 4.3.6 (f) of ***PBP-2006*** states:

> The BCA does not provide for any bush fire specific performance requirements and as such AS3959 does not apply as a set of 'deemed to satisfy' provisions. The general fire safety construction provisions are taken as acceptable solutions, but the aim and objectives of PBP apply in relation to other matters such as access, water and services, emergency planning and landscaping/vegetation management.

Therefore the general fire safety construction provisions of the BCA are taken as the *Acceptable Solution*. However, the anomaly with this is that the BCA determines that the fire source feature is:

> **BCA Volume 1, A1.1**
> Fire-source feature means—
> (a) the far boundary of a road, river, lake or the like adjoining the allotment; or
> (b) a side or rear boundary of the allotment; or
> (c) an *external wall* of another building on the allotment which is not a Class 10 building.

So for external, non-loadbearing walls that are located more than 3m from a fire source feature (the side or rear boundaries of the site), no general fire safety construction provisions apply. Should the future building have non-loadbearing walls, they could be located adjacent to the *forest* and constructed of combustible material. This is an unacceptable bushfire safety outcome, one which the legislative recognition of ***PBP-2006*** was designed to avoid.

As a suitable bushfire protection measure, I propose that any future building on the site should be constructed with the south-western and south-eastern facades having a fire resistance level determined by Specification C1.1 of the BCA where the line of the unmanaged vegetation is determined to be the fire source feature (not the property boundary).

4.2.2 Provide for a defendable space to be located around buildings

PBP-2006 defines a defendable space as:

> An area within the asset protection zone that provides an environment in which a person can undertake property protection after the passage of a bush fire with some level of safety.

A distance separation of as little as 0.9m between the future building and the unmanaged *forest* will satisfy the definition of a "defendable space" as provided in ***PBP-2006***. This is evident in many urban bushland interface areas where the standard BCA side boundary setback of 0.9m is deemed to satisfy.

This area should be bushfire fuel free, preferably concrete driveway or pedestrian path.

4.2.3 Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent direct flame contact and material ignition

PBP-2006 provides the following definition of Flame Zone:

> The distance from a bushfire at which it is calculated for the purposes of this document that there is significantly increased likelihood for flame contact to a building. Determined by the calculated distance at which the radiant heat received by the proposed building exceeds 40 kW/m^2 or calculated by the point of potential flame contact, whichever occurs first.

As detailed in 4.1.4 above, the modelled bushfire behaviour is calculated to have a flame length of 19.8m. Therefore the potential for flame contact extends for 19.8m from the unmanaged *forest* vegetation.

If the BCA general fire safety construction provisions are permitted, rather than the D-t-S *AS3959-2009 Construction of buildings in bushfire-prone areas* standard, then building ignition is almost certain to occur under the conditions modelled by ***PBP-2006***, unless my recommendation from 4.2.1 above is adopted.

4.2.4 Ensure that safe operational access and egress for emergency service personnel and residents is available

Access to the site would be via a driveway constructed to the standard imposed on industrial development within the Coffs Harbour City Council area (DCP Industrial Lands). Compliance with this DCP will ensure the access meets the standards specified in AS 2890.2 (Off-street commercial vehicle facilities (including medium rigid vehicles)).

However, firefighting appliance access would not be sought by responding fire crews. As fire hydrants are located in the street, and the site is relatively small with the furtherest part of the clearing within three (3) lengths of firefighting hose from Cook Drive, the fire service would not drive the appliance on to the site in the event of a bushfire emergency (nor in the event of a building fire).

4.2.5 Provide for ongoing management and maintenance of bushfire protection measures, including fuel loads in the asset protection zone

Conditions of development consent should be imposed requiring the bushfire protection measures be provided and maintained in perpetuity. The consent authority has the ability to list the bushfire safety measures on the fire safety schedule, required under the *Environmental Planning and Assessment Regulation 2000 (cl.166 Statutory fire safety measures)*.

4.2.6 Ensure that utility services are adequate to meet the needs of firefighters (and others assisting in bushfire fighting)

Fire hydrants are already provided in the street reserves of Cook Drive and O'Keefe Drive. There are no factors relating to this proposal that require the augmentation of the firefighting water supply to the site.

5.0 SUMMARY / CONCLUSION / RECOMMENDATIONS

Holiday Coast Bushfire Solutions Pty Ltd has been engaged by the Client to provide a Bushfire Hazard Assessment Report *"to support a rezoning application to allow development on the cleared part of the land"*. The site is *"likely to be used for light industry or bulky goods retailing"*.

The site is a single industrial lot having an area of 1.433 hectares. The cleared portion of the land comprises an area of approximately 82m x 34m, giving an area of approximately 2788m^2. The area of the property occupied by bushfire hazard vegetation is approximately 1.211 hectares.

The *swamp sclerophyll forest* remaining on the property imposes significant bushfire constraints on potential future development opportunity. The required separation distances from the *forest* vary, depending on which part of ***PBP-2006*** is applied; in summary:

- ***PBP-2006*** Appendix 2 imposes a minimum APZ of 15m; however
- ***PBP-2006*** Addendum Appendix 3 imposes a minimum APZ of 16m (meeting a D-t-S building outcome as specified by *AS3959-2009 Construction of buildings in bushfire-prone areas (BAL-40)*); however
- the Flame Zone, as defined by ***PBP-2006*** imposes a minimum APZ of 19.8m.

Nevertheless, ***PBP-2006*** appears to be unconcerned regarding construction standards for buildings of Class 5 - 8 under the BCA. In actual fact, as long as an industrial building (not being a *SFPP* or incorporating a caretaker's residence) meets the general fire safety construction standards of the BCA, no other bushfire-resisting construction standard is imposed.

One of the six (6) principal objectives of ***PBP-2006*** is to " ..... *prevent direct flame contact and material ignition*". It is doubtful whether this can be achieved without a suite of measures being imposed, but significantly the (bushfire-resisting) construction standard should match the appropriate setbacks / APZs. This is one of the fundamental objectives of ***PBP-2006*** and *AS3959-2009*. This is best achieved by requiring compliance with Table 2.4.3 of *AS3959-2009*.

I recommend the proposal be approved subject to the following provisions:

1 The site is unsuitable for developments that are either a *Special Fire Protection Purpose* (including assembly buildings as defined in the BCA) or of a nature such as bulk stores of flammable material (including timber yards and the like).

2 The existing cleared area identified on Figure 2 of this Report is to be maintained free of bushfire hazard vegetation whilst ever a structure exists on the site.

3 Any future building on the site should be constructed with the south-western and south-eastern facades having a fire resistance level determined by Specification C1.1 of the BCA, where the line of the unmanaged vegetation is determined to be the fire source feature.

5.1 Limitation

6.1.1 This Report and the subsequent recommendations reflect the reasonable and practical efforts of the author. It is important to note that the author (and State and Local Government authorities) cannot guarantee that bushfire ignition and subsequent bushfire damage will not occur.

6.1.2 Current legislation is 'silent' in relation to the maintenance of bushfire protection measures. Maintenance is a major factor in the effectiveness of any BPM

provided/installed. The extent to which the BPMs are implemented and maintained will affect the probability of achieving adequate bushfire safety margins.

6.1.3 Given the natural phenomenon of bushfires, and limitations in technology and research, a system to guarantee the survival of life and property cannot be made. This is reflected in the following statements of limitations:

> *The goal of 'absolute' or '100%' safety is not attainable and there will always be a finite risk of injury, death or property damage.* (IFEG-2005)

> *No development in a bushfire prone area can be guaranteed to be entirely safe from bushfires.* (**PBP-2001**)

> *Notwithstanding the precautions adopted, it should always be remembered that bushfires burn under a wide range of conditions and an element of risk, no matter how small, always remains.* (**PBP-2001**)

Steve Ellis
Holiday Coast Bushfire Solutions Pty Ltd

✓ Graduate Diploma In Design For Bushfire Prone Areas

✓ BPAD-A Certified Business and Practitioner – Fire Protection Association Australia "**Bushfire Planning and Design**" Certification Program

7.0 REFERENCES

ABCB (2005), *International fire engineering guidelines edition 2005,* Australian Building Codes Board, Canberra.

ABCB, *Building Code of Australia,* CanPrint Publications Pty Ltd, ACT.

Crane, R. (7/2013), *Vegetation management plan,* Coffs Coast Bush Regeneration, Korora.

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NSW Rural Fire Service (2006), *Planning for Bushfire Protection 2006 including Addendum Appendix 3,* Sydney.

NSW Rural Fire Service (2001), *Planning for Bushfire Protection 2001,* Sydney.

NSW Rural Fire Service (2005), *Standards for asset protection zones,* Sydney.

NSW Rural Fire Service (2012), *Practice note 5/12 - Reuse of rezoning reports on bushfire prone land,* Sydney.

Standards Australia (1999), *Australian Standard 3959-1999 Construction of buildings in bushfire-prone areas,* Sydney.

Standards Australia (2009), *Australian Standard 3959-2009 Construction of buildings in bushfire-prone areas,* Sydney.

8.0 APPENDICES

COFFS HARBOUR CITY COUNCIL (COUNCIL)

JAMES ROBERT AULD AND MARGARET DAWN AULD (APPLICANTS)

THIS DEED is made the day of 2014

1. PARTIES

1.1 Coffs Harbour City Council ABN 79 126 214 487 of Cnr Coff and Castle Streets, Coffs Harbour, NSW 2450 ("**Council**")

1.2 James Robert Auld and Margaret Dawn Auld of 29 Orlando Street, Coffs Harbour, NSW 2450 ("**the Applicants**").

2. BACKGROUND

2.1 The Applicants are the Registered Proprietors of the Land.

2.2 The Applicants have sought a change to an environmental planning instrument and have lodged the Planning Proposal with Council in support of the Rezoning.

2.3 The Applicants have voluntarily offered to enter into a planning agreement with Council under section 93F of the Act to provide for a material public benefit by enhancement of the natural environment by implementing vegetation management of the Land in accordance with the VMP.

2.4 Council accepts the above offer.

2.5 The Applicants have voluntarily agreed to enter into this Agreement.

3. DEFINED TERMS

In this document the following definitions apply:

3.1 **Act** means the *Environmental Planning and Assessment Act 1979* (NSW).

3.2 **Agreement** means this Agreement and includes any schedules, annexures and appendices to this Agreement.

3.3 **Bond or Bank Guarantee** means either a cash bond or a Guarantee drawn on an Australian bank from the Applicants to the Council for the sum of $10,000.00.

3.4 **Coffs Harbour LEP 2013** means Coffs Harbour Local Environmental Plan 2013.

3.5 **Council** means Coffs Harbour City Council.

3.6 **Development Site** means that part of the Land being the "cleared area" identified on the plan set out in Schedule 1 of this Agreement.

3.7 **GST** has the same meaning as in the GST Law.

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

3.9 **Land** means Lot 13 DP 591220 and Lot 6 DP 714455 known as Cook Drive, Coffs Harbour NSW 2450.

3.10 **Planning Proposal** means the proposal to rezone the Development Site to B5 Business Development Zone under Coffs Harbour LEP 2013.

3.11 **Registered Proprietor** means the registered proprietor of the Land from time to time.

3.12 **Rezoning** means the rezoning of the Development Site to B5 Business Development Zone under Coffs Harbour LEP 2013.

3.13 **VMP** means the Vegetation Management Plan set out in Schedule 2 to this Agreement.

4. OFFER

This document, executed only by the Applicants, is to be read and construed as containing the Applicants' irrevocable offer to enter into this Agreement to cause vegetation management of the Land to be provided in accordance with the VMP, on the terms set out in this Agreement, once the Rezoning has been effected.

5. OPERATIVE PROVISIONS

5.1 The parties agree that this Agreement is a planning agreement governed by Subdivision 2 of Division 6 of Part 4 of the Act.

5.2 This Agreement takes effect on the date of execution by both parties.

5.3 This Agreement applies to the Land.

6. REGISTERED PROPRIETOR'S OBLIGATIONS

6.1 Words used in this clause which are defined in the VMP have the same meaning given in that plan.

6.2 Upon the Rezoning being effected the Registered Proprietor must (unless other arrangements acceptable to Council are made):

6.2.1 Immediately pay the bond or bank guarantee;

6.2.2 cause the VMP to be implemented, including by causing the following to be done (without limitation):

- completion of all Initial Works required for each of the 4 "Vegetation Management Zones" – within 100 days of the Rezoning being effected;

- provision to Council of a report (Statement of Completion) upon satisfactory completion of the Initial Works – within 28 days of such completion;
- undertaking of the 5 year maintenance programme and Follow Up weed control – every 8 weeks for the first 2 years after completion of the Initial Works, followed by every 4 months for the remaining 3 years; and
- provision to Council of yearly reports throughout the five year Follow-up Works period.

7. APPLICATION OF S94, S94A AND S94EF OF THE ACT TO THE DEVELOPMENT

7.1 The application of sections 94, 94A and 94EF of the Act to any development on the Land is not excluded under this Agreement.

8. REGISTRATION OF THIS AGREEMENT

8.1 The Applicants represent and warrant that they are the registered proprietors of the Land.

8.2 The Applicants agree that they will procure the registration of this Agreement, under the *Real Property Act 1900* (NSW) against the title to the Land in accordance with section 93H of the Act.

8.3 The Applicants will, at their expense, promptly after this Agreement comes into operation, take all practical steps, and otherwise do anything that Council reasonably requires, to procure:

8.3.1 the consent of each person who has an estate or interest in the Land;

8.3.2 an acceptance of the terms of this Agreement and an acknowledgment in writing from any existing mortgagee in relation to the Land that the mortgagee will adhere to the provisions of this Agreement if it takes possession of the Land as mortgagee in possession;

8.3.3 the execution of any documents; and

8.3.4 the production of the relevant duplicate certificate of title,

to enable the registration of this Agreement in accordance with clause 7.2.

8.4 The Applicants will, at their expense, take all practical steps and otherwise do anything that Council reasonably requires:

8.4.1 to procure the lodgement of this Agreement with Land and Property Information as soon as reasonably practicable after this Agreement comes into operation but in

any event, no later than 90 business days after that date; and

8.4.2 to procure the registration of this Agreement against the title to the Land as soon as reasonably practicable after this Agreement is lodged for registration.

8.5 Council will provide a release and discharge of this Agreement so that it may be removed from the folios of the register for the Land (or any part of it) provided that the Registered Proprietor has provided Council with a Statement of Completion by Coffs Coast Bush Regeneration or some other suitably qualified consultant that the VMP has been materially satisfactorily completed.

8.6 The Applicants acknowledge and agree that:

8.6.1 this Planning Agreement creates an equitable estate and interest in the Land for the purpose of section 74F(1) of the Real Property Act 1900 (NSW);

8.6.2 Council has a sufficient interest in the Land in respect of which to lodge with Land and Property Information a caveat notifying that interest;

8.6.3 they will raise no objection to Council entering a caveat in the relevant folio of the register for the Land provided the caveat does not prevent registration of any dealing other than a transfer of the Land; and

8.6.4 they will obtain the consent to the lodgement of the caveat of each person who has an estate or interest in the Land.

9. REVIEW OF THIS AGREEMENT

This Agreement is not subject to review, other than in accordance with clause 21.

10. DISPUTE RESOLUTION

10.1 This clause applies to any dispute under this Agreement.

10.2 Such a dispute is taken to arise if one party gives another party a notice in writing specifying particulars of the dispute.

10.3 If a notice is given under clause 10.2 the parties are to meet within 14 days of the notice in an attempt to resolve the dispute.

10.4 If the dispute is not resolved within a further 28 days, the parties must mediate the dispute in accordance with the Mediation Rules of the Law Society of New South Wales published from time to time and must request the President of the Law Society, or the President's nominee, to select a mediator.

10.5 If the dispute is not resolved by mediation within a further 28 days, or such longer period as may be necessary to allow any mediation process which has been commenced to be completed, then the parties may exercise their legal rights in relation to the dispute, including by the commencement of legal proceedings in a court of competent jurisdiction in New South Wales.

11. ENFORCEMENT

11.1 Without limiting any other remedies available to the parties, this Agreement may be enforced by the parties in any court of competent jurisdiction.

11.2 For the avoidance of doubt, nothing in this Agreement prevents:

11.2.1 a party from bringing proceedings in the Land and Environment Court to enforce any aspect of this Agreement or any matter to which this Agreement relates; or

11.2.2 Council from exercising any function under the Act or any other Act or law relating to the enforcement of any aspect of this Agreement or any matter to which this Agreement relates, including cashing the Bond or Bank Guarantee.

12. NOTICES

12.1 Any notice, consent, information, application or request that must or may be given or made to a party under this Agreement is only given or made if it is in writing and sent in one of the following ways:

12.1.1 delivered or posted to that party at its address set out below,

12.1.2 faxed to that party at its fax number set out below, or

12.1.3 emailed to that party at its email address set out below.

Coffs Harbour City Council
Attention: The General Manager
Address: Locked Bag 155 Coffs Harbour NSW 2450
Phone: (02) 6648 4000
Fax Number: (02) 6648 4199
Email: coffs.council@chcc.nsw.gov.au

James Robert Auld and Margaret Dawn Auld
Attention: James Robert Auld and Margaret Dawn Auld
Address: 29 Orlando Street Coffs Harbour NSW 2450
Phone: (02) 6650 0845
Fax Number: Nil
Email: jamauld@bigpond.net.au

12.2 If a party gives the other party 3 business days' notice of a change of its address or fax number, any notice, consent, information, application or request is only given or made by that other party if it is delivered, posted or faxed to the latest address or fax number.

12.3 Any notice, consent, information, application or request is to be treated as given or made at the following time:

12.3.1 if it is delivered, when it is left at the relevant address;

12.3.2 if it is sent by post, 2 business days after it is posted;

12.3.3 if it is sent by fax, as soon as the sender receives from the sender's fax machine a report of an error-free transmission to the correct fax number.

12.4 If any notice, consent, information, application or request is delivered, or an error-free transmission report in relation to it is received, on a day that is not a business day, or if on a business day, after 5pm on that day in the place of the party to whom it is sent, it is to be treated as having been given or made at the beginning of the next business day.

13. ASSIGNMENT AND DEALINGS

13.1 The Applicants must procure from any mortgagee in relation to the Land an acceptance of the terms of this Agreement and an acknowledgement that the mortgagee will adhere to the provisions of this Agreement if it takes possession of the Land as mortgagee in possession.

13.2 Unless the matters specified in clause 12.3 are satisfied, the Applicants are not to do any or the following:

13.2.1 transfer, assign or dispose of the whole or any part of their right, title or interest in the Land to any person; or

13.2.2 assign or novate to any person the Applicants' rights or obligations under this Agreement.

13.3 The matters required to be satisfied for the purposes of clause 12.2 are as follows:

13.3.1 Council being satisfied, acting reasonably, that the proposed transferee is financially capable of complying with the Applicants' obligations under this Agreement;

13.3.2 Council being satisfied that its rights will not be diminished or fettered in any way;

13.3.3 The Applicants have, at no cost to Council, first procured the execution, by the person to whom the Applicants' rights or obligations under this Agreement are to be assigned or novated, an agreement in favour of Council under which that person agrees to comply with all the outstanding obligations of the Applicants under this Agreement; and

13.3.4 Any default by the Applicants under the provisions of this Agreement have been remedied by the Applicants or waived by Council.

13.4 The Applicants and the proposed transferee must pay Council's reasonable costs in relation to any assignment or novation of their rights and obligations under this Agreement.

14. COSTS

The Applicants are to pay Council's reasonable legal costs of preparing, negotiating and executing this Agreement.

15. ENTIRE AGREEMENT

This Agreement contains everything to which the parties have agreed in relation to the matters it deals with. No party can rely on an earlier document, or anything said or done by another party, or by a director, officer, agent or employee of that party, before this Agreement was executed, except as permitted by law.

16. FURTHER ACTS

Each party must promptly execute all documents and do all things that another party from time to time reasonably requests to effect, perfect or complete this Agreement and all transactions incidental to it.

17. GOVERNING LAW AND JURISDICTION

This Agreement is governed by the law of New South Wales. The parties submit to the non-exclusive jurisdiction of its courts and courts of appeal from them. The parties will not object to the exercise of jurisdiction by those courts on any basis.

18. NO FETTER

Nothing in this Agreement shall be construed as requiring Council to do anything that would cause it to be in breach of any of its obligations at law, and without limitation, nothing shall be construed as limiting or fettering in any way the exercise of any statutory discretion or duty.

19. REPRESENTATION AND WARRANTIES

The parties represent and warrant that they have power to enter into this Agreement and comply with their obligations under the Agreement and that entry into this Agreement will not result in the breach of any law.

20. SEVERABILITY

20.1 If a clause or part of a clause of this Agreement can be read in a way that makes it illegal,

unenforceable or invalid, but can also be read in a way that makes it legal, enforceable and valid, it must be read in the latter way.

20.2 If any clause or part of a clause is illegal, unenforceable or invalid, that clause or part is to be treated as removed from this Agreement, but the rest of this Agreement is not affected.

21. MODIFICATION

No modification of this Agreement will be of any force or effect unless it is in writing and signed by the parties to this Agreement.

22. WAIVER

22.1 The fact that a party fails to do, or delays in doing, something the party is entitled to do under this Agreement does not amount to a waiver of any obligations of, or breach of obligation by, another party.

22.2 A waiver by a party is only effective if it is in writing. A written waiver by a party is only effective in relation to the particular obligations or breach in respect of which it is given. It is not to be taken as an implied waiver of any other obligation or breach, or as an implied waiver of that obligation or breach in relation to any other occasions.

23. GST

23.1 Words used in this clause which are defined in the GST Law have the meaning given in that legislation.

23.2 If GST is payable on a Taxable Supply made under, by reference to or in connection with this Agreement, the party providing the Consideration for that Taxable Supply must also pay the GST Amount as additional Consideration. This clause does not apply to the extent that the Consideration for the Taxable Supply is expressly agreed to be GST inclusive.

23.3 Unless otherwise expressly stated, all prices or other sums payable or Consideration to be provided under or in accordance with this Agreement are exclusive of GST.

23.4 Any reference in the calculation of Consideration or of any indemnity, reimbursement or similar amount to a cost, expense or other liability incurred by a party, must exclude the amount of any Input Tax Credit entitlement of that party in relation to the relevant cost, expense or other liability.

23.5 This clause will continue to apply after expiration or termination of this Agreement.

24. INTERPRETATIONS

24.1 A reference to person includes a reference to a natural person, a company or other legal entity whether acting as a trustee or not.

24.2 A reference to a party in this Agreement is a reference to that party in its personal capacity as well as in its capacity as trustee of a trust (if any) and a party is obligated in terms of this Agreement in its personal capacity and in its capacity as trustee for a trust (if any).

24.3 A reference to:

24.3.1 a person includes the person's executors, administrators, successors, substitutes, including persons taking by novation and assigns; and

24.3.2 a group of persons includes them collectively and each of them individually.

24.4 An agreement, representation or warranty:

24.4.1 in favour of 2 or more persons is for the benefit of them jointly and severally; and

24.4.2 on the part of 2 or more persons binds them jointly and severally.

24.5 A reference to a gender includes any gender.

24.6 The singular includes the plural and vice versa.

24.7 The word 'person' includes a firm, a body corporate, an unincorporated association or an authority.

24.8 A reference to a document includes any amendment or supplement to or replacement or novation of the document.

24.9 Headings are for convenience only and do not affect the interpretation of this Agreement.

24.10 References to a statute or statutory provision include that statute or statutory provision as amended, extended, consolidated or replaced by subsequent legislation and any orders, regulations, documents or other subordinate legislation made under the relevant statute.

24.11 A clause number means the respective clause of this Agreement.

24.12 President of a body or authority includes a person acting in that capacity.

24.13 A thing includes the whole and each part of it.

24.14 A reference in this Agreement to a business day means a day other than a Saturday or Sunday on which banks are open for business generally in Sydney.

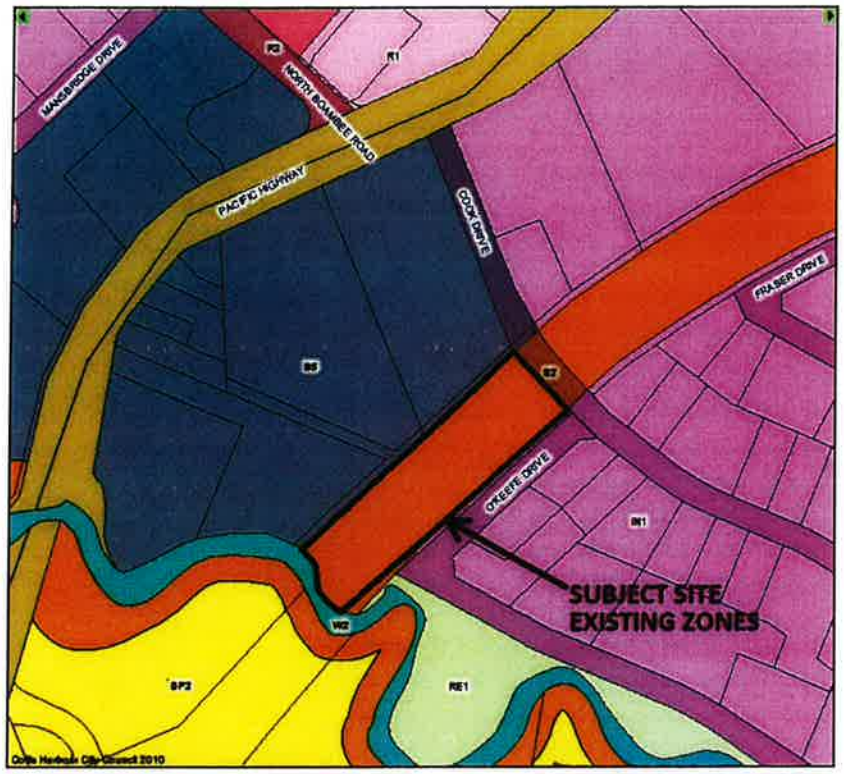
24.15 'Include' or 'including' when introducing a list of items does not limit the meaning of the

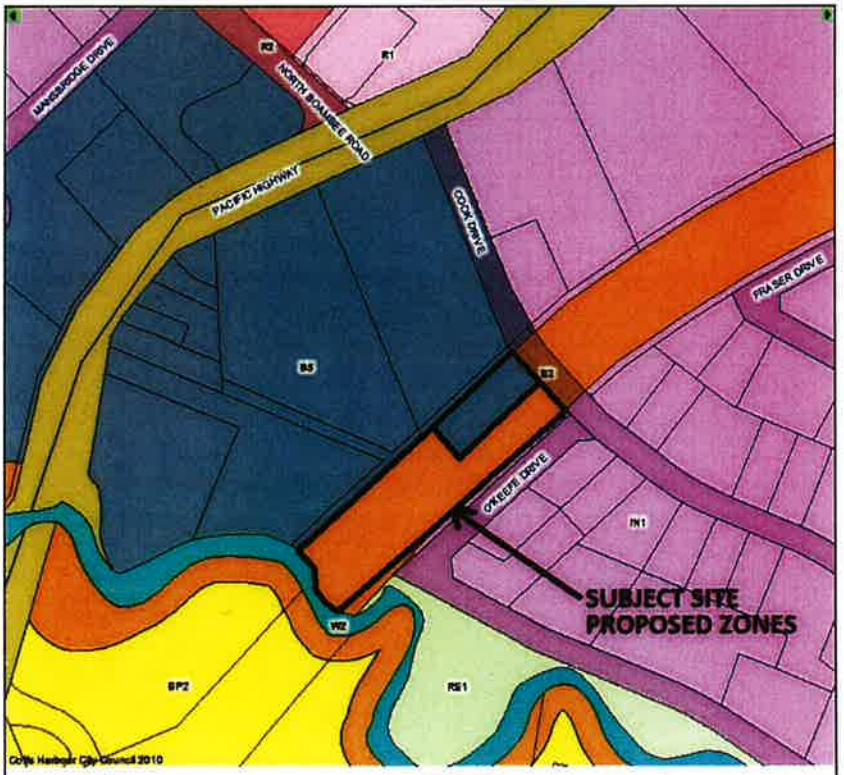
words to which the list relates to those items or to items of a similar kind.

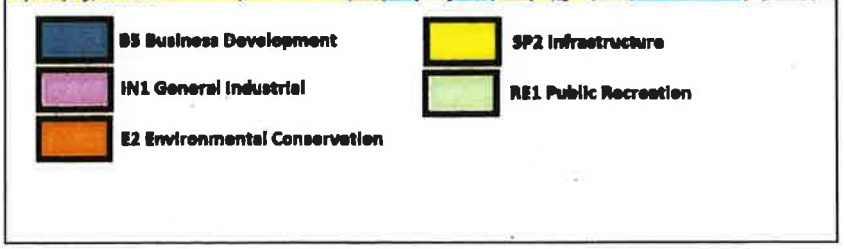
24.16 If a party is required to do something, that includes a requirement to cause that thing to be done. If a party is prohibited from doing anything, it is also prohibited from doing or omitting to do anything which allows or causes that thing to be done.

24.17 No rule of construction applies to the disadvantage of a party because that party was responsible for the preparation of this Agreement.

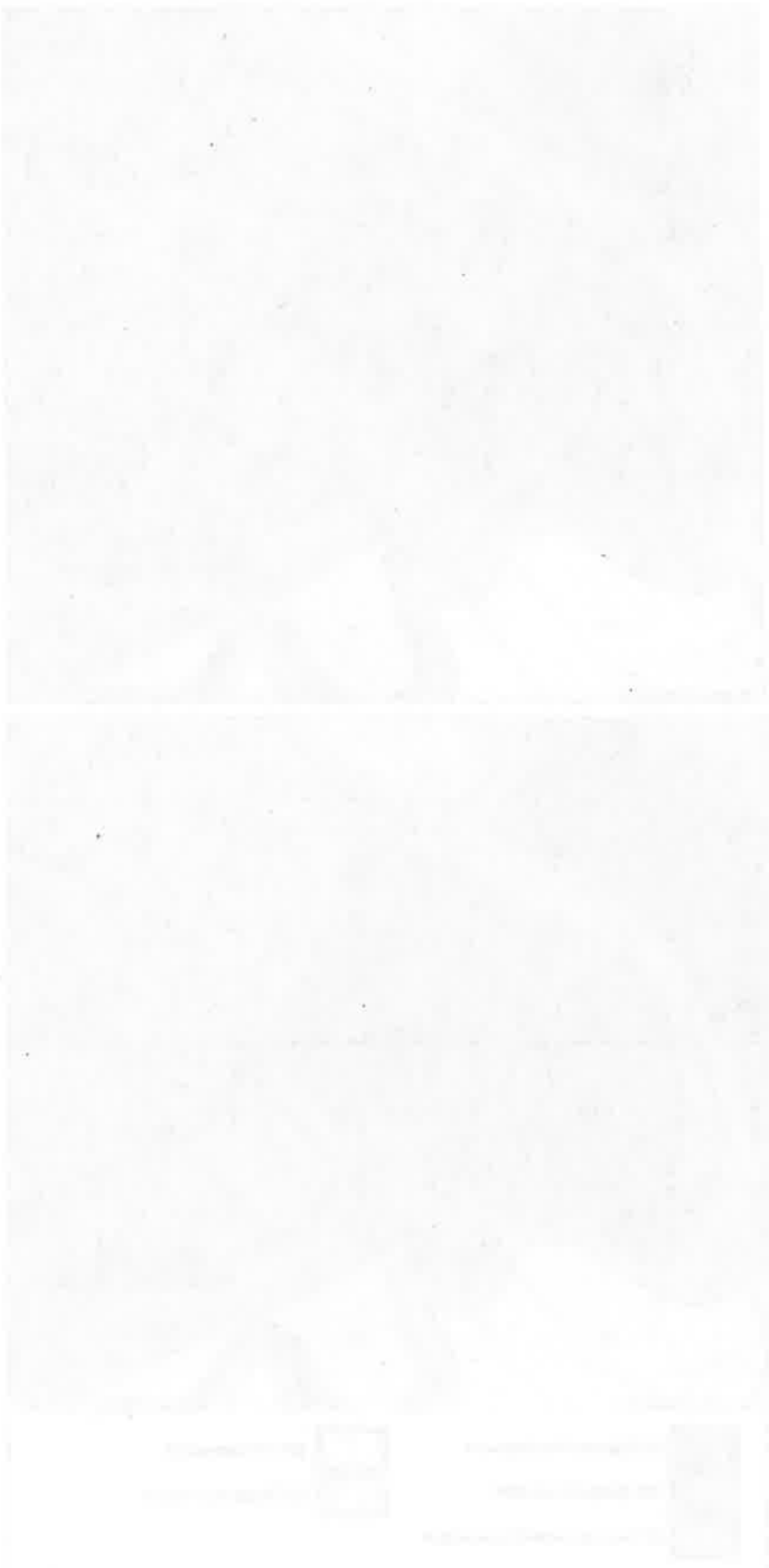
SCHEDULE 1 – PLAN IDENTIFYING THE DEVELOPMENT SITE







SCHEDULE 2 – VEGETATION MANAGEMENT PLAN (VMP)



Executed as an Agreement

Executed for and on behalf of Coffs Harbour City Council by its authorised delegate, in accordance with a resolution of the Council dated :

Signature of authorised delegate

Signature of witness

Name of authorised delegate

Name of witness

Executed by James Robert Auld in the presence of:

Signature of James Robert Auld

Signature of Witness

Name of Witness

Address of Witness

Executed by Margaret Dawn Auld in the presence of:

Signature of Margaret Dawn Auld

Signature of Witness

Name of Witness

Address of Witness

ABN 18 825 055 289
263 Korora Basin Rd Korora NSW 2450
Phone: 02 6653 6781
Email: coffscoastbushregeneration@bigpond.com

Eco Restoration Specialists

Vegetation Management Plan

Lot 13 DP 591220 and Lot 6 DP 714455 Cook Drive Coffs Harbour 2450

Feb 2014

Personnel

This Vegetation Management Plan was prepared by Ricky Crane of Coffs Coast Bush Regeneration Ltd, accredited member of the Australian Association of Bushland Regenerators (AABR)

Acknowledgements

Document Tracking

Revision History					
Version	**Date**	**Author**		**Reviewer**	
		Name	**Initials**	**Name**	**Initials**
DRAFT	24/7/13	Rick Crane	RC	"	RC

Client Issue							
Issue	**Version**	**Draft/Final**	**Date Sent**	**Distributed To**	**Copies**	**Media**	**Delivery**
1	1	Draft	24/7/13	Rick Bennell	1	elec	email

Disclaimer

This report has been prepared for the use of the stated client and for the specific purpose described in the introduction and is not to be used for any other purpose or by any other person or corporation. Coffs Coast Bush Regeneration accepts no responsibility for any loss or damage suffered howsoever arising to any person or corporation who may use or rely on this report in contravention of the terms of this disclaimer.

Due consideration has been given to site conditions and to appropriate legislation and documentation available at the time of preparation of the report. As these elements are liable to change over time, the report should be considered current at the time of preparation only.

The report relies on information supplied by the client and on findings obtained using accepted survey and assessment methodology. While due care was taken during field survey and report preparation, Coffs Coast Bush Regeneration accepts no responsibility for any omissions that may have occurred due to the nature of the survey methodology.

Conclusions to the report are professional opinions and Coffs Coast Bush Regeneration cannot guarantee acceptance or consent of the relevant determining/ consent authorities. Subsequent requests for further work or information will be subject to additional fees.

Introduction

Background

This Vegetation Management Plan (VMP) has been prepared by Coffs Coast Bush Regeneration (CCBR) following a request from Bennell and Associates consultant for Jim and Margaret Auld owners of the subject property at Lot 13 DP 591220 and Lot 6 DP 714455 which is situated at Cook Drive Coffs Harbour.

This VMP has been prepared to support a rezoning application to allow development on the cleared part of this land. This VMP is to provide strategies for vegetation management on the site and to fulfil Coffs Harbour City Council's (CHCC) requirements for VMP preparation.

CCBR or a suitably qualified consultant shall provide the land holder/ land manager with a copy of this VMP and undertake a site inspection with the landholder prior to initial works programme being implemented to explain or clarify the requirements of the works programme.

CCBR or a suitably qualified consultant shall provide a report (Statement of Completion) upon satisfactory completion of the Initial works described in this VMP. CCBR shall also provide to CHCC yearly reports throughout the five year Follow-up Works period.

Aim

- Creation of self-sustaining vegetation communities.
- To provide improved habitat connectivity by restoration of habitat corridors.
- To reduce the presence and spread of environmental/noxious weeds in the local area.
- Enhance the visual amenity of the site

Objectives

- To retain, rehabilitate and enhance existing native vegetation with weed control.
- To map proposed areas requiring weed control.
- To outline the methodology for removal of environmental/noxious weeds and ongoing management detailing the Initial and Follow up Maintenance works required.
- Provide table of costing for all works.

Site Description

Site Location

The property is located approximately 2. 8 kilometres southwest of Coffs Harbours CBD on Cook Drive, Coffs Harbour NSW 2450.

Latitude 30°18'51 76"S, Longitude 153°05'45 48"E

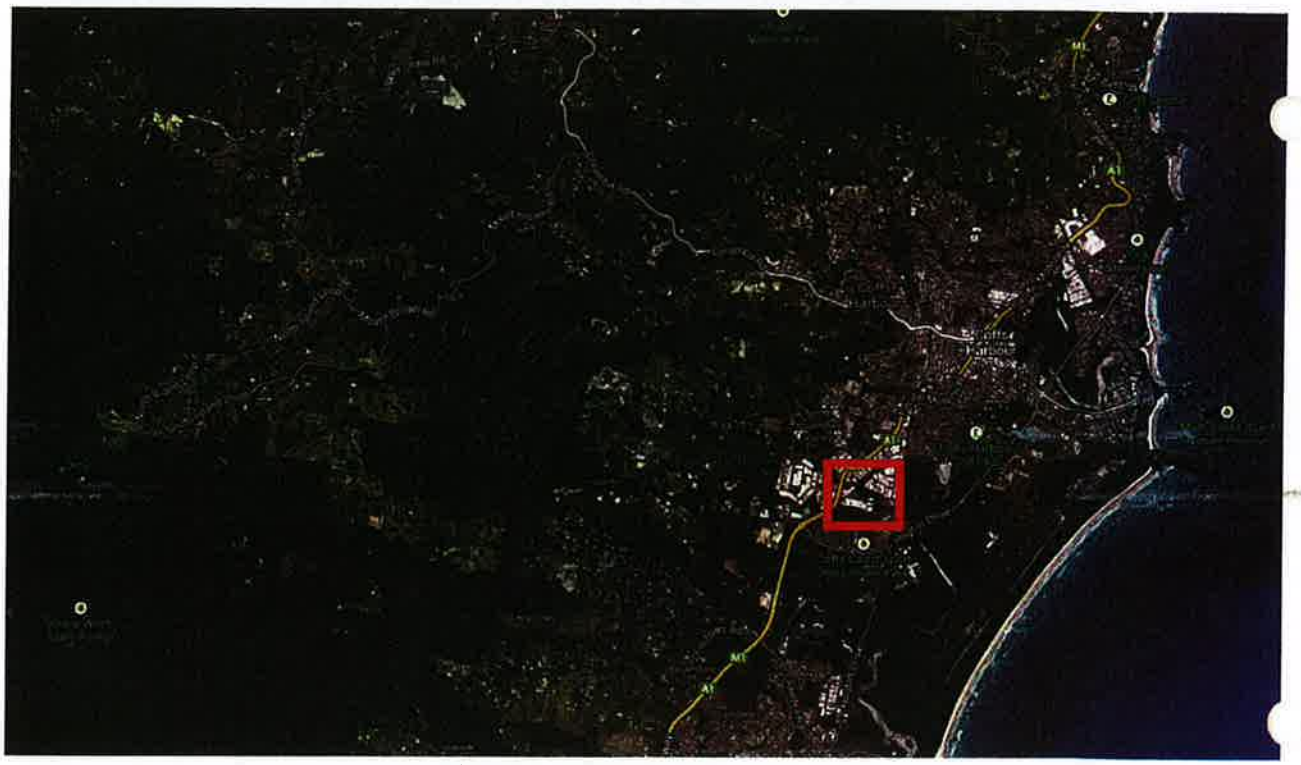


Figure 1. Site Location

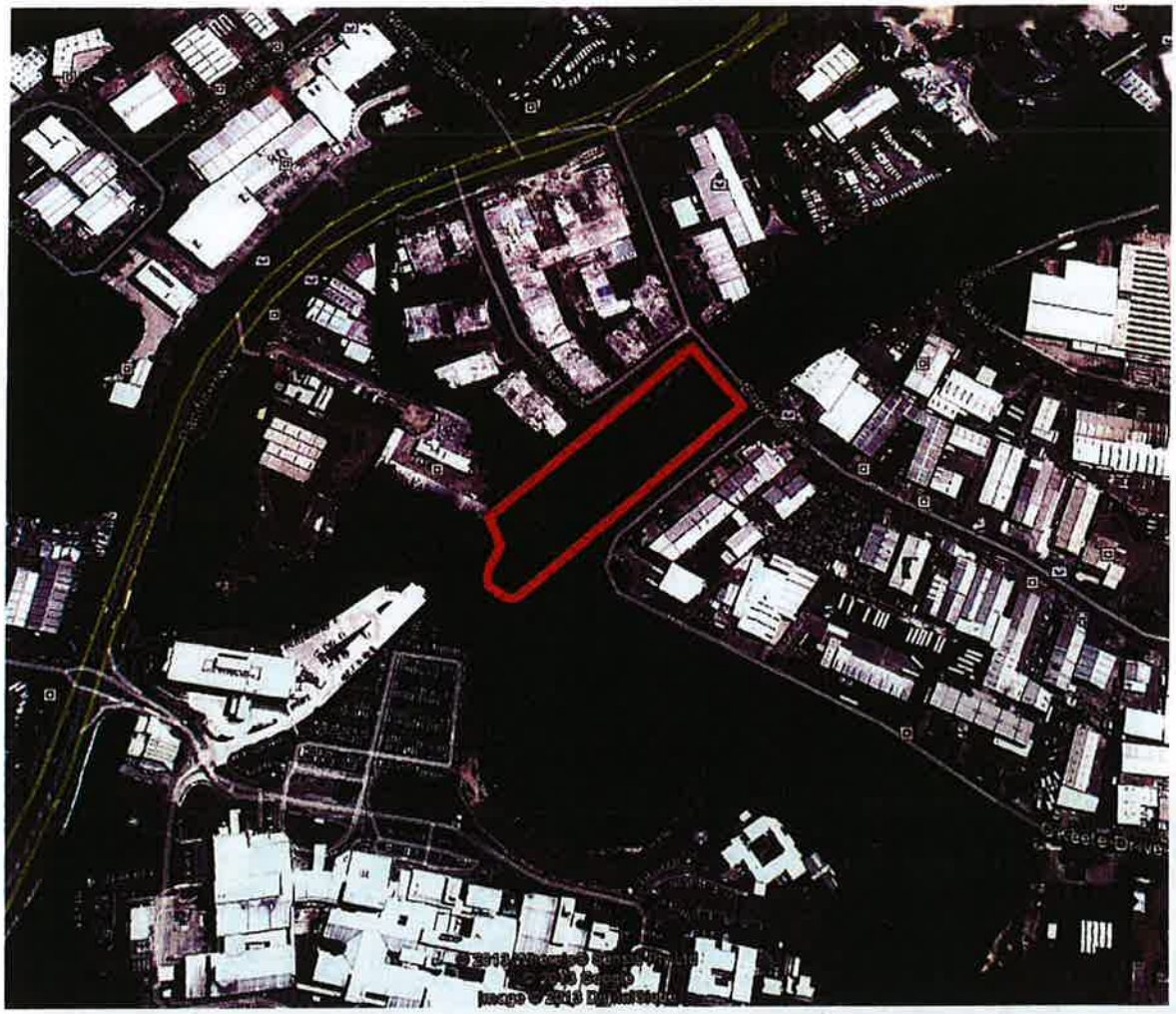


Figure 2. Detailed property location

Site Details

The site known as Lot 13 DP 591220 and Lot 6 DP 714455 is a property owned by Jim and Margaret Auld. It has a total area of approximately 1.2 hectares and is bounded to the north by Cook Drive.

The area covered by this VMP is north of the creek that divides the property; this area shall be referred to as the subject site (see Site Plan Appendix 1 for detail).

Development Outline

The proposal is for a rezoning application to allow development on the cleared part of this land.

The subject land is zoned 7A Environmental Protection (Appendix 3 – Coffs Harbour City Council LEP 2000 Land Zoning) under the provisions of the Coffs Harbour City Local Environmental Plan 2000.

Mapped Koala Habitat is present throughout the majority of the site and is deemed to be Primary Koala Habitat under the Koala Plan of Management (KPoM, 2000).

Site History

The subject site appears to have been utilised as a storage and/or waste area in the past. Scrap metal including car parts, building waste and machinery parts are found across the site.

Most of the subject site seems to have remained without major disturbance in the recent past with moderately resilient vegetation covering much of the site.

Figure 3. Building waste in zone 1

Landforms, geology and soils

Geology

Holocene clayey and silty alluvium (generally <1m total thickness) overlying Pleistocene mottled grey estuarine clays, which were deposited in all major coastal inlets in the Coffs Harbour area. (Leitch, E.C., Neilson, M.J., Hobson, E., 1971) or (Leitch et al 1971)

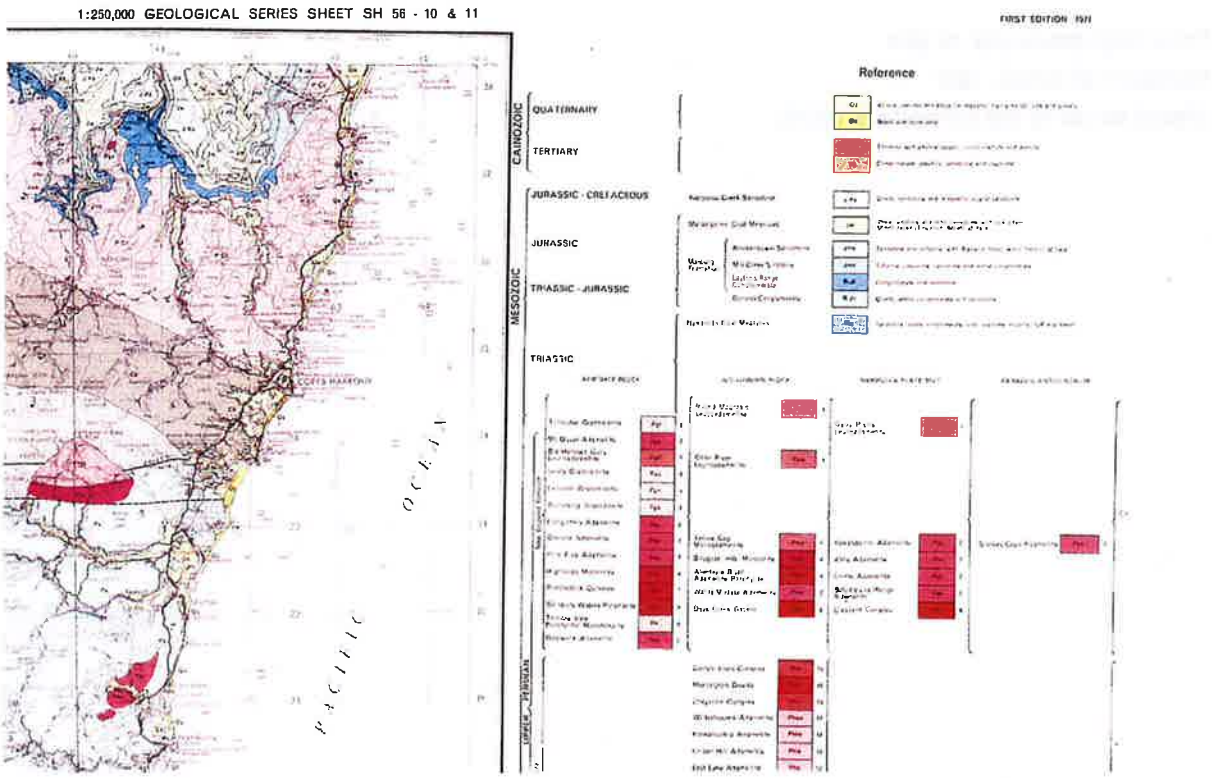


Figure 4: Detail from 1:250,000 Geological Series Dorrigo Sheet (source *www.geoscience.gov.au)*

Soil Type

The property is located on soil type: "*Newports Creek*" (np) Milford (1999).

The Newports Creek soil landscape possesses the following qualities:

- **Topography:** low, level to gently undulating coastal back barrier floodplains on Pleistocene estuarine sediments. Local relief <5m slopes, < %2 elevation.
- **Soils:** deep poorly drained Yellow Podsolic soils and humic clays.
- **Qualities and limitations:** Strongly to very strongly acid, strongly sodic (localised) strongly saline(localised) with high aluminium potential, low to very low wet bearing strength, slow deep topsoil permeability, high topsoil organic matter and low fertility.

Project Summary

Total area of retained vegetation-Approximately 1.1ha
Area of revegetation-1000m2

Total requirements of site
Number of trees- 100
Weed mass to be removed-100%

Assessment of Existing Vegetation

Vegetation Communities

The native vegetation on this property is described as containing the following vegetation types (Figure 4) under the CHCC Class 5 Vegetation Mapping system:

1. **(CH_FW 01) Broad-leaved Paperbark - Swamp Oak – Willow Bottle Brush Forested Wetland on Floodplain.**

2. **(CH_DOF 01) Blackbutt - Turpentine - Pink Bloodwood Grassy Dry Open to Tall Open Forest.**

3. **(CH_WSF 03) Turpentine – Sydney Blue Gum –Tallowwood Sheltered Wet Shrubby Forest of Metasedimentary Hinterland Foothills and Escarpment.**

On ground assessments of the vegetation communities onsite found the vegetation represented by these map units to contain the following species composition:

Broad-leaved Paperbark - Swamp Oak – Willow Bottle Brush Forested Wetland on Floodplain.

- Canopy species-Dominated by Swamp Mahogany *(Eucalyptus robusta)*.
- Mid stratum layer- Dominated by Willow Bottlebrush *(Callistemon salignus)*.
- Ground layer- dominated by Saw Sedge (Gahnia clarkei).

Blackbutt - Turpentine - Pink Bloodwood Grassy Dry Open to Tall Open Forest.

- Canopy species-Dominated by Tallowwood *(Eucalyptus microcorys)* and Blackbutt *(E. pilularis)* with Pink Bloodwood *(Corymbia intermedia)*, White Mahogany *(E. acmenioides)*, Red Mahogany *(E. resinifera)* and Turpentine *(Syncarpia glomulifera)* also present.
- Mid stratum layer- contains Willow Bottlebrush *(Callistemon salignus)* with other rainforest tree species such as Forest Maple *(Cryptocarya rigida)*, Guioa *(Guioa semiglauca)* and Cheese Tree *(Glochidion ferdinandi)*.
- Ground layer- contains Rasp Fern *(Doodia aspera)*, Gristle Fern *(Blechnum cartilagenium)*, Ottochloa *(Ottochloa gracillima) and* Common Ground Fern *(Calochlaena dubia)*.

Turpentine – Sydney Blue Gum –Tallowwood Sheltered Wet Shrubby Forest of Metasedimentary Hinterland Foothills and Escarpment.

- Canopy species-Dominated by Tallowwood *(Eucalyptus microcorys)* with Flooded Gum *(Eucalyptus grandis)* and Brush Box *(Lophostemon confertus)*.
- Mid stratum layer- is dense with diverse rainforest trees and vines including Yellow Pear Fruit *(Mischocarpus pyriformis)*, Murrogun *(Cryptocarya microneura)*, Muellers Walnut (Endiandra muelleri) and Water Vines *(Cissus* sp.).
- Ground layer- is sparse with rainforest tree regeneration amongst small vines and ferns.

Figure 5. Forested Wetland (Swamp Sclerophyll EEC) within Zone 1 of the subject site

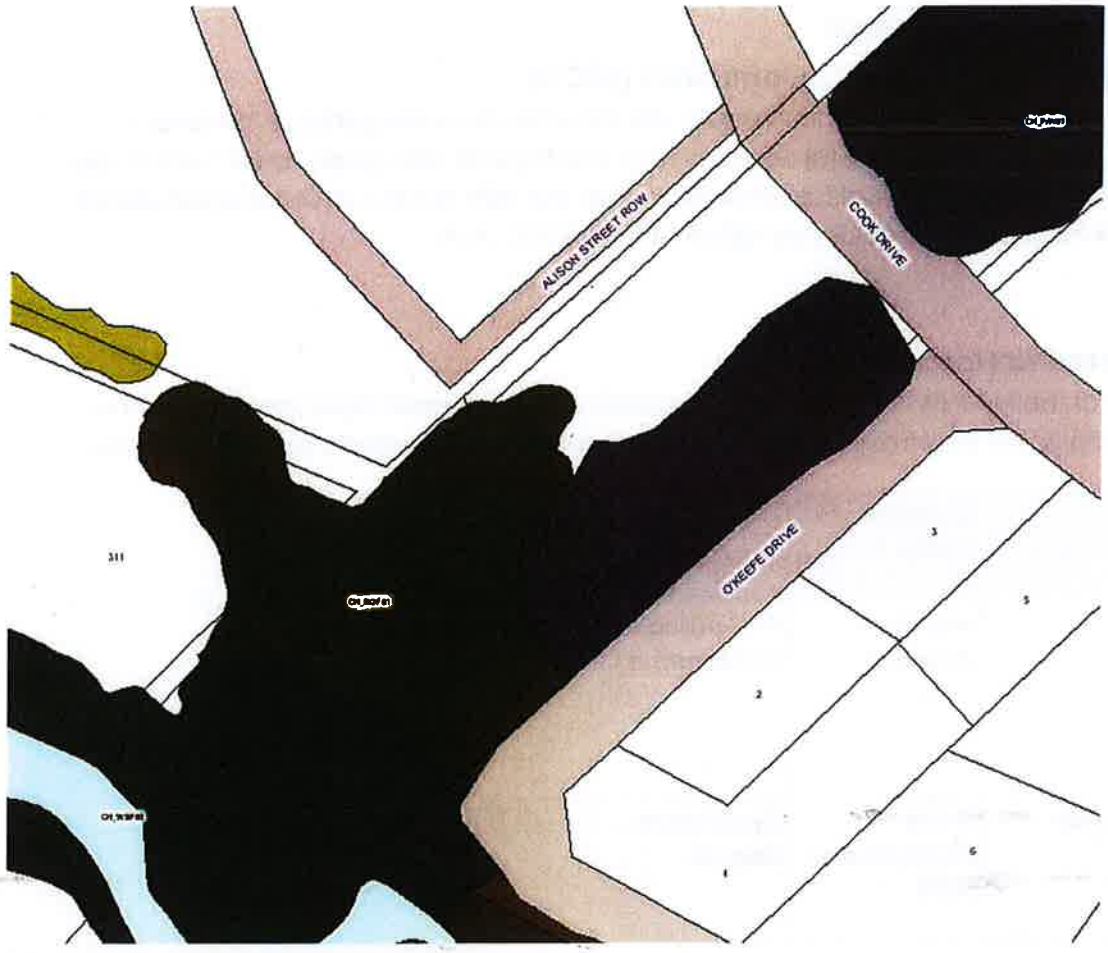


Figure 6: Vegetation Communities
(According to CHCC Fine Scale class 5 Vegetation Mapping)

(CH_FW 01) Broad-leaved Paperbark - Swamp Oak – Willow Bottle Brush Forested Wetland on Floodplain.

(CH_DOF 01) Blackbutt - Turpentine - Pink Bloodwood Grassy Dry Open to Tall Open Forest.

(CH_WSF 03) Turpentine – Sydney Blue Gum –Tallowwood Sheltered Wet Shrubby Forest of Metasedimentary Hinterland Foothills and Escarpment.

Conservation Significance

Endangered Ecological Communities (EEC's)

Elements of vegetation within the subject site fall within the categories of "Swamp Sclerophyll Forest on Coastal Floodplain" and "Subtropical Floodplain Forest" which are both Endangered Ecological Communities within the NSW North Coast Bioregion (listed on the Threatened Species Conservation Act 1995 (TSC Act).

Threatened Flora Species

A search of the NSW NPWS Wildlife Atlas revealed 50 threatened flora species with the potential to occur within the site, being recorded within a 5 kilometre radius of the site.

	Common name	Scientific name	NSW status	Comm. status
Plantae Flora Apiaceae	Mountain Angelica	^^Gingidia montana	E1,P,3	E
Apocynaceae	White-flowered Wax Plant	Cynanchum elegans	E1,P	E
	Slender Marsdenia	Marsdenia longiloba	E1,P	V
	Milky Silkpod	Parsonsia dorrigoensis	V,P	E
	Cryptic Forest Twiner	Tylophora woollsii	E1,P	E
Araceae	Stinky Lily	^^Typhonium sp. aff. brownii	E1,P,3	
Asteliaceae	Silver Sword Lily	Neoastelia spectabilis	V,P	V
Casuarinaceae	Dwarf Heath	Allocasuarina	E1,P	E

Appendix 8: Weed Profiles and Control Techniques

The weed species shown in Appendix 8 include those that are currently present on the site as well as those species that are not present at this point in time, but that do occur in the local area.

Weed Profiles

Weeds marked with an * although not currently listed on the CHCC environmental weed list are recognized as being bushland weeds by bushland regenerators/ ecologists.

***Ageratina adenophora* Crofton Weed** erect multi stemmed perennial herbs up to 1-2 metres high grows in full sun or shade but enjoys moist sites especially, and bare soil. Wind dispersed seeds. Forms dense cover inhibiting natural regeneration. **Class 4 noxious weed**
Control: manually remove or; spray seedlings with glyphosate; mature plants can be sprayed with Grazon (following manufacturers recommendations). Metasulfuron-methyl is also effective and results in less off target damage but is not registered for this weed.

***Ageratina riparia* Mistflower**
A scrambling perennial groundcover to 1m in height. White "mists" of flowers. Narrow, opposite toothed leaves. Mostly found in wet areas but not restricted to any soil or aspect. Forms dense mats preventing regeneration of native species. Leachate from leaves and plant litter have a harmful effect on other plants (Alleopathic). The many seeds are easily spread by wind and water. Roots form when stems hit the ground, forming a dense mat. Also spread by contaminated produce. **Class 4 noxious weed**
Control Methods: manually remove ; spray seedlings with glyphosate; mature plants can be sprayed with Grazon (following manufacturers recommendations). Metsulfuron-methyl is also effective and results in less off target damage but is not registered for this weed.

***Ageratum houstonianum* Blue Billy Goat Weed** erect or decumbent annual herb to 1 metre in height. Likes wet sites. Dispersal mechanisms wind, water, animals, machinery. Forms dense cover inhibiting natural regeneration. Mulch / plant out to reduce germination of seed Control manual removal or spray with glyphosate requires follow up.

***Andropogon virginicus* Whiskey Grass** A tufted erect brownish perennial grass with solid stems. Flower/ seed heads are long and narrow.
Control Methods: Spray (100:1)/ wick-wipe with glyphosate.

Appendix 6: Weed Species List

Botanical Name	Common Name	Noxious Weed Category
Ageratina adenophora	Crofton Weed	Class 4
Ageratum houstonianum	Blue Billy Goat Weed	Env.
Cinnamomum camphora	Camphor Laurel	Env.
Euodia elleryana	Pink Euodia	Env.
Hibiscus spp.	Hibiscus	Env.
Ipomoea indica	Morning Glory	Env.
Koelreuteria paniculata	Golden Rain Tree	Env.
Lantana camara	Lantana	Class 3
Paspalum urvillei	Giant Paspalum	Env.
Paspalum mandiocanum	Broadleaf Paspalum	Env.
Philodendron spp.	Philodendron	Env.
Asparagus aethiopicus	Ground Asparagus	WoNS
Senna pendula var glabrata	Senna	Env.
Syagrus romanzoffiana	Cocos Palm	Env.
Tithonia diversifolia	Japanese Sunflower	Env.

	longipetalum		
	Morinda jasminoides	Morinda	Vine
Rutaceae			
	Acronychia oblongifolia	Common Acronychia	Tree
Sapindaceae			
	Cupaniopsis anacardioides	Tuckeroo	Tree
	Dodonaea triquetra	Hop Bush	Tree
	Guioa semiglauca	Guioa	Tree
	Jagera pseudorhus	Foambark	Tree
	Mischocarpus pyriformis	Yellow Pear Fruit	Tree
Solanaceae			
	Duboisia myoporoides	Soft Corkwood	Tree
Uvulariaceae			
	Tripladenia cunninghamii	Tripladenia	Herb
Vitaceae			
	Cissus antarctica	Kangaroo Grape	Vine
	Cissus hypoglauca	Water Vine	Vine
Violaceae			
	Viola hederacea	Native Violet	Herb

	Ficus rubiginosa	Port Jackson Fig	Tree
	Ficus watkinsiana	Strangler Fig	Tree
	Maclura cochinchinensis	Cockspur Thorn	Vine
Myrtaceae			
	Angophora costata	Smooth-barked Apple	Tree
	Callistemon salignus	Willow Bottlebrush	Tree
	Corymbia intermedia	Pink Bloodwood	Tree
	Eucalyptus grandis	Flooded Gum	Tree
	Eucalyptus microcorys	Tallowwood	Tree
	Eucalyptus pilularis	Blackbutt	Tree
	Eucalyptus robusta	Swamp Mahogany	Tree
	Lophostemon confertus	Brush Box	Tree
	Lophostemon suaveolens	Swamp Box	Tree
	Melaleuca styphelioides	Prickly Leaved Tea Tree	Tree
	Rhodamnia rubescens	Scrub Turpentine	Tree
	Syncarpia glomulifera	Turpentine	Tree
	Syzygium smithii	Lilly Pilly	Tree
	Syzygium oleosum	Blue Lilly Pilly	Tree
Oleaceae			
	Notelaea longifolia	Mock Olive	Tree
Phyllanthaceae			
	Breynia oblongifolia	Coffee Bush	Tree
	Glochidion ferdinandi	Cheese Tree	Tree
Pittosporaceae			
	Pittosporum revolutum	Hairy Pittosporum	Shrub
	Pittosporum undulatum	Sweet Pittosporum	Tree
Rhamnaceae			
	Alphitonia excelsa	Red Ash	Tree
Rousseaceae			
	Cuttsia viburnea	Cuttsia	Tree
Rubiaceae			
	Cyclophyllum	Coast Canthium	Tree

	Archidendron grandiflorum	Pink Lace Flower	Tree
Flacourtiaceae			
	Scolopia braunil	Flintwood	
Lamiaceae			
	Clerodendron floribundum	Smooth Clerodendron	Tree
Lauraceae			
	Cryptocarya microneura	Murrogun	Tree
	Cryptocarya rigida	Forest Maple	Tree
	Cryptocarya triplinervis	Three-veined Laurel	Tree
	Endiandra discolor	Rose Walnut	Tree
	Endiandra muelleri	Green Leaf Rose Walnut	Tree
	Endiandra virens	White Apple	Tree
	Litsea australis		Tree
	Neolitsea dealbata	White Bollygum	Tree
Lobeliaceae			
	Lobelia trigonocaulis	Forest Lobelia	Herb
	Pratia purpurascens	White Root	Herb
Luzuriagaceae			
	Eustrephus latifolius	Wombat Berry	Vine
	Geitonoplesium resinosum	Scrambling Lilly	Vine
Malvaceae			
	Seringia arborescens	Seringia	Shrub
Meliaceae			
	Synoum glandulosum	Scentless Rosewood	Tree
Menispermaceae			
	Stephania japonica	Snake Vine	Vine
Monimiaceae			
	Wilkiea huegeliana	Veiny Wilkiea	
Moraceae			
	Ficus coronata	Creek Sandpaper Fig	Tree

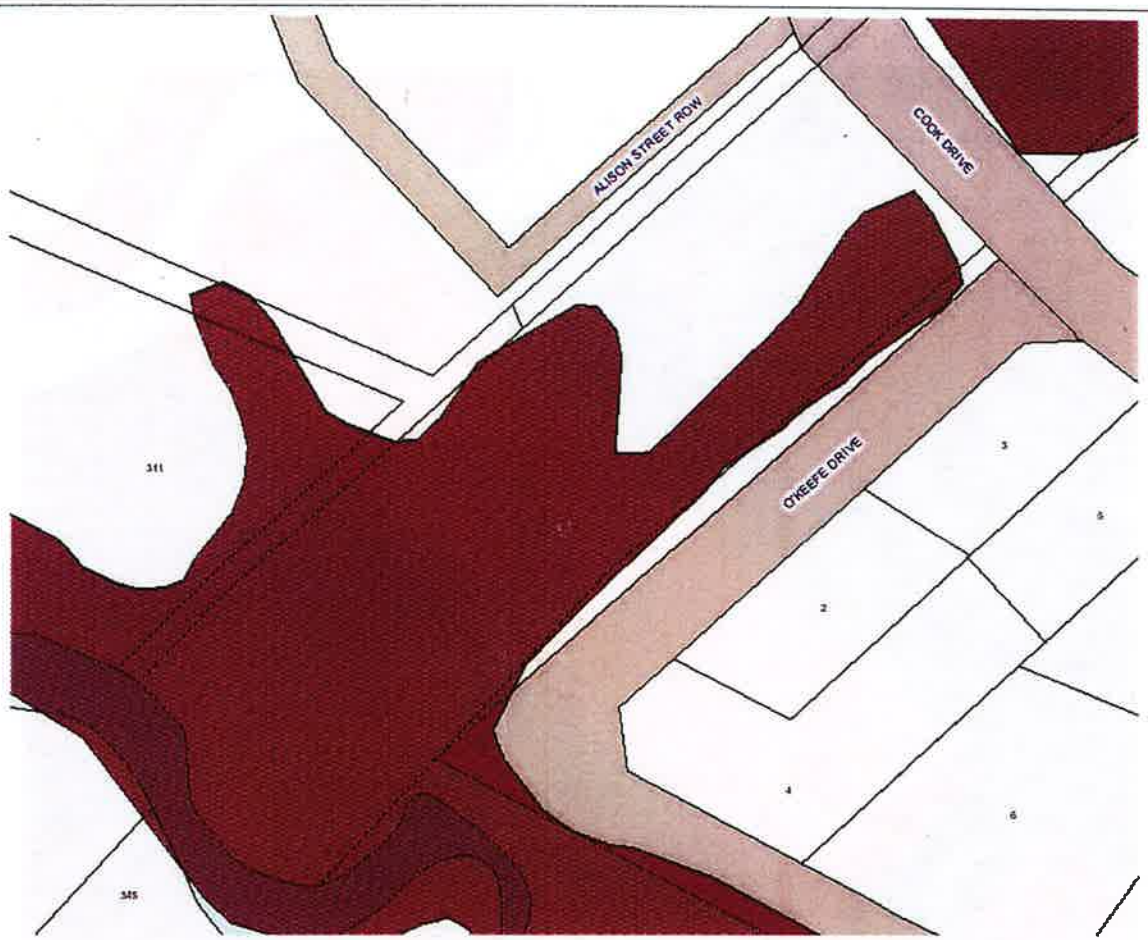
	pandacaqui		
Araliaceae			
	Polyscias sambucifolia	Elderberry Panax	Shrub
Asteraceae			
	Ozothamnus diosmifolius	Tick Bush	Shrub
Casuarinaceae			
	Allocasuarina littoralis	Black Oak	Tree
	Allocasuarina torulosa	Forest Oak	Tree
Celastraceae			
	Denhamia celastroides	Orange Boxwood	Tree
Commelinaceae			
	Commelina cyanea	Commelina	Herb
Convolvulaceae			
	Dichondra repens	Kidney Weed	Herb
Cunoniaceae			
	Callicoma serratifolia	Callicoma	Tree
	Schizomeria ovata	Crab-apple	Tree
Dioscoreaceae			
	Dioscorea transversa	Native Yam	Vine
Ericaceae			
	Trochocarpa laurina	Tree Heath	Tree
Elaeocarpaceae			
	Elaeocarpus reticulatus	Blueberry Ash	Tree
Euphorbiaceae			
	Claoxylon australe	Brittlewood	Tree
Eupomatiaceae			
	Eupomatia laurina	Bolwarra	Tree
	Eupomatia bennettii	Small Bolwarra	Shrub
Fabaceae			
Mimosoideae			
	Acacia fimbriata	Fringed Wattle	Tree
	Acacia melanoxylon	Blackwood	Tree

	Gahnia aspera	Rough Saw Sedge	Sedge
	Gahnia clarkei	Saw Sedge	Sedge
Dasypogonaceae			
	Lomandra hystrix	Mat Rush	Sedge
	Lomandra longifolia	Mat Rush	Sedge
Flagellariaceae			
	Flagellaria indica	Whip Vine	Vine
Juncaceae			
	Juncus usitatus	Common Rush	Rush
Phormiaceae			
	Dianella caerulea	Blue Flax Lilly	Flax
Poaceae			
	Entolasia stricta	Wiry Panic	Grass
	Imperata cylindrica	Blady Grass	Grass
	Oplismenus aemulus	Basket Grass	Grass
	Oplismenus imbecillis	Creeping Beard Grass	Grass
	Oplismenus undulatifolius	Creeping Beard Grass	Grass
	Ottochloa gracillima	Slender Shade Grass	Grass
Smilacaceae			
	Smilax australis	Austral Sarsaparilla	Vine
	Smilax glyciphylla	Sweet Sarsaparilla	Vine
Typhaceae			
	Typha orientalis	Broadleaf Cumbungi	Aquatic Perennial
DICOTYLEDONS			
Anacardiaceae			
	Euroschinus falcatus	Ribbonwood	Tree
Apiaceae			
	Centella asiatica	Pennywort	Herb
Apocynaceae			
	Marsdenia rostrata	Common Milk Vine	Vine
	Parsonsia straminea	Common Silk Pod	Vine
	Tabernaemontana	Banana Bush	Shrub

Appendix 5: Native Indigenous Flora Species List

Plant Family	*Botanical Name*	Common Name	Habit
FERNS			
Aspleniaceae			
	Asplenium australasicum	Bird's Nest Fern	Epiphytic Fern
Adiantaceae			
	Adiantum hispidulum	Rough Maidenhair	Ground Fern
Blechnaceae			
	Blechnum cartiliagineum	Gristle Fern	Ground Fern
	Doodia aspera	Rasp Fern	Ground Fern
Cyatheaceae			
	Cyathea australis	Rough Tree Fern	Tree Fern
	Cyathea cooperi	Smooth Tree fern	Tree Fern
Dennstaedtiaceae			
	Calochlaena dubia	Soft Bracken Fern	Ground Fern
	Pteridium esculentum	Bracken Fern	Ground Fern
Polypodiaceae			
	Platycerium bifurcatum	Elk Horn Fern	Epiphytic Fern
	Platycerium superbum	Stag Horn	Epiphytic Fern
MONOCOTYLEDONS			
Araceae			
	Gymnostachys anceps	Settlers Flax	Sedge
Arecaceae			
	Archontophoenix cunninghamiana	Bangalow Palm	Feather Palm
Astellaceae			
	Cordyline stricta	Narrow Leaved Palm Lily	Shrub
Cyperaceae			
	Cyperus difformis	Cyperus	Sedge

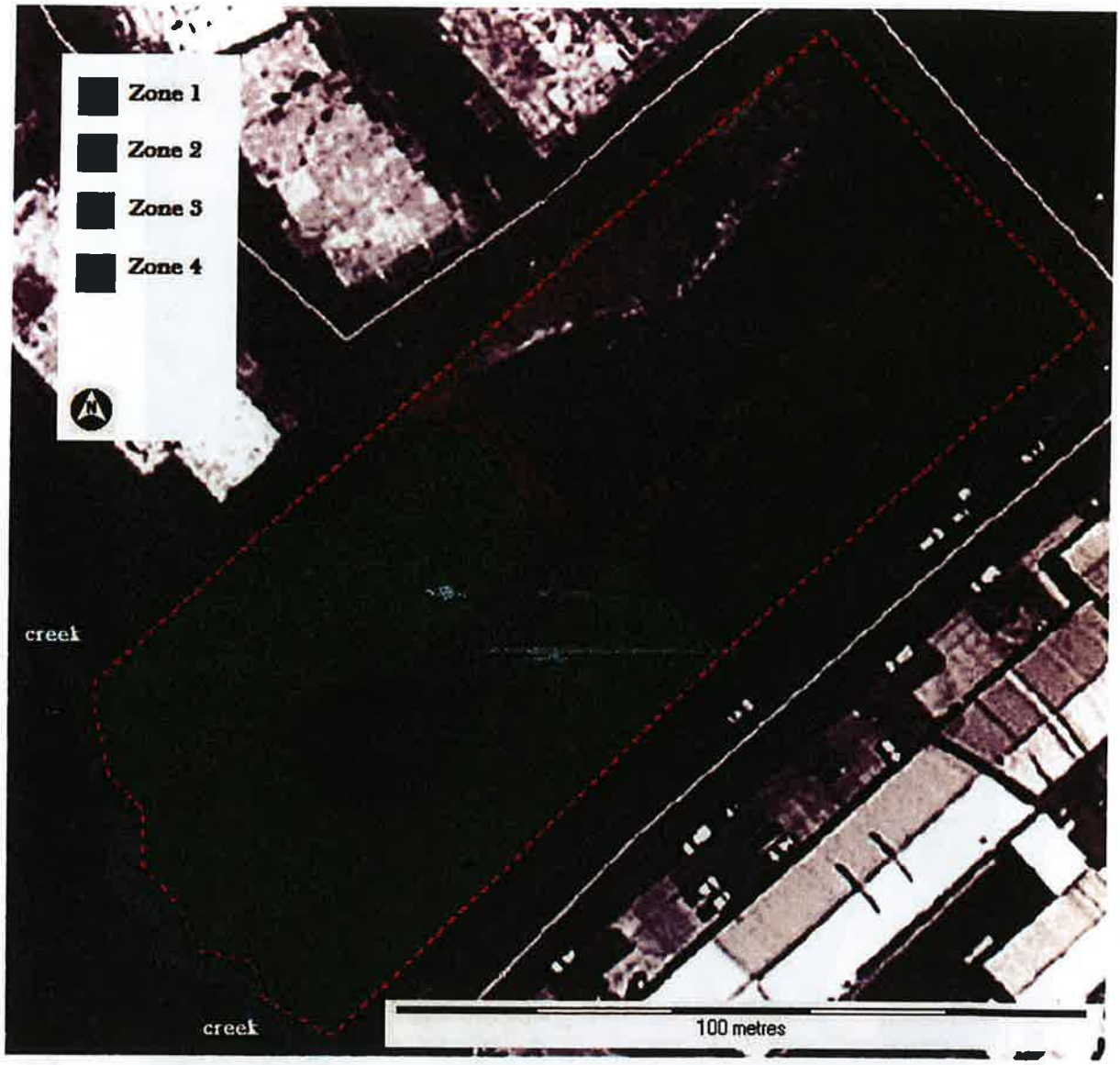
Appendix 4: Koala Habitat Mapping (CHCC KPoM)



Appendix 3: LEP Mapping

Appendix 2: Aerial Photo (with 10m contours)

Appendix 1: Site Plan



Maintenance, Monitoring and Reporting

On ground maintenance of restoration/ revegetation works

- The subject site shall require a 5 year maintenance programme.
- Maintenance and Follow Up weed control shall be undertaken every 8 weeks for the first 2 years followed by every 4 months for the remaining 3 years.
- Depletion of the seed bank of Broad Leaved Paspalum shall be a priority across the site.

Monitoring

Monitoring will be undertaken in conjunction with follow up weed control works, and will comprise the following:

- Check for survival rates.
- Check soil moisture and undertaken watering if required.
- Check for encroaching weeds and native vines to ensure. seedling growth is not adversely affected. Vine species shall be cut back to a reasonable distance.
- Bag protection is in place correctly
- Check general health of plants – to estimate further fertiliser application requirements.
- Check for human disturbance of the plantings.

Reporting

- This VMP covers a 5 year period.
- CCBR or a suitably qualified consultant shall provide a report (Statement of Completion) upon satisfactory completion of the Initial works described in this VMP.
- CCBR or a suitably qualified consultant shall also provide to CHCC yearly reports throughout the five year Follow-up Works period.

Revegetation Species

Species required shall be a mixture of Canopy and Midstorey:

Midstorey Species		
Botanical Name	**Common Name**	
Acronychia oblongifolia	Common Acronychia	5
Acacia melanoxylon	Blackwood	20
Cryptocarya microneura	Murrogun	5
Eucalyptus microcorys	Tallowwood	10
Eucalyptus robusta	Swamp Mahogany	5
Euroshinus falcattus	Ribbonwood	5
Pittosporum undulatum	Sweet Pittosporum	5
Syncarpia glomulifera	Turpentine	5

Table 11: Zone 4 revegetation species list

These native indigenous species shall:

- Be tubestock grown from local provenance seed (i.e. seed collected within a 50 kilometres radius of Coffs Harbour)
- Be planted using slow release fertiliser and water retention crystals,
- Have jute weed mats for weed control.
- Have large plastic tree guards installed for protection against Wallaby predation.
- Be watered on installation and depending on the soil moisture during the plant establishment phase, additional watering may be required.

Revegetation Follow up works

- Follow up weed control works shall include the continued suppression and removal of identified weed species in each Zone. Any opportunistic weed species not already identified shall be incorporated into the follow up weed control works for treatment.
- Any plant losses shall be replaced.
- Emergent seedlings of native species introduced to the site by fauna, shall require monitoring and identification. Native species that are not consistent with the vegetation community shall be removed.
- It may be necessary to prune native vines that are in close proximity to native seedlings. Pruning of the vines will allow for uninhibited growth of the native seedlings, until such time as they are established.

Any revegetation plantings that die within the 5 year plan period shall be replaced within the scope of the Follow-up Works programme at the owner's expense.

Botanical Name	Common Name	Legal or Risk Status	Population Structure
Paspalum mandiocanum	Broad-leaf Paspalum	Med. Risk Env. weed	Lightly scattered across zone with occasional dense infestations.

Table 9: Weed species present Zone 4

This shall involve treatments as outlined in *Table 10*. Detailed bushland regeneration weed control techniques including relevant herbicides and application rates are given in *Appendix 7*.

Technique	Species	Life Stage	Comments	Optimal Control Period
Manual removal	Paspalum	Mature	Remove within 50cm from native grasses prior to spraying	Prior to flowering in April
Wick Wiping	Paspalum	mature	Where understorey of native grasses exists.	Late Summer/ Autumn
Spraying	Paspalum	mature	Refer above	Late Summer/ Autumn

Table 10: Weed Control Requirements

Revegetation methodology

Revegetation shall been undertaken across the zone with the aim of closing the canopy whilst boosting diversity. Trees shall be planted at spacing of 3m centres throughout the zone.

Direct planting

It is an approximate area 500².

This shall involve the planting of 50 indigenous native tree species at plant spacings of 3 metre centres in all areas devoid of canopy. Planting shall be done following initial weed control as described above.

Detailed revegetation methodology.

Detailed site preparation and planting requirements are given in *Appendix 9*.

Figure 10. Zone 4: Dense Broad Leaved Paspalum infestation

Initial Works

Initial works required include weed control and revegetation works

Weed Control and Site Preparation

This shall involve the control of all Environmental and Noxious weeds in this zone as shown in *Table 9* and listed in *Appendix 6.*

Follow up weed control shall be undertaken at regular intervals and aim at controlling Paspalum before seeding in autumn. A minimum 5 year period of comprehensive follow up weed control shall be required to achieve the eradication of Broad Leaved Paspalum from the zone.

Restoration Goals

- Control and eventual eradication of Broad Leaved Paspalum.
- Canopy closure/consolidation.
- Understorey and midstorey development.
- Restoration of site resilience.
- Increased floristic diversity.
- Establishment of dense native ground cover.

Threatening Processes

- Dense Broad Leaved Paspalum infestation restricting the regeneration of native vegetation.
- Dense Broad Leaved Paspalum providing seed sources to disperse throughout the remainder of the site.

Mitigation Strategies

- Initial weed control shall remove Broad Leaved Paspalum in preparation for revegetation.
- Revegetation shall be undertaken to begin lowering light levels and aid in reducing the density of Broad Leaved Paspalum germination.
- Species compatible with the vegetation communities present shall be utilised to aid in boosting floristic diversity and developing site resilience. .
- The site shall be subject to a weed control programme utilising regular waves of targeted weed control to eradicate all environmental weeds from the site.

species not already identified shall be incorporated into the follow up weed control works for treatment.
- Any plant losses shall be replaced.
- Emergent seedlings of native species introduced to the site by fauna, shall require monitoring and identification. Native species that are not consistent with the vegetation community shall be removed.
- It may be necessary to prune native vines that are in close proximity to native seedlings. Pruning of the vines will allow for uninhibited growth of the native seedlings, until such time as they are established.

Any revegetation plantings that die within the 5 year plan period shall be replaced within the scope of the Follow-up Works programme at the owner's expense.

Management Zone 4

Outline

Resilience

The vegetation in this area is dominated by the Tallowwood/Blackbutt dry open forest community. Canopy species are present however disturbance and increased light levels have allowed for the invasion of the zone by Broad Leaved Paspalum. The vegetation is somewhat resilient owing to the canopy species present although further reductions in light levels by revegetation would facilitate the eradication of Broad Leaved Paspalum and thus aid the enhancement of site resilience.

Restoration Techniques

The zone shall require Broad Leaved Paspalum to be controlled with regular follow up undertaken to achieve eradication. This shall be achieved by qualified Professional Bushland Regenerators (PBRs) sweeping through the zone with the aim of treating all Broad Leaved Paspalum located within the zone.

Sensitive weed control undertaken at regular intervals shall allow for the retention of site resilience by carefully treating environmental weeds without harming native vegetation.

Methods to be used shall involve manual removal, wick wiping and foliar application of herbicide.

The establishment of a dense layer of native grasses shall be encouraged by sensitive weed control. This ground layer shall aid in reducing large germinations from the seed bank and facilitate the eventual eradication of Broad Leaved Paspalum

This shall involve the planting of 50 indigenous native tree species at plant spacings of 3 metre centres in all areas devoid of canopy. Planting shall be done following initial weed control as described above.

Detailed revegetation methodology.

Detailed site preparation and planting requirements are given in *Appendix 8.*

Revegetation Species

Species required shall be a mixture of Midstorey:

Midstorey Species		
Botanical Name	**Common Name**	
Acronychia oblongifolia	Common Acronychia	5
Acacia melanoxylon	Blackwood	10
Cryptocarya microneura	Murrogun	5
Elaeocarpus obovatus	Hard Quandong	5
Endiandra discolor	Rose Walnut	5
Eucalyptus microcorys	Tallowwood	10
Euroshinus falcattus	Ribbonwood	5
Syncarpia glomulifera	Turpentine	5

Table 8: Zone 3 revegetation species list

These native indigenous species shall:

- Be tubestock grown from local provenance seed (i.e. seed collected within a 50 kilometres radius of Coffs Harbour)
- Be planted using slow release fertiliser and water retention crystals,
- Have jute weed mats for weed control.
- Have large plastic tree guards installed for protection against Wallaby predation.
- Be watered on installation and depending on the soil moisture during the plant establishment phase, additional watering may be required.

Revegetation Follow up works

- Follow up weed control works shall include the continued suppression and removal of identified weed species in each Zone. Any opportunistic weed

This shall involve treatments as outlined in *Table 7*. Detailed bushland regeneration weed control techniques including relevant herbicides and application rates are given in *Appendix 7*.

Technique	Species	Life Stage	Comments	Optimal Control Period
Cut & Paint	Senna	Mature		Prior to flowering in April
	Cocos Palm	Juvenile		
	Camphor Laurel	Juvenile		
	Lantana	sapling		
Direct Inject	Cocos Palm	mature		
	Camphor Laurel	mature		
Manual Removal	Senna	seedlings		
	Lantana	Seedling/mature		
	Asparagus	mature	Remove where climbing on native seedlings	
	Paspalum	mature	Remove within 50cm from native grasses prior to spraying	Late Summer/ Autumn
Spraying	Paspalum	mature	Refer above	Late Summer/ Autumn
	Asparagus	mature		Before fruiting in Autumn

Table 7: Weed Control Requirements

Revegetation methodology

Revegetation shall been undertaken across the zone with the aim of closing the canopy whilst boosting diversity. Trees shall be planted at spacing of 3m centres throughout the zone.

Direct planting

It is an approximate area 500².

Initial Works

Initial works required include weed control and revegetation works

Weed Control and Site Preparation

This shall involve the control of all Environmental and Noxious weeds in this zone as shown in *Table 6* and listed in *Appendix 6.*

Botanical Name	Common Name	Legal or Risk Status	Population Structure
Syagrus romanzoffiana	*Cocos Palm*	Med. Risk Env. weed	Lightly scattered across zone
Lantana camara	Lantana	Class 3 noxious	Dense infestations throughout zone
Senna pendula	Senna	Med. Risk Env. weed	Dense infestations throughout zone
Paspalum mandiocanum	Broad-leaf Paspalum	Med. Risk Env. weed	Lightly scattered across zone with occasional dense infestations.
Asparagus aethiopicus	Asparagus fern	WoNS	Lightly scattered across zone
Cinnamomum camphora	Camphor Laurel	High risk env. weed	Lightly scattered across zone
Ageratina adenophora	Crofton Weed	Class 4 noxious	Scattered across zone
Tithonia diversifolia	Japanese Sunflower	Med. Risk Env. weed	Occasional dense infestations.
Philodendron sp.		Low Risk Env. weed	Localised infestation.
Megathursis maximus	Guinea Grass	Med. Risk Env. weed	Occasional dense infestations.
Panicum repens	Torpedo Grass	Med. Risk Env. weed	Occasional dense infestations.
Ipomoea purpurascens	Morning Glory	Med. Risk Env. weed	Small infestation
Melicope elleryana	Pink Euodia	Low Risk Env. weed	Occasional individuals
Koelruteria paniculata	Golden Rain Tree	Low Risk Env. weed	Occasional individuals
Setaria sphacelata	Setaria	Med. risk env. weed	Scattered across zone

Table 6: Weed species present Zone 3

Threatening Processes

- Dense environmental weed infestation restricting the regeneration of native vegetation.
- Dense environmental weed infestation providing seed sources to disperse throughout the remainder of the site.

Mitigation Strategies

- Initial weed control shall remove all weeds in preparation for revegetation.
- Revegetation shall be undertaken to begin lowering light levels to aid in reducing the density of environmental weeds.
- Densely foliaged edge species compatible with the vegetation communities present shall be utilised to screen the edge.
- The site shall be subject to a weed control programme utilising regular waves of targeted weed control to eradicate all environmental weeds from the site.

Figure 9. Dense Crofton Weed in Zone 3

Management Zone 3

Outline

Resilience

The vegetation in this area is dominated by environmental weeds. Canopy species of the native communities are present however this zone is an edge along the north west of zone1 and zone 2 and as such has exposure to drying and high light levels. This zone appears to have undergone recent disturbance. The vegetation is lacking in resilience and high densities of weed infestation are present with woody weeds such as Senna and Lantana present amongst grasses such as Broad Leaved Paspalum, Setaria, Torpedo Grass and Guinea Grass with Japanese Sunflower and Crofton weed also present.

Restoration Techniques

The zone shall require all environmental weeds to be controlled with regular follow up undertaken to achieve eradication. This shall be achieved by qualified Professional Bushland Regenerators (PBRs) sweeping through the zone with the aim of treating all individuals of environmental weeds located within the zone.

Sensitive weed control undertaken at regular intervals shall allow for the development of site resilience by carefully treating environmental weeds without harming native vegetation.

Methods to be used shall involve manual removal, cut and paint technique, stem injection and foliar application of herbicide.

Follow up weed control shall be undertaken at regular intervals and aim at controlling environmental weeds at the seed ling stage. Undertaken over a 5 year period this follow up weed control shall allow for the eradication of all environmental weeds from the zone.

Restoration Goals

- Control and eventual eradication of all environmental weeds.
- Canopy establishment.
- Understorey and midstorey development.
- Restoration of site resilience.

This shall involve treatments as outlined in *Table 5*. Detailed bushland regeneration weed control techniques including relevant herbicides and application rates are given in *Appendix 7*.

Technique	**Species**	**Life Stage**	**Comments**	**Optimal Control Period**
Cut & Paint	Senna	Mature		Prior to flowering in April
	Cocos Palm	Juvenile		
	Camphor Laurel	Juvenile		
	Lantana	sapling		
Direct Inject	Cocos Palm	mature		
	Camphor Laurel	mature		
Manual Removal	Senna	seedlings		
	Lantana	Seedling/mature		
	Asparagus	mature	Remove where climbing on native seedlings	
	Paspalum	mature	Remove within 50cm from native grasses prior to spraying	Late Summer/ Autumn
Spraying	Paspalum	mature	Refer above	Late Summer/ Autumn
	Asparagus	mature		Before fruiting in Autumn

Table 5: Weed Control Requirements

Initial Works

Initial works required include weed control and revegetation works

Weed Control and Site Preparation

This shall involve the control of all Environmental and Noxious weeds in this zone as shown in *Table 4* and listed in *Appendix 6.*

Botanical Name	Common Name	Legal or Risk Status	Population Structure
Syagrus romanzoffiana	*Cocos Palm*	Med. Risk Env. weed	Lightly scattered across zone
Lantana camara	Lantana	Class 3 noxious	Lightly scattered across zone
Senna pendula	Senna	Med. Risk Env. weed	Lightly scattered across zone
Paspalum mandiocanum	Broad-leaf Paspalum	Med. Risk Env. weed	Lightly scattered across zone
Asparagus aethiopicus	Asparagus Fern	WoNS	Lightly scattered across zone
Cinnamomum camphora	Camphor Laurel	High risk env. weed	Lightly scattered across zone

Table 4: Weed species present Zone 2

Threatening Processes

- Shade tolerant environmental weeds such as Asparagus Fern, Cocos Palm and Broad Leaved Paspalum continuing to disperse throughout the zone and impeding the regeneration of native vegetation and thus restricting the development of site resilience.

Mitigation Strategies

- The site shall be subject to a weed control programme utilising regular waves of targeted weed control to eradicate all environmental weeds from the site.

Figure 8. Broad Leaved Paspalum in Zone 2

Management Zone 2

Outline

Resilience

The vegetation in this area is Tallowwood/ Blackbutt dry open forest. This vegetation is intact and relatively resilient with a dense canopy of native species however it is suffering from a degree of weed infestation with woody weeds such as Senna and Lantana present and grasses especially Broad Leaved Paspalum requiring control. Weed densities are generally low.

Restoration Techniques

The zone shall require all environmental weeds to be controlled with regular follow up undertaken to achieve eradication. This shall be achieved by qualified Professional Bushland Regenerators (PBRs) sweeping through the zone with the aim of treating all individuals of environmental weeds located within the zone.

Sensitive weed control undertaken at regular intervals shall allow for the retention of site resilience by carefully treating environmental weeds without harming native vegetation.

Methods to be used shall involve manual removal, cut and paint technique, stem injection and foliar application of herbicide.

Follow up weed control shall be undertaken at regular intervals and aim at controlling environmental weeds at the seed ling stage. Undertaken over a 5 year period this follow up weed control shall allow for the eradication of all environmental weeds from the zone.

Restoration Goals

- Control and eventual eradication of all environmental weeds.
- Increase in site resilience.

Botanical Name	Common Name	Legal or Risk Status	Population Structure
Syagrus romanzoffiana	*Cocos Palm*	Med. Risk Env. weed	Lightly scattered across zone
Lantana camara	Lantana	Class 3 noxious	Lightly scattered across zone
Senna pendula	Senna	Med. Risk Env. weed	Lightly scattered across zone
Paspalum mandiocanum	Broad-leaf Paspalum	Med. Risk Env. weed	Lightly scattered across zone
Asparagus aethiopicus	Asparagus Fern	WoNS	Lightly scattered across zone

Table2: Weed species present Zone 1

This shall involve treatments as outlined in *Table 3*. Detailed bushland regeneration weed control techniques including relevant herbicides and application rates are given in *Appendix 7*.

Technique	Species	Life Stage	Comments	Optimal Control Period
Cut & Paint	Senna	Mature		Prior to flowering in April
	Cocos Palm	Juvenile		
	Lantana	sapling		
Direct Inject	Cocos Palm	mature		
Manual Removal	Senna	seedlings		
	Lantana	Seedling/mature		
	Asparagus	mature	Remove where climbing on native seedlings	
	Paspalum	mature	Remove within 50cm from native grasses prior to spraying	Late Summer/ Autumn
Spraying	Paspalum	mature	Refer above	Late Summer/ Autumn
	Asparagus	mature		Before fruiting in Autumn

Table 3: Weed Control Requirements

Mitigation Strategies

- The site shall be subject to a weed control programme utilising regular waves of targeted weed control to eradicate all environmental weeds from the site.

Figure 7. Resilience Swamp Sclerophyll vegetation in Zone 1, showing Cocos Palm in foreground.

Initial Works

Initial works required include weed control and revegetation works

Weed Control and Site Preparation

This shall involve the control of all Environmental and Noxious weeds in this zone as shown in *Table 2* and listed in *Appendix 6*.

Management Zone 1

Outline

Resilience

The vegetation in this area is dominated by Swamp Mahogany forested wetland. This vegetation is intact and resilient with a dense canopy of native species however it is a narrow strip exposed on three sides and shall remain under pressure from weed invasion especially in the vicinity of the edges. Environmental weeds present are diverse and well distributed throughout the zone however their densities are generally low.

Restoration Techniques

The zone shall require all environmental weeds to be controlled with regular follow up undertaken to achieve eradication. This shall be achieved by qualified Professional Bushland Regenerators (PBRs) sweeping through the zone with the aim of treating all individuals of environmental weeds located within the zone.

Sensitive weed control undertaken at regular intervals shall allow for the retention of site resilience by carefully treating environmental weeds without harming native vegetation.

Methods to be used shall involve manual removal, cut and paint technique, stem injection and foliar application of herbicide.

Follow up weed control shall be undertaken at regular intervals and aim at controlling environmental weeds at the seed ling stage. Undertaken over a 5 year period this follow up weed control shall allow for the eradication of all environmental weeds from the zone.

Restoration Goals

- Control and eventual eradication of all environmental weeds.
- Increase in site resilience.

Threatening Processes

- Shade tolerant environmental weeds such as Asparagus Fern, Cocos Palm and Broad Leaved Paspalum continuing to disperse throughout the zone and impeding the regeneration of native vegetation and thus restricting the development of site resilience.

Vegetation Management Strategy

Vegetation Management Zones

The site has been divided into 4 "Vegetation Management Zones" that are displayed on the Site Map in Appendix 1.

Zone 1: is located in the north east corner of the site. It is occupied by the swamp sclerophyll vegetation and is zoned 7A. Dominant canopy species are Swamp Mahogany; midstorey/understorey is dominated by Willow Bottlebrush and Saw Sedge with occasional environmental weeds.

Zone 2: is located in the south-western corner of the subject site. Dominant canopy species are Tallowwood and Blackbutt. Midstorey/understorey contains rainforest tree species interspersed with low densities of environmental weeds including Cocos Palm and Broad Leaved Paspalum.

Zone 3: is located along the northern and western edges of zone 1 and zone 2. This zone is a thin strip of dense environmental weeds containing Lantana, Senna, Guinea Grass, Paspalum sp., Crofton Weed and Japanese Sunflower among others.

Zone 4: is located in a band that stretches down into the centre of zone 2 and is occupied by dense Broad Leaved Paspalum. Dominant canopy species are Tallowwood and Blackbutt.

Promote natural regeneration

Initial weed control work will target ground, mid-storey and canopy weed species. The weed control program addresses the required treatments for the suppression of the targeted weed species and will result in promoting natural regeneration to occur with the aim of establishing a more self-sustaining environment.

Monitoring

Monitoring will be undertaken in conjunction with the Follow-up Works Programme, and will comprise the following:

- Check for survival rates.
- Check soil moisture and undertaken watering if required.
- Check for encroaching weeds and native vines to ensure seedling growth is not adversely affected. Vine species shall be cut back to a reasonable distance.

Follow up works shall involve continued weed control targeting the main weed species and any opportunistic weeds.

This shall involve the periodic manual removal and spot spraying of weeds (before seed set). Follow up work shall involve regular weed control and this shall take place every 8 weeks for 2 years and thereafter every 4 months for the following 3 years.

Newly emerging weeds may be species that are not currently occurring on this site. Weed species that are present in the local area and therefore may germinate on the site in the future and shall require control are outlined in *Appendix 7*.

Natural Regeneration

- Natural regeneration shall be assisted by not targeting, within the scope of the weed control programme, specific exotic species that assist natural regeneration (e.g. Tobacco Bush and annuals such as Farmers Friends and Ragweed)

Koala Habitat

The CHCC Koala Plan of Management (KPoM) has identified most of the subject site as Primary Habitat, and therefore any operations under development must comply with the KPoM directions of habitat restoration.

Commercial Availability of Local Provenance

The commercial availability of some species is an issue as there is a limited diversity of species available (unless of course specifically propagated for a particular project).

This is especially relevant for Eucalypt species that, unlike rainforest species, cannot be held in nurseries for extended periods of time prior to planting. Many groundcover species are not commercially available.
Possible solutions to lack of commercial availability of required species include:

- Project planning to be undertaken over a longer period of time to allow for the collection of local provenance seed and its propagation. This would require landholders/ land managers/developers being made aware of this requirement.
- Purchase of non provenance sources.
- Reduce the diversity of species planted initially and enrich over time(with associated follow up works) as species propagated from locally sourced seed become available.

It may take up to 10 years before the native vegetation is stable enough to out compete weed species/ and or the weed seed bank has been exhausted.

Replacement of any revegetation plantings that did not survive is required in this phase and also may involve planting of supplementary groundcover species.

Weed Control

Overview

The weed control works that are presented in this VMP have been designed to address a range of requirements and issues that exist across the subject site. All works shall be carried out following the guidelines and techniques as recommended by the Australian Association of Bushland Regenerators (AABR).

Due to the abundance of native vegetation of medium and high ecological value and the possible presence of undetected threatened species (*Senna acclinis, Marsdenia longiloba, Neimeyera whitei*) environmentally sensitive weed control techniques are required.

Machinery and Powerspray units shall **not be used** for the control of weeds at this site.

All weed species present are listed in *Appendix 6.* Profiles of the weed species and control techniques are included in *Appendix 7.*

Initial Works Programme

The initial weed control programme shall target all weeds outlined for each of the Management zone categories.

During the initial phases of the weed control works, Tobacco Bush (*Solanum mauritianum*) shall be considered as a pioneer species and left untreated to assist with natural regeneration. Wild Tobacco shall be treated as a native pioneer species until the native vegetation is established and providing an intact canopy cover, at which time it may then be controlled.

Follow-up Works Programme

Follow up weed control works shall include the continued suppression and removal of identified weed species for each zone. Any opportunistic weed species not already identified shall be incorporated into the follow up weed control works for treatment.

Restoration Methodology

Outline

The aim of Bushland Regeneration work is to restore native vegetation, degraded by weed infestations, to a healthy intact and diverse ecosystem or to re-establish an area devoid of native vegetation.

To achieve this, two approaches may be taken:

- **Natural Regeneration:** - weed control is carried out but no planting of native species takes place relying on the inputs of seed from surrounding bushland (brought in by birds or other fauna, wind and water). It requires some form of native canopy to be present on the site. It also requires that there be a healthy area of bushland in close proximity or adjacent to the site.

- **Revegetation:** - planting of native species on site approximately 2- 3 metres apart. This is most applicable to areas that have severe weed infestations or that are devoid of native vegetation (eg grass paddocks)

A restoration works programme has two distinct phases that comprises a weed control component and, if applicable to the site, revegetation.

- **Primary treatment**: - Initial treatment of area.

  Weed control is undertaken to assist natural regeneration or in conjunction with revegetation. Weed control may involve control of all weed species present within the site or may be a staged process where a percentage is retained within the initial phase and controlled in subsequent secondary stages (e.g. canopy weed species). Low priority weed species may not require any control until the secondary phase(s). Revegetation in the initial works phase will generally focus on the planting of canopy and midstorey species with understory species generally planted after canopy establishment.

- **Secondary treatment**- Follow up work- consolidation of initial works.

  The aim is for this work to be timed as to prevent germinating weeds from reaching seeding stage as well as reducing the competition for natural regeneration or revegetation that has taken place following the initial works. To be most effective Follow-up work must be undertaken on a regular basis.

  Also may involve the completion of staged weed removal that was initiated in the primary control phase or control of low priority weed species.

It is recommended that any persons undertaking weed control activities in the Eucalypt Open Forest of the study area be informed of the presence of potential habitat for the threatened species *Marsdenia longiloba, Niemeyera whitei, Senna acclinis* and *Typhonium sp aff brownii* and be able to demonstrate an ability to recognise these species in the field.

Conservation Status

- Contains two EEC's 'Swamp Sclerophyll' and 'Subtropical Coastal Floodplain'.
- Mapped as Sub-regional Corridor and Key Habitat in the CHCC LGA as identified by: 'Scotts, D. (2003) Key habitats and corridors for forest fauna'.
- Protected by SEPP 14 Coastal Wetlands.
- Protected by SEPP 44 Koala Habitat.
- Primary Koala habitat (CHCC KPoM 2000).

Sapotaceae	Rusty Plum, Plum Boxwood	Niemeyera whitei	V,P	
Simaroubaceae	Moonee Quassia	Quassia sp. Mooney Creek	E1,P	E
Winteraceae	Fragrant Pepperbush	Tasmannia glaucifolia	V,P	V

Table 1: Threatened species within 5 km radius according to the NSW NPWS Wildlife Atlas.

During site vegetation surveys:

No *Schedule 1* plant species under the *Threatened Species Conservation Act 1995(NSW)* were encountered.

No plant species from *Schedule 2* under the *Threatened Species Conservation Act 1995(NSW) were* encountered.

No threatened flora species from Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) were encountered.

No Rare plant species from the ROTAP (Rare or Threatened Australian Plants) list were encountered.

Although no Rare or Threatened Australian Plant (ROTAP) was located the following species may be present:

- *Senna acclinis* (Native Cassia)
- *Marsdenia longiloba*
- *Tylophora woollsii*
- *Niemeyera whitei* (Rusty Plum)

Senna acclinis could be confused with the exotic *Senna pendula.*

The same confusion could occur between *Marsdenia longiloba* and the exotic weed Moth Vine *Araujia hortorum*. The later having a milky sap and the former a clear sap, although there are other native Marsdenia sp. that are not ROTAP yet have a milky sap as the exotic Moth Vine.

	Hairy Jointgrass	Arthraxon hispidus	V,P	V
Polygonaceae	Tall Knotweed	Persicaria elatior	V,P	V
Proteaceae	Nightcap Oak	^Eidothea hardeniana	E1,P,2	CE
	Big Nellie Hakea	^^Hakea archaeoides	V,P,3	V
	Red Boppel Nut	Hicksbeachia pinnatifolia	V,P	V
	Rough-shelled Bush Nut	Macadamia tetraphylla	V,P	V
Rhamnaceae	Scant Pomaderris	Pomaderris queenslandica	E1,P	
Rubiaceae	Trailing Woodruff	Asperula asthenes	V,P	V
Rutaceae	Scented Acronychia	Acronychia littoralis	E1,P	E
	Orara Boronia	Boronia umbellata	V,P	V
	Headland Zieria	Zieria prostrata	E1,P	E
	Low growing form of Z. smithii, Diggers Head	Zieria smithii	E2	
Santalaceae	Austral Toadflax	Thesium australe	V,P	V
Sapindaceae	Small-leaved Tamarind	Diploglottis campbellii	E1,P	E

Menispermaceae	Tinospora Vine	Tinospora smilacina	E1,P	
Myrtaceae		Kardomia silvestris	E1,P	
	Peach Myrtle	Uromyrtus australis	E1,P	E
Orchidaceae	Spider orchid	^Dendrobium melaleucaphilum	E1,P,2	
	Rough Doubletail	^Diuris praecox	V,P,2	V
	Veined Doubletail	^Diuris venosa	V,P,2	V
	Yellow-flowered King of the Fairies	^Oberonia complanata	E1,P,2	
	Red-flowered King of the Fairies	^Oberonia titania	V,P,2	
	Brown Fairy-chain Orchid	^Peristeranthus hillii	V,P,2	
	Southern Swamp Orchid	^Phaius australis	E1,P,2	E
	Lady Tankerville's Swamp Orchid	^Phaius tancarvilleae	E1,P,2	E
	Ravine Orchid	^Sarcochilus fitzgeraldii	V,P,2	V
Poaceae	Floyd's Grass	Alexfloydia repens	E1,P	

	Casuarina	defungens		
Corynocarpaceae	Glenugie Karaka	Corynocarpus rupestris subsp. rupestris	V,P	V
Cyperaceae	Square-stemmed Spike-rush	Eleocharis tetraquetra	E1,P	
Ebenaceae	Red-fruited Ebony	Diospyros mabacea	E1,P	E
Euphorbiaceae	Sand Spurge	Chamaesyce psammogeton	E1,P	
Fabaceae (Caesalpinioideae)	Rainforest Cassia	Senna acclinis	E1,P	
Fabaceae (Faboideae)	Coast Headland Pea	Pultenaea maritima	V,P	
	Silverbush	Sophora tomentosa	E1,P	
Fabaceae (Mimosoideae)	Newry Golden Wattle	Acacia chrysotricha	E1,P	
Haloragaceae	Tall Velvet Sea-berry	Haloragis exalata subsp. velutina	V,P	V
Lauraceae	Crystal Creek Walnut	Endiandra floydii	E1,P	E
	Rusty Rose Walnut	Endiandra hayesii	V,P	V
Lindsaeaceae	Slender Screw Fern	^^Lindsaea incisa	E1,P,3	

***Anredera cordifolia* Madeira Vine** Climber with soft fleshy leaves, aerial tubers forms on stems, flowers small greenish/ white and fragrant. Spreads when tubers drop to ground and regrow. Forms very thick infestations, often smothering trees, particularly in rainforest.
Control: Small plants spray with Metsulfuron-methyl and surfactant. Large plants need to be carefully scrape and painted with Metsulfuron-methyl (1g to 1 litre) or Glyphosate. Care needs to be taken as severing the stems will result in the drop of all aerial tubers. Large plants can also be treated by scraping and painting at ground level and then inserting the scraped portion of the stem into a small container of Metsulfuron-methyl (1g to 1 litre) and leave for several days.

***Araujia hortorum* Moth Vine** Climber with twining stems, 5-10m in height. Large grayish green leaves. White milky sap. White flower. Produces choko like fruit encasing feathery (airborne) seeds. Seed longevity high. Smothers native vegetation. Can be confused with the native moth vine (Marsdenia sp.) one of which is on the threatened species list.
Control: Hand remove ensuring all roots removed. Cut /scrape and paint with glyphosate. Bag and remove any fruit.

***Ardisia crenata* Ardisia** Small shrub. Lanceolate oblong dark glossy green leaves with slightly wavy margins, White sweet scented flowers followed by bright red berries. Can grow in full shade.
Control Can be difficult to remove manually due to long taproot. Cut and paint with glyphosate.

***Asparagus aethiopicus* Ground Asparagus** dense ground smothering spiny herb, preventing or discouraging regeneration. Can reach size of up to 2 metres wide Grows in dense shade but prefers areas of higher light. Prefers sandy soils of littoral rainforest. Short thick rhizome and forms mat of tuberous roots- can regrow from rhizome but not from tuberous roots. Produces long-lived bird attractive seed

Control Methods Hand pull small seedlings; manually remove larger plants by removing rhizome from plant no need to remove tuberous roots. Spray with Metsulfuron-methyl.

***Asparagus plumosus* Climbing Asparagus** climber with wiry stems, forms dense layer, which smother plants and inhibit regeneration. Produces bird attractive fruit and has woody rhizome that regrows.

Control Methods small infestation handpull seedlings, larger plants manually remove all rhizomes. Larger infestations cut and paint or cut and allow to reshoot before spaying regrowth. Spray with Metsulfuron-methyl.

***Baccharis halimifolia* Groundsel Bush** Shrub or small tree. Wind dispersed seeds over short distance. **Class 3 noxious weed**
Control Methods: small plants manual removal larger specimens cut and paint with glyphosate. Spray with Grazon at manufacturers recommended rate.

***Bidens pilosa* Farmers Friends** slender tall annual (or short lived perennial) herb of disturbed areas. Produces large amounts of seed with high longevity. Only germinates on bare soil mulch or plant out to reduce.
Control Methods: Manual removal or spray with glyphosate.

***Bromelia* sp.** Evergreen garden plant. Stem short and tubular. Leaves pale green arching form.
Control Methods Hand Remove.

***Canna indica* Canna Lily** Perennial erect herb with a rhizome. Large light green sheathing leaves. Red flower followed by viable black capsule.
Control Manually remove all of rhizome (difficult). Spray with Metsulfuron-methyl.

***Cardiospernum grandiflorum* Balloon Vine**

A climber with tendrils and stems up to 10m long. Leaves are bright green with 'biternate' arrangement with 3 sets of 3 leaves on each leaf stem. The stems and leaves are covered with soft hairs with the stem often having reddish ribs. Small, white flowers are present summer to autumn. The fruit/seed is a green, papery, inflated capsule, and is produced any time of year. Can grow vegetatively from stem fragments. Vigorous climber that can smother and kill native trees.
Control Methods: Seedlings can be manually removed.
For more mature plants cut, scrape and paint with herbicide (glyphosate). Alternatively cut stems allow to reshoot and then spray the regrowth with glyphosate.

***Celtis sinensis* Chinese Celtis** Deciduous tree to 15 metres. Green serrated leaves. Small reddish brown fruit. Serious environmental weed declared **Class 3 noxious weed** .

Control: Large specimens direct inject with glyphosate. Saplings cut and paint with glyphosate. Small plants hand remove.

***Cestrum parqui* Green Cestrum** Woody shrub up to 3 metres tall. Deep green glossy leaves. Flower greenish to yellow. Fruit a black berry. Class 3 noxious weed

Control methods: Hand weed small plants. Cut and paint larger specimens with glyphosate.

***Cinnamomum camphora* Camphor Laurel** large trees of spreading habit can grow up to 25-30 metres. Abundant seed production dispersed mainly by birds. Can also form dense stands by suckering
Control Methods Direct injection/ cut and paint with glyphosate.

***Chloris gayana* Rhodes Grass** erect tufted stoloniferous grass to 1.2 m high, perennial
Control Methods crown tuft with knife or mattock. Remove stolon, glyphosate in late spring early summer.

***Coffea arabica* Coffee Plant** Large shiny green leaves with wavy margins forms red berries (from which Coffee is produced). Seedlings germinate prolifically.
Control Manually remove or cut and paint with glyphosate.

***Colocasia esculenta* cv. Fontanesii Ornamental Taro:**Robust herb to 1m , large purple leaves (60 cm long 30 cm wide). Large underground tubers. Likes wet open sites. Can colonize sites densely and rapidly.
Control: manual removal (must remove all underground tubers). Can control with herbicide by spraying or injecting with Glyphosate & Metasulfuron-methyl mix ('Cut out'), but this is problematic as species usually inhabits areas that are waterways or wetlands.

***Conyza albida* Fleabane** Single stem, erect annual herb up to 1.5m high. On disturbed sites. Control methods Manual removal or spray with glyphosate.

***Cortaderia selloana* Pampas Grass**Large tussock grass to 2 metres width to 1 metre. Leaves to 2 metres in length and to 3.5cm wide, blue green above darker green below. Flower stem to 6 metres, large silvery white panicle to 80cm. Dense infestations can invade and replace native communities and also provide heavy fuel load for fires.
Control methods: Spray with glyphosate (75:1) with surfactant added. Alternatively to reduce risk of fire, brushcut then manually remove rhizome or spray regrowth

***Delairea odorata* Cape Ivy** vigorous, twining perennial herb with succulent stems many metres long. Forms dense mats smothering low vegetation. Spreads vegetatively, does not set seed in northern NSW.
Control Methods Manual removal or spray with Metasulfuron-methyl.

***Desmodium uncinatum* Velcro Weed**
Herb/scrambler that forms dense smothering mass. Trifoliate leaves. Leaves hairy upper surface with a silver stripe. Stem is densely hairy with hooked hairs. Flowers pink to mauve or white. Seeds contained in pods covered with hooked hairs.

Control Methods Hand remove minor infestations (including root system) bag and remove from site if seeding. Major infestations spray with Metasulfuron-methyl *(Brush-off)*.

***Eriobotrya japonica* Loquat** Evergreen tree with dark glossy green foliage, hairy underneath. Fragrant yellow/white flowers borne on stiff woolly panicles. Yellow fruit.
Control Manually remove small seedlings. Mature specimens cut and paint or direct inject with glyphosate.

***Erythrina crista-galli* Cockscomb Coral Tree** Deciduous tree up to 6 metres in height. Prickles on trunks and branches. Flowers scarlet tube shaped held in clusters. Problem weed in north of NSW and Queensland.
Control Methods direct injection with glyphosate. Cut and paint saplings with Glyphosate. Spray seedlings with Glyphosate and surfactant.

***Erythrina x sykesii* Coral Tree** Deciduous tree, hybrid up to 15 metres in height. Easily re grows from sections of stem/ branches, suckers from large sections of roots.
Control Methods direct injection with glyphosate.

***Eucalyptus torelliana* Cadaghi** A native of North Queensland that has been planted for horticultural / plantation purposes in NSW where it has become an invasive species.
Control Methods: Large specimens direct inject (or remove totally in areas where falling branches may create a public safety issue). Seedlings may be sprayed with glyphosate or hand weeded.

***Gleditsia triacanthos* Honey Locust**
Deciduous tree to 10 metres. Flowers in spring producing golden yellow flowers. Stout spines present on branches and trunk. Compound bipinnate leaves. Seed pods 15-40 cm long enclosing large dark brown seeds. Grows readily from seed/ cuttings and suckers freely forming dense thickets. **Class 3 noxious weed**
Control Methods: Direct inject with undiluted glyphosate/ cut and paint smaller specimens.

***Gomphocarpus fruitcosus* Cotton Bush** erect perennial shrub with narrow dull green leaves. Exudes milky sap when damaged. Large green ovoid fruit covered in long silky hairs.
Control Manually remove. Cut and paint/ spray with glyphosate.

***Hedychium gardnerianum* Kahili Ginger** perennial herb to 2.5 metres high. Prefers damp areas on good soil. Large yellow orange flower with red filaments. Produces seed attractive to birds. Thick fleshy rhizome near soil surface.

***Hypoestes phyllostachya* Freckle Face/Polka Dot Plant** herbaceous garden/indoor plant that rapidly infests areas. Long thin dark green leaves with pink spots.
Control Methods Difficult to completely manually remove. Spray with Metasulfuron-methyl

***Inga paterna* Ice-Cream Bean** Evergreen tree to a height of 17 metres. Leaves compound and pinnate with 6-8 leaflets 15cm long with woolly undersurface. Flowers are white & pea shaped. The fruit are pods 15 cm long.
Control Methods: Hand remove small seedlings; cut and paint saplings; direct inject /frill larger specimens.

***Ipomoea cairica* Mile a Minute** Vigorous, perennial with trailing and twining stems. Palmate shaped leaf with pink- purple flowers. Produces seed spread by wind/ gravity, also spreads vegetatively
Control Methods Manual removal by gently pulling up runners, cut and paint larger stems. Spray with glyphosate during period of rapid growth.

***Ipomea indica* Morning Glory** A vigorous vine which can smother trees and whose stolons can penetrate and establish metres into native vegetation. It is widely naturalized in coastal districts of N.S.W.
Control Methods Manual removal by gently pulling up runners, scrape and paint larger stems. Spray with Glyphosate during period of rapid growth.

Koelreuteria paniculata **Golden Rain Tree** Deciduous tree with long pinnate leaves and large terminal panicles of yellow flowers.
Control Methods Cut and paint or direct inject with glyphosate.

Lantana camara **Pink/ Red Lantana** Perennial, scrambling thicket forming shrub to 3m high. Stems multi branched sprawling to 5m long with prickles. Can be vine like and climb trees. Grows best in fertile moist disturbed sites. Black fruit spread by birds. Red flowering form **Class 3 noxious weed** .
Control methods Manual removal of taproot, mechanical removal with follow up. Stems lying on ground may re shoot. Cut and paint base with glyphosate. Spray with glyphosate (Red form needs penetrant added)

Ligustrum lucidum **Large leaf Privet** can grow to large tree. Likes fertile moist sites. Can dominate rainforest and wet sclerophyll forest. Produces masses small berries spread by birds or water. Germinate in even shady conditions. Coppices from base. **Class 4 noxious weed**
Control methods small seedlings manually remove or spray with Metasulfuron-methyl. Cut and paint mature specimens with glyphosate. Direct inject mature specimens with glyphosate.

Ligustrum sinense **Small Leaf Privet** Large shrub small tree to 4m high. Moist fertile sites. Can slowly establish on undisturbed sites in shady conditions. Small berry with short viability spread by birds and water. Coppices from base and suckers from roots **Class 4 noxious weed**
Control methods small seedlings manually remove or spray with Metsulfuron-methyl. Cut and paint mature specimens with glyphosate. Direct inject mature specimens with glyphosate.

Lonicera japonica **Japanese Honeysuckle** Woody twining climber or small shrub with a dense smothering habit. Leaves dark green above lighter below. Flowers tubular 30mm long, white tuning yellow, sweetly fragrant. Fruit is a small black shiny berry, spread by birds. Can regrow from stem nodes.
Control methods Manual removal with care to remove all root forming nodes. Cut and paint or scrape and paint with glyphosate. Spray with herbicide (Metasulfuron-methyl) where no desirable vegetation may be damaged (or cut back then spray regrowth). Follow up needed for all techniques.

***Macfadyena unguis-cati* Cats Claw Creeper** Large woody vine to 30m+, distinguished by three tiny hooked claws on the end of tendrils. Leaves dark green with new foliage being red. From spring to summer, bright yellow flowers with orange lines are present. Produces seed capsule 15-45cm long containing winged seeds that are wind and water dispersed. Can germinate and grow in shade so can easily invade undisturbed bushland. Forms underground tubers. Grows rapidly and totally smother and kill mature trees.
Control Methods: Spray seedlings with glyphosate (100:1). Cut stems and apply glyphosate (undiluted), or pull young stems from tree and spray with glyphosate (100:1)can also drill an inject large stems with glyphosate (undiluted).

***Macroptilium atropurpureum* Siratro** Twining herb with stems 2-3 metres long. Dark purple pea like flower with long slender pods.
Control Methods Care must be taken when removing by hand due to large root system. Seed pod collection and disposal is important to ensure eradication. Scrape and paint with glyphosate is effective.

***Monstera deliciosa* Fruit Salad Plant** Evergreen vine to a height of 5 metres. Glossy large green perforated leaves with deeply incised margins. Flowers are greenish similar to that of an Arum Lily. Fruit are edible cob like spikes.
Control methods: Hand remove

***Nephrolepis cordifolia* Fishbone Fern** endemic to the far north coast of NSW and Queensland but has become an invasive species that develops dense infestations excluding endemic native vegetation. Erect fronds covered with brown spores on the back. Rhizomes are connected by wiry stolons.
Control Methods Manually remove by digging up entire plant including rhizomes and bag and remove from site (dispose of responsibly -garden waste dumping of this weed in bushland is a serious problem). Large infestations may be sprayed with Metasulfuron methyl.

***Ochna serrulata* Mickey Mouse Plant** Shrub 2-3 metres high. Dark green-toothed oblong leaves, new foliage bronze coloured. Conspicuous fruit with bright red sepals holding 5 glossy green fruit that ripens to black. Well-developed taproot, which can reshoot from considerable depth, makes control difficult.
Control Methods Hand remove small specimens (only when soil is moist to prevent root snapping. Scrape and Paint (glyphosate) is generally more effective than cut and paint. Better results achieved by painting bottom third of plant around entire circumference of stem with Starane mixed with diesel @ 5ml Starane to 100ml diesel. Small seedlings can be sprayed with Starane @ 65ml to 10L water.

***Paspalum urvillei* Giant Paspalum** tufted perennial grass, large up to 2.5m high. Distinguished by its long (up to 12cm) and more numerous racemes (12-20)
Control methods Manual removal for minor infestations/ major infestations spray with glyphosate.

***Paspalum mandiocanum* Broad Leaf Paspalum** tufted perennial, which can grow in moderately shady conditions. Can form extensive dense infestations inhibiting or preventing regeneration.
Control methods manual removal (remove crown and adventitious roots) for minor infestations or those surrounding young native specimens. For major infestations spray with glyphosate and follow up with mulching and planting's.

***Passiflora edulis* Edible Passionfruit** A climber with auxillary tendrils glossy green leaves trifoliate shape. Produces edable back/ purple/yellow fruit.
Control methods large specimens manually remove or cut and paint with glyphosate.

***Passiflora subpeltata* White Passionflower** A climber with axillary tendrils. Smothers plants and trees in forest edges and gaps, as well as disturbed sites. Grey/green leaves with waxy coating. Fruit spread by birds and animals. Reshoots from any root part left in ground.
Control methods large specimens manually remove or cut and paint with glyphosate. Spray with penetrant when young or cut and spray when reshoots

***Pennisetum clandestinum* Kikuyu** Rhizomatous and stoloniferous aggressive, creeping coarse perennial grass often mat-forming. Inhibits seedling growth and prevents regeneration.
Control methods Spray with weak rate glyphosate.

***Pennisetum purpureum* Barner Grass** A robust stoloniferous, perennial grass forming large bamboo like clumps to 7m high.

***Phoenix canariensis* Date Palm** characterized by numerous bright yellow spines that arm the short frond stalk.
Control Methods Cut and paint with glyphosate when small. Direct inject larger specimens

***Pinus* sp. (*P. radiata, P. elliottii*) Pine Tree** Evergreen with alternate needle like spreading leaves. Forms cones.
Control Methods Cut tree down or ringbark as cannot regrow from stump.

***Psidium cattleianum* Cherry Guava** Shrub or tree to 6 metres. Purplish red fruit. Has the ability n invade undisturbed native vegetation.
Control: Hand remove small seedlings. Cut and paint larger specimens with glyphosate (cutting close to the ground as possible).

***Rhaphiolepis indica* Indian Hawthorn**
Shrub 1 to 1.5 high. Dark green leathery leaves, slightly toothed. Small white flowers with red centers. Small bluish fruit.
Control Methods: Hand pull small seedlings. Cut and paint larger specimens with undiluted glyphosate.

***Rivina humilis* Coral Berry**
small shrub to 1 metre high. Dark green leaves. Produces small red globular berries
Control Manually remove or cut and paint with glyphosate (remove and bag any berries present). Spray with glyphosate.

***Rubus fruticosus* Blackberry**

A perennial scrambling shrub to 3m high. Class 3 noxious weed Hook-spined canes grow to 6m long. New plants form when they meet the ground. Fruit a segmented red berry ripening to black. The many fruits are eaten and spread by birds and foxes. May be confused with native Rubus species which are distinguished by lighter green leaves and finer thorns.

Control Methods: Spray with Metsulfuron-methyl at the manufacturer's recommended rate.

***Schefflera actinophylla* Umbrella Tree** Native of North Queensland, tree to 10m high often multi stemmed and sometimes epiphytic. Red fruit dispersed by birds. Adventitious roots form readily from stem segments left in contact with ground. Control methods Cut and paint or direct inject with glyphosate.

Schinus terebinthifolia Broad-leaf Pepper Tree

Tree to 16m in height with dense spreading crown. Dark glossy green leaves with prominent cream venation. Produces masses of red/pinkish berries in winter/spring. Leaves have a peppery smell when crushed. Has been known to cause allergic reactions in some people care needs to be taking when removing trees as to avoid inhaling toxins that may be released when cutting or wood chipping trunk and branches. Significant environmental weed with a serious large infestation at Sapphire. Class 3 noxious weed

Control Methods: Manually remove small seedlings, cut and paint saplings with glyphosate, larger trees direct inject with glyphosate.

***Senecio madagascariensis* (Fireweed)** Spreading herb up to 50cm high with bright yellow daisy like flowers present spring to autumn. Produces numerous white fluffy seeds. Commonly mistaken for a native fireweed Senecio lautus, which is found more commonly on dunes. Identiofication between the two involves counting the involucral bracts. Generally S. madagaascariensis has 20-21 bracts and S. lautua has 15-18 bracts.

Control Methods: Manually remove taking care not to place on ground as will re root(bag and remove from site). Spray with Bromoxynil 1.4-2.8L in 110-220L of water per hectare. Spray young, actively growing plants during autumn/winter.

Use low rate before flower budding, higher rate for early flowering. Will not be effective on mature plants in full flower.

***Senna pendula* var. *glabrata* (Eastern Cassia/Senna)** Large shrub to 3m. Can regrow from larger sections of taproot and main laterals. Seeds dispersed by birds, water, and gravity, germinate prolifically.
Control methods Cut and paint with glyphosate, direct inject larger specimens, spray large infestations of seedlings with glyphosate 9 hand remove small infestations)

***Sida rhombifolia* Paddy's Lucerne** Perennial erect herb to 1m. Grows in sunny or disturbed areas and on compacted soils. Strong deep taproot.
Control methods difficult to remove by hand especially in heavy soils. Cut and paint or spray with glyphosate.

Setaria palmifolia Palm Grass Tufted perennial grass to 1.5 metres high. Leaves 'pleated'. Flower a creamy white/yellow silky panicle to 80 cm long. Forms dense infestations especially near water courses.
Control: Small infestations dig out plant with mattock. Larger infestations spray with glyphosate. Care must be taken not to pollute watercourses

***Solanum mauritianum* Tobacco Bush** Perennial shrub or small tree to 4m, densely tomentose especially under surface, Produces fruits which are eaten by many native fauna. High seed longevity requires light for germination. In many cases can be left as part of a rainforest regeneration process as; provides shade which represses many annual weeds but allows growth of third stage pioneer species and attracts birds and bats which bring in native seeds from other areas.
Control Methods if removal is necessary cut and paint with glyphosate.

***Solanum seaforthianum* Brazillian Nightshade** Sprawling vigorous climber with light green divided leaflets. Flowers violet in colour with typical form of those in the Solanum family (e.g. similar to tomato/ potato flower). Produces masses of bright red berries that hang in bunches. Berries are bird attractive and this plant is therefore spread easily. Aggressively smothers native vegetation.
Control Methods: Hand remove or for larger vines scrape and paint with glyphosate.

***Sphagneticola trilobata* Singapore Daisy** A perennial creeper found on the edges of rainforests and coastal dunes. It has coarse bright green leaves. Flowers are yellow and daisy like. This weed re-shoots very easily and when well established can smoother other plants.
Control Method: Hand-pull small plants. Be sure to remove all parts of this plant from the site as they will re-shoot. Spray with metasulfuron-methyl.

Sporobolus fertilis **Giant Parramatta Grass** tufted perennial growing on poor or compacted soils and disturbed sites. Seed adheres to animals, vehicles, and water. Class 3 noxious weed
Control Methods small infestations hand remove or spot spray with glyphosate.

Syagrus romanzoffiana **Cocos Palm** Large Palm with drooping feathery type fronds. Produces masses of orange coloured fruit that hang in large panicles. Very attractive to fruit Bats which aid in the spread of the seed. Germinates readily.
Control Methods Larger specimens can be felled with no need to apply herbicide, as they will not regrow, direct injection with herbicide for specimens that are to be left in situ. Smaller specimens and seedlings need to be either cut and painted or manually removed (including the root system) as spraying herbicide is not effective.

Syngonium* sp. **Prayer Plant/ Arrowhead Vine Vigorous climber to 3 metres. Glossy spear shaped leaves dark to light green in colour (dependant on light levels where it grows). Can also have variegated leaves with a creamy colour towards the centre with light green edges. Forms roots at nodes. Can produce seedpods encasing bright red seeds when well established up a tree etc (not known if these are viable). Difficult to control due to its resistance to most herbicide sprays.
Control Methods: Spray with glyphosate at a rate of 50:1 with LI 700

***Tagetes minuta* Stinking Roger** Very erect annual herb, strongly aromatic, which grows on disturbed sites. Flowers February –April.
Control methods Small infestations hand remove, larger ones spray with glyphosate.

***Tecoma stans* Yellow bells** A shrub or small tree, often to 4m in height. Widely grown for its bright yellow trumpet-like flowers. Flowers between spring and summer producing yellow flowers with reddish lines at the base. Large pods contain many seeds that are easily spread by wind Class 3 noxious weed

Control Method: Hand-pull or foliar spray seedlings with herbicide. Cut and paint saplings. Frill or stem inject herbicide into sapwood of mature trees.

***Tithonia diversifolia* Japanese Sunflower** tall perennial herb 2-5 metres tall, large toothed leaves. Flowers April- June. Wind dispersed seeds long seed longevity. Control Methods manually remove smaller plants. Cut and paint larger specimens (low to ground to avoid plant re shooting) or preferably drill and apply herbicide. Care must be taken as stems placed directly on the ground will commonly grow roots from nodes.

Tradescantia flumensis **Tradescantia (Wandering Jew)**
Perennial creeping succulent herb rooting well from well-defined nodes. Invasive weed grows vigorously, smothering low growing shrubs herbs and seedlings of native species, inhibits regeneration. Likes moist fertile sites can grow in dense shade or full sun. Spreads vegetatively.
Control methods manually rake and roll with repeated maintenance. Spray with glyphosate-repeated follow up required.

Triadica sebifera **(Chinese Tallow)**
A deciduous tree growing to a height of 12 metres. Flowers are yellowish and occur in elongated clusters. The fruit is a splitting capsule that exposes large, white seeds.
Control Methods: Hand-pull or foliar spray seedlings with herbicide. Cut and paint saplings (glyphosate). Direct inject mature trees (glyphosate).Class 3 noxious weed

***Verbena* sp. Purple Top** Tall, erect, perennial herb of sunny disturbed areas. Purple flower and square stem.
Control methods Weed manually infestations (rarely dense).

Weed Control Techniques

1) **Cut and paint**: This method applies to all woody shrubs, trees and some vines.
   i. cutting stem of plant as close to the ground as possible, also scraping sides lightly to reveal green tissue
   ii. apply chemical(usually undiluted glyphosate) immediately (within 15 seconds)

2) **Scrape and Paint** This method is applicable to many species of vines where it is desirable to treat the vine intact, particularly those with aerial tubers (e.g. Madeira Vine) or those that will propagate from segments.
   i. Scrape the stem **on one side of the stem only** for 20- 30 cm if possible
   ii. Apply herbicide immediately.

3) **Direct Inject** This method applies to all woody trees and shrubs with a diameter of about 6- 10cm or greater
   i. Make cuts into the trunk (as low down as possible) with a tomahawk. Make cuts the width of the blade at a slight angle. Or preferably make drill holes with cordless drill. Holes or cuts shall be angled downwards into the trunk to prevent herbicide escape.
   ii. Apply herbicide immediately into the cut or hole
   iii. Repeat this pattern in brickwork pattern around the circumference of the tree, or if using a drill holes approximately 10 cm apart 25mm deep.
   iv. Treat any visible lateral roots as per **i.**

4) **Spot Spraying** should be carried out using a knapsack sprayer to keep pressure/volume to a minimum. This is to ensure newly planted tubestock/ germinating natives are not affected by spray drift. Glyphosate is the main herbicide used, though some weed species require Metsulfuron methyl (*Brush-off*) for treatment. A combination of the two herbicides can be used for treatment in areas where there area combination of species that are susceptible to either glyphosate or Metsulfuron methyl. A marker dye and surfactant will improve control results.

5) **Chemical Crowning** This applies to those species which have a fleshy root system such as a rhizome or large bulbs (e.g. Asparagus Fern, Canna Lily)
   I. Gouge out sections of fleshy base with a knife
   ii. Apply undiluted herbicide.

6) **Manual Removal** Is the preferred method of control if practical. Especially useful in follow up work as mitigates any risk of off target damage to germinating or young native species

i. **Hand pulling** removal by hand (or with a mattock etc) of the plant including all tap and lateral roots. Is especially useful for smaller specimens; species with a bulb, corm or tuber; isolated grass specimens amongst native species.

ii. **Crowning** This method is applicable to weeds which have their growing points below the surface of the ground (corms, bulbs, rhizomes, clumped or fibrous root systems etc e.g. grasses, Asparagus Fern)

1. Grasp the stems or leaves and hold them tightly so that the base of the plant is visible
2. Insert a knife close to the base of the plant at a slight angle with the tip well under the root system
3. Cut through the roots close to the base
4. Remove the plant ensuring that the base of the plant where the roots begin is completely removed.

Noxious Weed Categories

Class 1: State Prohibited Weeds	These are noxious weeds that pose a potentially serious threat to primary production or the environment and are not present in the State or are present only to a limited extent. These are noxious weeds which must be eradicated from the land and the land must be kept free of the plant.
Class 2: Regionally Prohibited Weeds	These are noxious weeds that pose a potentially serious threat to primary production or the environment of a region to which the order applies and are not present in the region or are present only to a limited extent. These are noxious weeds which must be eradicated from the land and the land must be kept free of the weed.
Class 3: Regionally Controlled Weeds	These are noxious weeds which pose a serious threat to primary production or the environment of an area to which the order applies, are not widely distributed in the area and are likely to spread in the area or to another area. These are noxious weeds which must be fully and continuously suppressed and destroyed.
Class 4: Locally Controlled Weeds	These are noxious weeds that pose a threat to primary production, the environment or human health, are widely distributed and are likely to spread in the area or to another area. The growth and spread of these noxious weeds must be controlled according to the measures specified in the relevant management published by Council.
Class 5: Restricted Plants	These are noxious weeds that are likely, by their sale or sale of their seeds or movement within the State or an area of the State, to spread either within or outside the State. These noxious weeds are prohibited from sale.

Appendix 8: Revegetation Techniques

Clear away weed and exotic grass growth within a 500mm radius area where the plant is to be placed, by spot spraying with *Glyphosate* (following manufacturer's directions).

Dig and loosen soil (150mm deep and 75mm wide) to place tubestock in.

Plant sun-hardened tubestock ensuring root system is below ground level.

It is best to also use slow release fertiliser and "*rainsave*"' water crystals (following manufacturer's recommendations).

Place medium grade jute mat (370x 370mm) around each plant ensuring that the mat does not inhibit water filtration to plant.

Hardwood chips could be used as a suitable alternative to jute matting.

Course grade hardwood chips shall be used (minimum size of 20mm x 20mm x 3mm).

Hardwood chips would need to be 100mm deep with a radius of 500mm.

The cost of either material is equivalent however spreading hardwood chips is more labour intensive.

Plants shall be protected with large (1200x 500mm) plastic tree guards using 2 small hardwood stakes as support.

This will limit Swamp Wallaby *(Wallabia bicolor)* predation and facilitate follow up weed control when spot spraying.

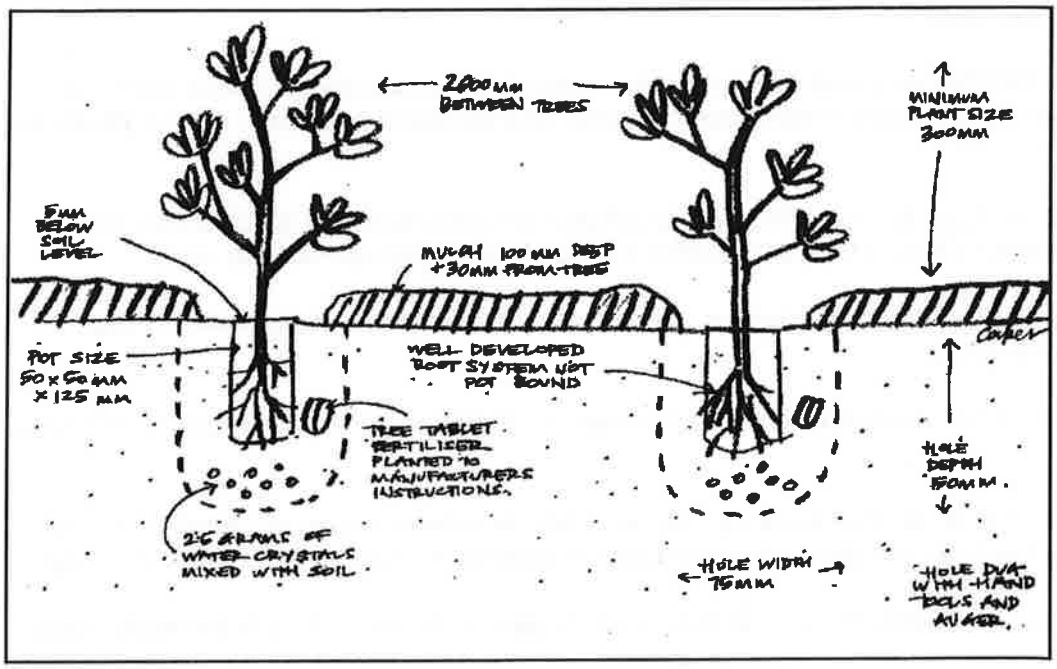
To maximize survival rates, planting should be under taken in the "wet season" (end of February to beginning May).

Generally, Spring and Summer are too hot and dry for undertaking Revegetation.

Plants will require watering directly after planting if the weather conditions are dry.

Follow up watering will also be required dependant on prevailing weather conditions.

Planting Diagram



Note: Although plant spacing is depicted as being at 2 metre intervals, this is only a general guide and the requirements for each site may vary.

Refer to the specifications given in the zone categories for the specified plant spacings. Jute weed matting may be used instead of hardwood chip.

Refer to specifications given in the zone categories.

Possible Suppliers for the Planting Program

- Coffs Coast Bush Regeneration Native Nursery Tel: 66536781
- Lacebark Native Nursery Tel: 6654 4373

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