

16.0 BUFFER MANAGEMENT PLAN, PRECINCTS 2 TO 4 AND 6 TO 14 – JAMES WARREN & ASSOCIATES, AUGUST 2012

Implementation and Summary Table

Action No	Action	Location (reference to Map)	Purpose	Timing and Frequency	Responsibility	Performance Measure	Monitoring and Reporting	Further Details
Vegetation Protection								
BMP - 1	Erection of temporary high visibility fencing in accordance with AS 4970-2009	Precinct 2 -4 & 6-14 along edge of 30m inner buffer zone	3. To protect retained vegetation (incl. Endangered & EEC's) from construction activities by restricting machinery and contractor access 4. To discourage access to the construction site by native fauna	Prior to site work commencing.	Project 28 Pty Ltd – Site Manager with sign off by Environmental Officer	Fencing erected in accordance with design specification and required timing Fencing maintained over reporting period. Any breaches reported and promptly repaired.	Daily checks of fencing. Reporting at 6 monthly intervals noting status of works (including photos), monitoring frequency, any incidents and nature of management response.	Proponent assumes maintenance responsibility until revegetation work is self-sustaining i.e. 3 - 5yrs
BMP - 2	Erection of temporary signage: "Environmental Protection zone- No Unauthorised Entry".	Approximately 100m intervals along all temporary fencing (see above)	2. To protect retained vegetation from construction activities by restricting machinery and contractor access	Prior to site work commencing.	Project 28 Pty Ltd- Site Manager	Signage maintained over reporting period. Any breaches reported and promptly repaired	Daily checks of fencing/ signage.	Temporary signage will be erected prior to construction that indicates the location of EPZs
BMP - 3	High visibility tagging of Threatened flora species and EEC's	Where Threatened flora and EEC's occur	2. To protect Threatened vegetation from construction activities including accidental damage when carrying out management actions i.e. weeding	Prior to site work commencing	Project 28 Pty Ltd – Site Manager with sign off by Environmental Officer	Continued persistence of Threatened flora and EEC's	Annually for 5 years: survival, height, flowering, fruiting, signs of natural recruitment, potential threats	Precincts 1 & 5 VMP and TSMP
BMP - 4	Erection of permanent signage: No Unauthorised	Approximately 100m intervals Along all Koala-	3. Notification of Koala habitat	During construction phase, prior to	Project 28 Pty Ltd- Site	Signage maintained over reporting period.	Daily checks of fencing/ signage.	Proponent assumes maintenance

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Action No	Action	Location (reference to Map)	Purpose	Timing and Frequency	Responsibility	Performance Measure	Monitoring and Reporting	Further Details
	Access; Dogs prohibited; No dumping of rubbish; Rehabilitation works in progress	proof fencing (see above)	4. Notification of restricted access	occupation	Manager	Any breaches reported and promptly repaired		responsibility until revegetation work is self-sustaining i.e. 3 - 5yrs
Stormwater and water quality management								
BMP- 5	Background water quality monitoring	In water bodies within and adjacent to the construction site	2. To establish appropriate discharge criteria for the construction phase	Prior to commencement of works and maintained until stabilisation by revegetation at completion of works	Nominated environmental consultant	Background monitoring pre-construction water quality: chemical and physical water quality assessment	Results of water quality monitoring to be reported to TSC	Stormwater Management Plan) & Erosion and Sediment Control Plan
BMP- 6	Temporary stormwater treatment measures installed prior to disturbance	Where required in water bodies downslope of construction areas	4. To maintain water quality of receiving waters during the construction phase of the development 5. To prevent the displacement of sediment and soil into ecologically sensitive water bodies 6. Prevent dispersal of weed seeds and vegetative material	Prior to commencement of works	Contractors site manager, environmental consultant	All discharges and water bodies have water quality in line with background monitoring	Surface water quality assessed monthly and following rainfall events	Stormwater Management Plan & Erosion and Sediment Control Plan
Weed Control								
BMP- 7	Weed control	In accordance with Precinct 2-4 & 6-11 Weed Management Plan and Precinct 12, 13 & 14 Weed Management Plan, e.g. slashpine wildings mechanically removed or manually cut (chainsaw or loppers) in areas of native vegetation, areas of exotic grasses (Setaria, whiskey grass) sprayed out with glyphosate, targeted weed control while health and Koala trees establishing.						

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Action No	Action	Location (reference to Map)	Purpose	Timing and Frequency	Responsibility	Performance Measure	Monitoring and Reporting	Further Details
Heath regeneration and revegetation								
BMP- 8	Stockpile topsoil	Where appropriate	For use in regeneration, to promote natural heath recruitment	During the construction phase	Project 28 Pty Ltd- Site Manager	Topsoil stockpiled for re-use	Refer Section 16.5 of this BMP for monitoring requirements	N/A
BMP- 9	Ripping	Areas of natural heath regeneration	To promote natural heath recruitment and regeneration	During the construction phase	Project 28 Pty Ltd- Site Manager	Ripping completed where appropriate and natural regeneration occurring	Refer Section 16.5 of this BMP for monitoring requirements	N/A
Koala compensatory habitat planting								
BMP- 10	Planting of Koala feed trees	Within inner buffer zones (FIGURES 7 & 7A – 7L, APPENDIX 2)	To improve the quality and quantity of Koala habitat on the site and facilitate dispersal across the site	At the completion of bulk earthworks	Suitably qualified Bush Regeneration company	Approximately 10,294 Koala food trees planted in accordance with the Performance Criteria outlined in the Precinct 1 & 5 VMP, Precinct 2, 3, 4, 6, 7, 8, 9, 10, 11 VMP and Precinct 12, 13 & 14 VMP	Growth and condition of plantings to be monitored and reporting completed until self-sustaining i.e. 3 - 5yrs	Rehabilitation monitoring/ reporting is outlined in the Flora and Fauna Monitoring Report
Buffer Maintenance								
BMP-11	Maintenance of Ecological buffers (refer Section 16.4 of this BMP)	Precinct 2 -4 & 6-14 Buffer zones	To ensure buffers become established (i.e. plantings) and are fully functioning	During the construction phase (refer Section 16.4.5 of this BMP for timing details)	Suitably qualified Bush Regeneration company	Buffers maintained until appropriately established and Performance Criteria have been met (Section 16.5.8 of this BMP) Performance criteria: foliage Projective Cover (%) assessed using eye estimates or photo points (i.e. FPC of native vegetation increasing after each monitoring visit); species composition targets will be based on accepted benchmarks	As above	N/A

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Action No	Action	Location (reference to Map)	Purpose	Timing and Frequency	Responsibility	Performance Measure	Monitoring and Reporting	Further Details
						for the specific vegetation communities on the Kings Forest site (NEH 2012); noxious and environmental weeds are to be eradicated; infrastructure functional and well-maintained in a state suitable for hand over to Tweed Shire Council; natural recruitment of native seedlings throughout planting areas; and plantings providing variable habitats for native fauna species. Completion criteria: When performance criteria have been met, completion will have occurred.		
Acid Frog compensatory habitat								
BMP- 12	Creation of Wallum sedge frog habitat	Within inner buffer zones (FIGURES 7 & 7A – 7L, APPENDIX 2)	To improve the quality and quantity of Acid frog habitat on the site and facilitate dispersal across the site	At the completion of bulk earthworks	Project 28 Pty Ltd- Site Manager / Ecologist	Creation of Acid frog habitat in accordance with the Precinct 1 & 5 TSMP	Monitoring and reporting as outlined in the Flora and Fauna Monitoring Report	39.30ha of suitable habitat for Wallum sedge frogs will be created across the site in which other Acid frogs such as Wallum froglets will also utilise for foraging and breeding habitat

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List of Abbreviations

BMP - Buffer Management Plan
DGEARs - Director General Environmental Assessment Requirements
DoP – NSW Department of Planning
EECs - Endangered Ecological Communities
EPZs - Environmental Protection Zones
FAMP – Feral Animal Management Plan
SEPP 14 - State Environment Planning Policy Num. 14 – Freshwater Wetlands
TSMP – Threatened Species Management Plan
VMP – Vegetation Management Plan
WMP - Weed Management Plan

16.1 Introduction

16.1.1 Executive Summary

The Kings Forest Stage 1 Project Application No. MP 08_0194 was lodged in November 2011. The Application and Environmental Assessment Report was advertised from December 2011 to January 2012 following which 302 public submissions and 10 agency submissions were received.

As a result of the submissions, amendments to the project have been made. The amended project contains the following key elements (NB: these elements will be revised and updated as the amended project is finalised).

- ♦ Subdivision to create new lots for future development;
 - Bulk earthworks across the site;
 - Road works comprising:
 - construction of the entrance road into the site and associated intersection works on Tweed Coast Road;
 - alignment and construction of the proposed Kings Forest Parkway from Tweed Coast Road via Precincts 4 and 5 through to the western precincts; and
 - alignment and part construction of two proposed roads through SEPP 14 areas to access the southern precincts;
- ♦ Development of 2,036 m² of floor space for rural supplies development and access arrangements within Precinct 1;
- ♦ Construction of subdivision and infrastructure works along the Kings Forest Parkway and within Precincts 1 and 5;
- ♦ The Plan of Development for Precinct 5.

This revised Buffer Management Plan (BMP) addresses the amendments to the project and the key issues raised in the submissions.

16.1.2 Aims & Objectives

16.1.3 Background

The Stage 1 Development Application includes the proposed bulk earthworks in precincts 2-4 & 6 -14 (refer **FIGURE 1 (APPENDIX 2)** for final Precinct Plan) which are designed to achieve the required 1/100 year flood immunity for future residential development. Bulk earthworks are to be carried out in accordance with Mortons Urban Solutions Plan no. 12301-ALL-040 Amendment C (**FIGURE 2, APPENDIX 2**).

State Environmental Planning Policy (Major Projects) 2005 (Amendment No 10) was gazetted in November 2006, resolving the zonings of the Kings Forest site (**FIGURE 3, APPENDIX 2**). Threatened flora, habitat for threatened fauna, Endangered Ecological Communities (EECs) and State Environmental Planning Policy (SEPP) 14 Wetlands are protected within zoned Environmental Protection Zones (EPZs). Provision was made for a 50m ecological buffer to these areas.

The BMP (JWA 2009) approved as part of the Concept Plan application established the principles with respect to ecological buffers at the Kings Forest site. Within Precinct 14 a golf

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course is proposed and will fulfil the functions of an ecological buffer between residential development (i.e. Precincts 12 & 13) the adjacent SEPP 14 Wetlands, EPZs and EECs in accordance with the approved BMP (JWA 2009).

The golf course has been designed by GNP Golf design and a layout is provided as **FIGURE 4 (APPENDIX 2)**. The golf course buffer is a minimum of 50 m wide and in many areas is two or three fold wider (e.g. fairways 6 to the east, 15 and 16 to the west, 3 and 4 to the south).

The construction and operation of the golf course area was subject to a Golf Course Management Plan (Gilbert & Sutherland 2008). A report by EPar - Review of Environmental Management Program Proposed for Kings Forest Golf Course (Epar 2009) - endorses the actions prescribed in the Gilbert & Sutherland (2008) plan and recommends additional measures, on which basis the impacts of the construction and operation of the golf course are considered by Epar to be effectively manageable. The current Kings Forest Stage 1 Management Plan incorporates the actions and management measures described in the above report.

The proposal is to develop the buffer as an active recreation area (golf course). Within the golf course will be:

- ♦ Fairways
- ♦ Tees
- ♦ Greens
- ♦ Short and long Roughs
- ♦ Bio-retention and filter basins
- ♦ Ecological regeneration zones
- ♦ Open space
- ♦ Forest regeneration.

All components of the golf course will contribute to the buffer capacity of the land separating urban land use from the surrounding ecological zones.

This BMP has been prepared for the proposed bulk earthworks only in precincts 2- 4 & 6 -14.

Subsequent to gazettal of the SEPP Amendment, a Concept Plan for Kings Forest was prepared and lodged with DoP. The objectives of ecological buffers at the Kings Forest site were originally discussed in the BMP (JWA 2009) that accompanied the Concept Plan Application. The 2009 BMP included a literature review on the types and purposes of environmental buffers.

16.1.4 Aim of this Report

The aim of this BMP is to provide guidelines, strategies and methods for the treatment and management of ecological buffers to Cudgen Nature Reserve and EPZs within precincts 2 – 4 & 6 – 14 of the Kings Forest residential development.

The following section details the objectives of ecological buffers under the State Environmental Planning Policy (Major Projects) 2005 (Amendment No 10) and the Concept Plan approval (06-0318). Compliance with these requirements is discussed in detail in **SECTION 16.6** of this Management Plan.

16.1.5 Objectives of buffers at Kings Forest

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SEPP (Major Projects) Amendment

Clause 7(2) of the SEPP (Major Projects) Amendment states that the objectives of the ecological buffers are:

- (a) *To protect wetlands or areas of particular habitat significance;*
- (b) *To restrict development so that, as far as practicable, it does not occur within ecological buffers;*
- (c) *To help ensure that development is designed, sited and managed so as to minimise its impact on the ecological and hydrological functions of the ecological buffers; and*
- (d) *To encourage the restoration and maintenance of the native vegetation and ecological processes of the land within and adjacent to wetlands or areas of particular habitat significance.*

Clause 7(3) of the SEPP (Major Projects) Amendment requires that development on land within an ecological buffer is to:

- (a) *incorporate effective measures to manage wetlands or areas of particular habitat significance, and*
- (b) *be designed and sited to maintain connectivity of vegetation and minimise vegetation clearing, soil disturbance and alterations to the rate, volume or quality of surface and ground-water flows, and*
- (c) *retain and maintain all existing native vegetation outside the area immediately required for the development, and*
- (d) *incorporate measures to regenerate native vegetation for all disturbed areas within the buffer, and*
- (e) *incorporate appropriate stormwater and erosion control measures to protect the buffer from surface water run-off or other disturbance.*

Clause 7(4) of the SEPP (Major Projects) Amendment provides that, when considering whether or not there is a practicable alternative to siting development inside an ecological buffer, the consent authority must consider:

- (a) *the design, type and site cover of the proposed development, and*
- (b) *the physical characteristics of the land on which the development is proposed to be carried out, and*
- (c) *the suitability of the land for the proposed development.*

The consent authority may, of course, consider additional matters.

Concept Plan Approval

Condition B3 states that:

"Further heathland is to be provided with long-term protection and allowed to naturally regenerate on the site.

The further heathland to be protected is to be that contained within the 50m ecological buffer in the locations depicted as 'Heath to be Naturally Regenerated' in Figure 2A titled 'Heath Regeneration and Revegetation Areas' drawn by James Warren and Associates and dated 22 March 2010. The heathland in these locations is to be protected and regenerated for the full 50m width of the ecological buffer.

The details of this further protection are to be submitted along with the preferred long term protection mechanism, such as land use zoning, to the satisfaction of the Director-General prior to determination of Stage 1".

16.2 Ecological buffers in precincts 2-4 & 6-14

16.2.1 Introduction

The following sections provide a discussion on the treatment of the ecological buffers within Precincts 2-4 & 6-14. Impacts of the buffer treatments and bulk earthworks on the vegetation communities are also analysed.

16.2.2 Buffer Treatments

The Stage 1 Project Application is for the completion of bulk earthworks only within Precincts 2-4 & 6-14. The proposed Stage 1 earthworks are designed to achieve the required 1/100 year flood immunity for future residential development and to achieve this purpose earthworks in some areas occupy the outer 20 m of the buffer zone (**FIGURE 2, APPENDIX 2**). This is, however, still considered to be consistent with the Major Projects SEPP Amendment Clauses 7 (2), (3) and (4). Compliance is discussed in **SECTION 16.6**.

For Precincts 2-4 & 6-11 the proposed bulk earth works are contained within the outer 20 m of the ecological buffers (**FIGURE 2, APPENDIX 2**). Subsequent to the completion of these works, this area will be revegetated with heathland. For Precincts 12, 13 and 14 bulk earthworks are proposed to occupy the entire area with the exception of sections of the inner buffer at the west of Precinct 12, and where heath is to be naturally regenerated.

At the completion of earthworks the golf course will be revegetated and function as the ecological buffer to the surrounding EPZs. The following sections provide an analysis of the impacts of the proposed bulk earthworks on the vegetation occurring within the Precincts 2-4 & 6-14 ecological buffers. Amelioration measures are also discussed.

16.2.3 Impacts on Native Vegetation within Buffers to Precincts 2-4 & 6-14

16.2.4 Introduction

Continued farming practices (i.e. cattle grazing, periodic slashing etc.) and ongoing weed infestations over the site have resulted in some changes to the extent and structure of the vegetation communities since the previous detailed mapping which occurred in 2005. The mapping of vegetation communities within the ecological buffers was therefore recently updated (August 2011) (**FIGURE 5, APPENDIX 2**). Utilising the updated mapping within the buffers, impacts of the proposed development have been analysed in the following sections.

16.2.5 Impacts on Native Vegetation within Buffers

All vegetation within the areas proposed for earthworks as shown in **FIGURE 2 (APPENDIX 2)** will be cleared. The impacts on the vegetation within the ecological buffers in Precincts 2-4 & 6-14 have been calculated collectively. **TABLE 1** outlines the impacts on each of the vegetation communities. **FIGURE 6 (APPENDIX 2)** provides an illustration of the impact.

TABLE 1
IMPACTS ON VEGETATION COMMUNITIES WITHIN PRECINCT 2-4 & 6-14 BUFFERS

Vegetation Communities	Total area (ha)	Area to be lost (ha)
Community 1 - Highly Modified		
1(a) Substantially cleared of native vegetation	23.26	9.77
1(b) Camphor laurel dominant closed forest (with rainforest species)	0.28	0.06
1(c) Native plantation/plantings	0.10	0.10
1(d) <i>Leptospermum petersonii</i> plantation (with heathland species)	3.38	3.29
1(e) Exotic pine plantation/pine wildings	3.56	0.85
1(f) Exotic grassland dominated (with heathland species)	13.66	6.99
1(g) Exotic grassland dominated (with regrowth Acacia & other native species)	-	-
Subtotal	44.24	21.06
Community 2 - Freshwater Wetland		
2(a) Hillside seepage swamp	-	-
2(b) Ponds & fringing wetland	-	-
2(c) Sedgeland/rushland	1.28	0.34
Subtotal	1.28	0.34
Community 3 - Heathland & Shrubland		
3(a) Dry coastal heathland to shrubland	2.21	1.80
3(b) Wet coastal heathland to shrubland	0.77	0.46
3(c) Mixed wet/dry coastal heathland to shrubland (with Scribbly gum)	0.11	0.10
3(d) Regen. wet/dry coastal heathland to shrubland	17.65	11.59
3(e) Regen. wet/dry coastal heathland to shrubland (with exotic pines)	5.20	3.63
Subtotal	37.94	17.58
Community 4 - Swamp Sclerophyll Floodplain Forest		
4(a) Forest red gum open forest to woodland/Broad-leaved paperbark closed forest to woodland	-	-
4(b) Swamp mahogany open forest to woodland & heathland species	0.23	0.01
4(c) Scribbly gum/Swamp mahogany open forest to woodland	-	-
4(d) Swamp box open forest to woodland	-	-
4(e) Broad-leaved paperbark closed forest to woodland	1.91	0.48
4(f) Broad-leaved paperbark closed forest to woodland (with rainforest species)	-	-
4(g) Broad-leaved paperbark closed forest to woodland/Swamp mahogany open forest to woodland	-	-
4(h) Swamp sclerophyll & heathland species (with exotic pines)	-	-
4(i) Regen. Broad-leaved paperbark closed forest to woodland & heathland species	2.65	1.82
4(j) Regen. Swamp mahogany open forest to woodland	2.68	0.82
Subtotal	7.47	3.13
Community 5 - Dry to Moist Open Forest		
5(a) Blackbutt wet to dry open forest	-	-
5(b) Blackbutt/Tallowwood open forest	-	-
5(c) Blackbutt with grassy understorey	-	-
5(d) Scribbly gum open forest to woodland	-	-
5(e) Regen. Scribbly gum open forest to woodland & heathland species	0.13	0.10

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Vegetation Communities	Total area (ha)	Area to be lost (ha)
Subtotal	0.13	0.10
Community 6 - Rainforest		
6(a) Littoral rainforest	-	-
6(b) Regenerating sub-tropical rainforest	-	-
TOTAL	91.06	42.21

In summary, the earthworks for Precincts 2-4 & 6-14 will impact on a total of 42.21 ha within the buffer zones. Of this 42.21 ha, 21.06 ha or 50% of the impact will be to highly modified vegetation (i.e. cleared and/or covered by exotic grasslands).

Impacts on the remaining areas of native vegetation can be summarised as follows:

- 42% of the total impact will be to heath and shrubland communities;
- Of Heath and shrubland communities to be lost, only a very small portion (i.e. approximately 13%) is in good condition. The majority (87%) of the heath to be lost is disturbed but regenerating;
- The remaining impacts will be to Sclerophyll Forest (7%), Freshwater wetland (0.8%) and Open Forest (0.04%).

16.2.6 Amelioration of Buffer Impacts

The majority of the ecological buffers within Precincts 2-4 & 6-14, including large areas within the golf course, will be regenerated and/or revegetated with heath communities.

FIGURES 7 & 7A - 7L (APPENDIX 2) shows regeneration and/or revegetation areas. Details of the proposed regeneration/revegetation are provided in **SECTION 16.3**.

TABLE 2 below provides a summary of the proposed regeneration/revegetation works within Precinct 2-4 & 6-14 ecological buffers.

TABLE 2
SUMMARY OF PROPOSED REGENERATION/
REVEGETATION WORKS IN PRECINCT 2-4 & 6-14 ECOLOGICAL BUFFERS

Vegetation Community	Current extent	Proposed impacts	Proposed regeneration/revegetation	Net gain
3(a) Dry coastal heathland to shrubland	2.21	1.80	44.15 ha	26.57 ha
3(b) Wet coastal heathland to shrubland	0.77	0.46		
3(c) Mixed wet/dry coastal heathland to shrubland (+ Scribbly gum)	0.11	0.10		
3(d) Regenerating wet/dry coastal heathland to shrubland	17.65	11.59		
3(e) Regenerating wet/dry coastal heathland to shrubland with pines	5.20	3.63		
TOTAL	25.94	17.58	44.15 ha	26.57 ha

Proposed regeneration/revegetation measures within the Precinct 2-4 & 6-14 ecological buffers will result in a long-term net gain of 26.57 ha of intact heathland communities.

Planting of Koala feed and shelter trees will be completed where appropriate within the buffers to EPZs. These plantings will generally occur in combination with heath regeneration/revegetation activities and will contribute significantly as mitigation for the loss of any vegetation within the buffer zones. Areas identified for planting preferred Koala food trees are shown in **FIGURES 7 & 7A - 7L (APPENDIX 2)** and quantified in **APPENDIX 1. SECTION 16.3.10** provides further discussion on Koala food tree compensation.

Furthermore, compensatory habitat areas for Wallum sedge frogs will also be created within ecological buffers and will include core breeding habitat and forage habitat areas. These plantings will also occur in combination with heath regeneration/revegetation activities. Details are provided in the Precinct 2-4 & 6-11 Threatened Species Management Plan (JWA 2012b) and the Precinct 12, 13 & 14 Threatened Species Management Plan (JWA 2012e).

16.3 Specific Management Strategies

16.3.1 Introduction

The specific management strategies for the buffer areas are detailed in the following sections. The Stage 1 Project Application is for the completion of bulk earthworks only within Precincts 2-4 & 6-14. Management strategies have therefore been addressed for the construction phase only and will include:

- ♦ Protective measures;
- ♦ Weed control;
- ♦ Heath regeneration & revegetation;

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- ♦ Koala compensatory habitat plantings;
- ♦ Acid frog compensatory habitat;
- ♦ Golf Course Management strategies;
- ♦ Pest management; and
- ♦ Adaptive management

16.3.2 Protective Measures

16.3.3 Introduction

This section outlines the measures that will be taken to protect the significant natural values adjacent to Precincts 2-4 & 6-14 during the construction phase.

16.3.4 Vegetation Protection

The following steps will be completed prior to vegetation removal:

- ♦ The extent of vegetation removal/earthworks will be surveyed and clearly pegged.
- ♦ All vegetation to be retained will be secured with temporary high visibility exclusion fencing. Fencing will be erected in accordance with Australian Standard 4970-2009 Protection of Trees. This will exclude any activities which may compromise the integrity of the retained vegetation and provide a clearly marked working space for earthworks and then the bush regenerators/landscaping team.
- ♦ Temporary signage will be provided along all fencing during the construction phase stating "Environmental Protection Zone – No Unauthorised Entry".
- ♦ All vegetation and/or trees to be retained immediately adjoining the works area, will be protected by this fencing. Fencing will be established a minimum of 1 metre outside of the identified root protection zone areas and/or drip line zone whichever is greater.
- ♦ Prior to clearing/earthworks, all vegetation is to be checked for the presence of native fauna.
- ♦ All contractors will be made aware of restrictions applying to the areas of retained vegetation (i.e. SEPP 14, EECs and Environmental Protection Zones). The area of retained vegetation will not be used for any of the following activities:
 - Storage and mixing of materials;
 - Vehicle parking;
 - Liquid disposal;
 - Machinery repairs and/or refuelling;
 - Construction site office or shed;
 - Combustion of any material;
 - Stockpiling of soil, rubble or debris;
 - Any filling or excavation including trench line, topsoil skimming and/or surface excavation, unless otherwise approved by the Project Manager; and
 - Unauthorised pesticide, herbicide or chemical applications.
- ♦ All vegetation removal is to be undertaken in a manner that ensures the ongoing integrity of the vegetation to be retained and/or adjacent native plants. Due care will be taken by all construction workers.
- ♦ All pruning activities will conform to the Australian Standard as detailed in "Pruning of Amenity Trees". Pruning activities will be conducted in a manner that ensures the ongoing environmental integrity of the area.
- ♦ All vegetative material from native species is to be mulched and used in the rehabilitation program.
- ♦ All vegetated matter from weed species (e.g. Slash pines) is to be removed from the site and disposed of in an appropriate manner.
- ♦ An ecologist is to remain onsite during all clearing works.

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16.3.5 Protection of Threatened Flora

None of the identified Threatened flora species occur within the proposed ecological buffers. The Precinct 2-4 & 6-11 VMP (JWA 2012a) provides detailed protective measures for Threatened flora occurring within EPZ's. These protective measures will be implemented during bulk earthworks and associated construction activities.

16.3.6 Protection of EECs

None of the EECs occur within the proposed ecological buffers. The Precinct 2-4 & 6-11 VMP (JWA 2012a) and the Precinct 12, 13 & 14 VMP (JWA 2012d) provide detailed protective measures for EECs occurring within EPZs. These protective measures will be implemented during bulk earthworks and associated construction activities.

16.3.7 Stormwater Management

Surface water runoff during construction will be managed and mitigated in accordance with the erosion and sediment control measures detailed in the Erosion and Sediment Control Plan (G & S 2011a). Temporary stormwater management and treatment measures will be installed prior to disturbance and maintained until such time as the disturbed areas are stabilised by revegetation upon completion of the earthworks. Temporary measures will include the provision of a sediment fence around the perimeter of any disturbed areas.

16.3.8 Weed Control

Due to the significant disturbance history, Kings Forest supports a variety of weed species of which Slash pine is the most common. Plantations have resulted in the species being naturalised on the site. Progeny range in size from small seedlings to trees 15-20 metres. In some areas there is significant invasion into native vegetation communities, while in other areas there may be only one or two plants.

Weeds will be controlled within the precincts 2-4 & 6-14 ecological buffers to ensure the protection of EPZs and the Cudgen Nature Reserve, particularly during construction. Disturbance during the construction will create a significant opportunity for weeds to colonise and establish. Weed control will be completed in accordance with the Weed Management Plan (WMP) for Precincts 2-4 & 6-11 (JWA 2012c) and Precinct 12, 13 & 14 (JWA 2012f) and will begin in conjunction with the bulk earthworks.

16.3.9 Heath Regeneration and Revegetation

All Rehabilitation/Regeneration works to be carried out within Precinct 2-4 & 6-11 ecological buffers will be completed in accordance with the Precinct 2-4 & 6-11 VMP (JWA 2012a). All Rehabilitation/Regeneration works to be carried out within Precinct 12, 13 & 14 ecological buffers will be completed in accordance with the Precinct 12, 13 & 14 VMP (JWA 2012d).

Revegetation will commence immediately upon completion of bulk earthworks resulting in a vegetative barrier to prevent weed invasion into the EPZs and Cudgen Nature Reserve.

Regeneration and/or revegetation of heath communities is proposed within the majority of the buffers to the EPZs within precincts 2-4 & 6-14. **FIGURES 7 & 7A - 7L (APPENDIX 2)** show the regeneration and/or revegetation areas and **APPENDIX 1** quantifies these areas. The re-use of existing top soil will be very important in the process of rehabilitation of heath communities (JWA 2012a & JWA 2012d).

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Topsoil is an important source of seeds and propagules and has been effectively used in rehabilitation of native vegetation communities (e.g. [Bellairs & Bell 1993](#); [Koch & Ward 1994](#); [Ward et al. 1996](#)). Therefore, handled correctly, the topsoil seedbank can be used to successfully revegetate after disturbances like bulk earthworks.

At the commencement of the Stage 1 earthworks at Kings Forest, stockpiles of topsoil will be created where appropriate. This soil will then be used in the regeneration of the heath communities within the buffer zones (refer **APPENDIX 1** in the Precinct 1 & 5 VMP).

To optimise the recovery of native vegetation rehabilitation areas the manner in which the top soil is handled is important. Therefore the following will be considered:

- It is important to consider the timing of topsoil recovery. Stripping topsoil immediately after summer seed drop may improve the germinable seed load ([Berg 1975](#));
- The seed bank is usually concentrated in the upper soil layer (i.e. 40–50 mm) so it is important to only remove this depth of soil. A greater depth will dilute the seed bank and reduce the effectiveness of the soil as a potential mechanism for natural regeneration (Putwain & Gillham 1990);
- Topsoil will be used as soon as possible after stripping to prevent loss of seed viability ([Koch et al. 1996](#); [Mahesh et al. 1996](#)); and
- Top soil will be replaced at maximum depths of 100mm ([Rokich et al. 2000](#)).

16.3.10 Koala Compensatory Habitat plantings

Planting of Koala feed and shelter trees will be completed, where appropriate on the Kings Forest site including buffers to EPZs. This will establish linkages between areas of Koala habitat and increase foraging resources for the species in the long term (in accordance with the Stage 1 KPOM [JWA 2012a]). Planting methodology and a species list is outlined in Precinct 2-4 & 6-11 & Precinct 12, 13 & 14 VMPs (JWA 2012a, JWA 2012d). Areas identified within the KPOM (JWA 2012h) for planting preferred Koala food trees are shown in **FIGURES 7 & 7A - 7L (APPENDIX 2)** and are quantified in **APPENDIX 1**.

16.3.11 Acid frog compensatory habitat

The creation of core Acid frog breeding habitat will be completed in Precinct 2-4 & 6-14 ecological buffers in combination with heath regeneration/revegetation measures and Koala compensatory habitat plantings (refer **FIGURES 7 & 7A - 7L (APPENDIX 2)** and **APPENDIX 1**). The acid frog compensatory habitat will be created in accordance with the Precinct 2-4 & 6-11 TSMP (JWA 2012b) and the Precinct 12, 13 & 14 TSMP (JWA 2012e).

16.3.12 Golf Course management strategies

An integral part of the construction of the golf course will involve revegetation of the following (**FIGURE 4, APPENDIX 2**):

- Fairways;
- Tees;
- Greens;
- Short and long Roughs;
- Bio-retention and filter basins (wetlands);
- Ecological regeneration zones (heath communities);
- Open space;
- Forest regeneration (Koala food trees); and

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- ♦ Acid frog compensatory habitat.

All the above components will contribute to the buffer capacity of the golf course, however, this BMP covers the areas proposed for heath regeneration, acid frog compensatory habitat and Koala food tree plantings. The relevant guidelines are provided in the following documents:

1. compensatory core acid frog habitat in accordance with the Precinct 12, 13 & 14 TSMP (JWA 2012e);
2. Koala habitat enhancement measures in accordance with the Stage 1 KPoM (JWA 2012h);
3. heath revegetation in accordance with the Precinct 12, 13 & 14 VMP (JWA 2012d);
4. general revegetation measures are outlined in Precinct 12, 13 & 14 VMP (JWA 2012d).

Details for the provision of fairways, tees, greens, short and long roughs and open space will be the subject of the landscape design as determined by the Golf Course Layout by GNP Golf Design (**FIGURE 6, APPENDIX 2**).

16.3.13 Pest Management

Several feral animal species have been identified as a problem on the Kings Forest site (e.g. Red Fox, Cane Toads). A Stage 1 FAMP (JWA 2012g) has been prepared for the Kings Forest site. Various strategies are discussed for the control of feral animals occurring at the site. Recommendations are provided with regard to the timing and implementation of these strategies.

16.3.14 Adaptive Management

Adaptive management is an approach that involves learning from management actions, and using those lessons to improve upon the overall plan. The principles of adaptive management have been incorporated into the administration of restoration projects within a variety of governmental authorities and programs (Thom 1997). Comprehensive, long-term monitoring is a component of adaptive management as adaptive management strategies rely on the accumulation of evidence supporting decisions that demand changes in action.

An adaptive management approach involves an integrated process of firstly monitoring, then reviewing and responding to the health and conditions of the plantings, natural regeneration and the status of the weed infestation. Where necessary, alteration to the design and maintenance of works required, to ensure the objectives of the BMP are achieved, are then made.

Adaptive management strategies will be determined by the information provided in monitoring reports. Adaptive management strategies that may be required within this BMP are as follows:

- ♦ Amendment of species list for revegetation works;
- ♦ Replacement of enhancement plantings that do not survive;
- ♦ Alteration of weed control methods or timing.

Before the implementation of any adaptive management strategy a brief report is be provided to Project 28 Pty Ltd and other relevant agencies detailing the proposed

management actions and the predicted outcomes. The implementation must be approved by the relevant authority prior to implementation.

16.4 Maintenance

16.4.1 Introduction

Ecological buffers will require maintenance during the construction phase to ensure they become well established and fully functioning. This section outlines the maintenance requirements during the construction phase. Maintenance will be completed focusing in three areas:

- General weed control;
- Care and/or labelling of plants natural regenerating in heath communities; and
- Care (i.e. watering, staking, mulching, protection) of heath and Koala food plantings.

16.4.2 Weed Control

Targeted weed control will be completed whilst heath communities and Koala food trees are establishing. Weed control methods will be in accordance with the methods outlined in the WMPs for Precincts 2-4 & 6-11 & Precincts 12, 13 & 14 (JWA 2012c, JWA 2012f).

In order to retain the effectiveness of the golf course as an ecological buffer, it is imperative that weed control activities are continued. Therefore, weed control will become part of the ongoing golf course maintenance.

16.4.3 Natural Regeneration

Areas of regeneration where heath top soil has been spread will be continually assessed to detect and record seed germination. Seedlings will be marked and/or labelled and any weeds removed to increase the probability of survival.

16.4.4 Koala Food Tree Plantings

Maintenance for the compensatory Koala food tree plantings will include the following:

- Ensuring adequate soil nutrient levels by periodic fertilising;
- Ensuring adequate soil moisture levels;
- Surveying for evidence of over browsing and applying adaptive management strategies (**refer to SECTION 16.3.14**); and
- Replacing any plantings that fail.

16.4.5 Timing of Maintenance

Maintenance visits will occur:

- On a fortnightly basis for an appropriate time to survey seedling recruitment in heath regeneration areas;
- Two weeks after enhancement plantings;
- Bi-monthly (check on plantings and weeds) for the first year; and
- Six monthly (check on plantings and weeds) for the 2nd, 3rd, 4th and 5th years.

16.5 Monitoring and Reporting

16.5.1 Introduction

Monitoring is an ongoing part of any rehabilitation works. The condition of revegetation areas can be assessed by checking environmental conditions and matching these with management aims and objectives. The results obtained through monitoring can help managers to prioritise management actions and keep track of the health of rehabilitated areas.

A well-designed monitoring program will allow project managers to detect results months, years, or decades following implementation of a plan. This section outlines the monitoring requirements for this BMP.

16.5.2 Rehabilitation Monitoring

16.5.3 Monitoring Requirements

The monitoring of ecological Buffers will include regular visits by a qualified ecologist who is to complete the following:

- ♦ Transects
 - Ten (10) transects are to be placed within the ecological buffers;
 - Transect locations are to be permanently marked;
 - Transects are to be 30 metres in length;
 - During monitoring visits tape measures are to be placed on the ground and the specific measurable features recorded along the transects;
 - Specific measurable features include:
 - Areas of vegetation cover (native species);
 - Areas of weed cover;
 - Areas of bare ground/mud;
 - Number, percentage and species of planted stems surviving;
 - Results are to be shown in a table which is to be presented in the monitoring reports.
- ♦ Quadrats
 - Three (3) quadrats (1m²) are to be placed along each of the transects;
 - Quadrats must be placed a minimum of 5m apart along the length of the transect;
 - Quadrats are to be placed randomly within five (5) metres of the transect line;
 - The boundary of the quadrat with respect to the tape measure (e.g. between 3.5 – 4.5 metres on tape measure) will be recorded;
 - For each quadrat the following specific measurable features will be recorded:
 - Plant species occurring
 - Percentage cover
 - Height
 - Relative abundance of native species
 - Weed cover
 - Number, percentage and species of planted stems surviving
 - Results are to be shown in a table which is to be presented in the monitoring reports.
- ♦ Fixed Photo points
 - A central transect marker on each established monitoring transect is to be used as permanent photo station for photographic monitoring;

- Four (4) photos are to be taken from each central transect marker. Photos are to be taken to the north, south, east and west;
- Photos will be labelled with the:
 - Transect code
 - Direction of view
 - The date & time
- Photos must be supplied in the monitoring reports in a form of prints no smaller than 4" x 6" and must be colour.

16.5.4 Timing of Monitoring Visits

The monitoring is to be completed by a suitably qualified ecologist. Site visits will occur:

- ♦ Six (6) weeks after primary weeding;
- ♦ Six (6) weeks after initial plant-out;
- ♦ Every six (6) months thereafter until groundcovers are sufficiently established (i.e. between two (2) - three (3) years)
- ♦ Annually after establishment. Monitoring will cease after five (5) years or until the vegetation is self-sustaining (whichever is the earliest) unless performance criteria have not been met, whereby monitoring will continue annually until performance criteria have been met.

16.5.5 Long Term Monitoring

Along with the regular monitoring within the ecological buffers, the overall vegetation composition is to be regularly assessed and recorded. Long term monitoring will use both aerial photos and yearly assessments (ground truthing) of the vegetation communities using a hand held GPS.

The Long term monitoring of the vegetation composition within ecological buffers will include:

- ♦ A detailed vegetation map at a scale of 1:5,000 is to be completed within the ecological buffers every twelve (12) months;
- ♦ Each year, after completion of vegetation mapping, a report is to be completed showing the changes in the composition of the vegetation communities within the ecological buffers. The results are to be shown in a table that shows the vegetation community and the area of the vegetation community as a percentage of the ecological buffers. Monitoring will cease after five (5) years unless performance criteria have not been met, whereby monitoring will continue annually until performance criteria have been met.

16.5.6 Fauna Monitoring

Further to the monitoring of the progress of rehabilitation, an annual fauna survey will be completed within the ecological buffers until performance criteria are met (**refer Section 16.5.8**). A baseline survey will be completed within the ecological buffers prior to commencement of construction to determine species presence. The fauna surveys will target Threatened species recorded, or predicted to occur, and will include the following methodology (where appropriate):

- ♦ Elliott trapping;
- ♦ Cage trapping;
- ♦ Pitfall trapping;

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- ♦ Arboreal Elliott trapping;
- ♦ Spotlighting/stag watching;
- ♦ Call playback;
- ♦ Dawn & dusk bird surveys;
- ♦ Hair tubes; and
- ♦ Active searching.

16.5.7 Water Quality Monitoring

A detailed water quality monitoring regime is included in the Overall Water Management Plan (Gilbert & Sutherland, July 2012) and will ensure that significant impacts on ecological buffers and ecologically significant areas are avoided.

16.5.8 Performance Criteria

A number of criteria will indicate successful rehabilitation of the ecological buffers, including:

- ♦ Growth rate
- ♦ Foliage Projective Cover
- ♦ Species composition targets based on accepted benchmarks for the specific vegetation communities on the Kings Forest site
- ♦ Noxious and environmental weeds are to be eradicated;
- ♦ Natural recruitment of native seedlings throughout planting areas;
- ♦ Maintenance of 100% of planted diversity; and
- ♦ Plantings providing variable habitats for native fauna species.

Performance criteria will be assessed for the ecological buffers as follows:

- ♦ The photos taken during monitoring visits, in combination with the annual monitoring and mapping of native vegetation composition and the results of the annual fauna survey, will be used to determine the density and diversity of native flora and fauna species and the levels of biodiversity the area is supporting.
- ♦ When the Ecologist has determined that all performance criteria have been met, completion will have occurred.

16.5.9 Reporting

16.5.10 Rehabilitation Monitoring Reports

Following each inspection by the qualified ecologist, a report will be prepared that will include tables and photographs from the monitoring visits. At the end of each year a detailed report will be prepared for the Department of Environment and Climate Change & Water (DECCW) and Tweed Shire Council (TSC). The report will discuss the following:

- ♦ Works undertaken;
- ♦ Progress of regeneration/revegetation areas against performance criteria using photos and tables showing the results of the monitoring visits;
- ♦ Significant problems encountered (death of seedlings, broken fences, vandalism etc.) and the effect of these on the plantings and aims of the revegetation or regeneration strategy;
- ♦ Success or failures of measures implemented to rectify previously identified problems;
- ♦ Measures to be taken to rectify new problems; and
- ♦ Performance against performance criteria (**Section 16.5.8**).

16.5.11 Fauna Monitoring Reports

A report will be prepared to DECCW & TSC after each annual fauna survey and will include the following:

- ♦ Results of the fauna survey;
- ♦ A comparison of results with previous years;
- ♦ Discussion regarding the absence of previous species/occurrence of new species;
- ♦ Any habitat maintenance recommendations (i.e. additional nest boxes etc.);
- ♦ Discussion regarding the occurrence of any pest species; and
- ♦ Recommendations for controlling pest species (if required).

16.6 Compliance with Statutory Requirements

16.6.1 Background

This section discusses compliance with the requirements of ecological buffers under the State Environmental Planning Policy (Major Projects) 2005 (Amendment No 10) and the Concept Plan approval (06-0318).

16.6.2 The SEPP (Major Projects) Amendment

16.6.3 Introduction

A literature review on the types and purposes of environmental buffers was included in the approved Buffer Management Plan (JWA 2009) prepared for the Concept Plan Application. The approved 2009 Buffer Management Plan established the following principles with respect to ecological buffers (with the exception of the southern zone i.e. Golf Course). Buffers were to consist of a:

- ♦ *Minimum 30m vegetated inner zone; and*
- ♦ *Maximum 20m outer zone. The outer zone may contain, subject to approval in each case, roads, footpaths and cycle ways, an asset protection zone (APZ), stormwater management and passive recreation areas.*

The 2009 Buffer Management Plan (JWA 2009) also noted that:

The application of this principle will be the subject of zone-specific Buffer Management Plans submitted in support of each Project Application or Development Application, and is supported by the Department of Environment and Climate Change.

As foreshadowed in the Concept Plan, it is proposed as part of the Project Application that compatible works would be undertaken in the 20m outer buffer with no infrastructure proposed within the 30m inner buffer.

16.6.4 Compliance with Clause 7(2)

Clause 7(2) of the SEPP (Major Projects) Amendment states that the objectives of the ecological buffers are:

- (a) To protect wetlands or areas of particular habitat significance;*
- (b) To restrict development so that, as far as practicable, it does not occur within ecological buffers;*

- (c) To help ensure that development is designed, sited and managed so as to minimise its impact on the ecological and hydrological functions of the ecological buffers; and
- (d) To encourage the restoration and maintenance of the native vegetation and ecological processes of the land within and adjacent to wetlands or areas of particular habitat significance.

The following details will be taken into consideration when determining compliance with Clause 7(2) of the SEPP (Major Projects) Amendment.

- This management plan for Precincts 2-4 & 6-14 provides specific management strategies as well as a detailed monitoring and reporting program to ensure significant values within and adjacent to ecological buffers are maintained, protected and rehabilitated.
- No bulk earthworks are proposed within the 30m inner buffer with the exception of the Golf Course as per the Buffer Management Plan (JWA 2009) and civil works for the two proposed roads through the east-west SEPP 14 area to access the southern part of the site approved as part of the Concept Application;
- Earthworks within the golf course 50m buffer will be removed where heath is to be naturally regenerated.
- There will generally be no hard infrastructure (roads, concrete, pipes etc.) located within the inner 30m portion of the buffer with the exception of the approved roads discussed above;
- As detailed in this management plan, the existing vegetation to be removed from the outer 20m buffer zone is predominantly disturbed vegetation.
- It is considered that the proposed development within ecological buffers, limited to the completion of bulk earthworks for the Golf Course and bulk earthworks within the outer 20m of some ecological buffers to provide flood immunity and construct approved roads, is a practicable solution.

16.6.5 Compliance with Clause 7(3)

As foreshadowed in the approved Concept Plan, a golf course is proposed within Precinct 14 and will fulfil the functions of an ecological buffer between residential development (i.e. Precincts 12 & 13) the adjacent SEPP 14 Wetlands, EPZs and EECs.

Elsewhere on the site (i.e. Precincts 2-4 & 6-13) bulk earthworks are required to provide for flood immunity of the residentially zoned areas. In some locations, cut/fill batters extend into ecological buffers.

Such development is accordingly required to comply with the provisions of Clause 7(3), as follows:

- (a) *incorporate effective measures to manage wetlands or areas of particular habitat significance, and*
- (b) *be designed and sited to maintain connectivity of vegetation and minimise vegetation clearing, soil disturbance and alterations to the rate, volume or quality of surface and ground-water flows, and*
- (c) *retain and maintain all existing native vegetation outside the area immediately required for the development, and*
- (d) *incorporate measures to regenerate native vegetation for all disturbed areas within the buffer, and*
- (e) *incorporate appropriate stormwater and erosion control measures to protect the buffer from surface water run-off or other disturbance.*

The measures to be applied in any development within the buffers, in accordance with Clause 7(3) of the SEPP Amendment, have been provided for as follows:

- ♦ The following measures are incorporated to satisfy sub-clause (a):

This management plan for Precincts 2-4 & 6-14 provides specific management strategies as well as a detailed monitoring and reporting program to ensure significant values within and adjacent to ecological buffers are maintained, protected and rehabilitated.

The golf course has been designed by GNP Golf design and a layout is provided as **FIGURE 4 (APPENDIX 2)**. It should be noted that the golf course buffer is a minimum of 50m wide and in many areas around the buffer it is two or three fold wider (e.g. fairways 6 to the east, 15 and 16 to the west, 3 and 4 to the south).

The construction and operation of the golf course area was previously subject to a Golf Course Management Plan (Gilbert & Sutherland 2008). A report by EPar - Review of Environmental Management Program Proposed for Kings Forest Golf Course (Epar 2009) - endorses the actions prescribed in this plan and recommends additional measures, on which basis the impacts of the construction and operation of the golf course are considered by Epar to be effectively manageable. The current Kings Forest Stage 1 Management Plan incorporates the actions and management measures described in the above report.

An integral part of the construction of the golf course will involve revegetation of the following (**FIGURE 4, APPENDIX 2**):

- Fairways;
- Tees;
- Greens;
- Short and long Roughs;
- Bio-retention and filter basins (wetlands);
- Ecological regeneration zones (heath communities);
- Open space;
- Forest regeneration (Koala food trees); and
- WSF compensatory habitat.

All the above components will contribute to the buffer capacity of the golf course. The advantages of the proposed golf course buffer overcome some of the disadvantages of a passive vegetative buffer:

- ♦ Active management - the site will be actively managed to maintain its ecological integrity including regeneration.
- ♦ Cost - the management will be paid for by the users of the course and not the local government authority.
- ♦ Stormwater treatment - the designed water treatment works will actively control the flow of water and contaminants to the SEPP 14 wetlands.
- ♦ Protection - access and security of the ecological zone will be actively managed.
- ♦ Monitoring - monitoring of the golf course and ecological zones will be on-going and for an indefinite period.

The outcome for the proposed golf course buffer will be an actively managed biological screen between the urban land users and the adjacent sensitive ecological areas.

- ♦ The following measures are incorporated to satisfy sub-clause (b):

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- No bulk earthworks are proposed within the 30m inner buffer with the exception of the Golf Course as per the approved Buffer Management Plan (JWA 2009) approved as part of the Concept Application and the approved roads discussed previously.
 - There will generally be no hard infrastructure (roads, concrete, pipes etc.) located within the inner 30 m portion of the buffer (with the exception of approved roads discussed previously);
 - As detailed in this management plan, the existing vegetation to be removed from the outer 20m buffer zone is predominantly disturbed vegetation.
- The following measures are incorporated to satisfy sub-clause (c) & sub-clause (d):
 - All native vegetation within areas not required for development will be retained and fully rehabilitated in accordance with the Precinct 2-4 & 6-11 and the Precinct 12, 13 & 14 VMPs (JWA 2012a & JWA 2012d).
 - Earthworks within the golf course 50m buffer will be removed where heath is to be naturally regenerated.
 - Additionally, all disturbed areas within ecological buffers will be fully restored in accordance with the Precinct 2-4 & 6-11 and the Precinct 12, 13 & 14 VMPs (JWA 2012a & JWA 2012d).
 - The following measures are incorporated to satisfy sub-clause (e):
 - Surface water runoff during construction and operations will be managed and mitigated in accordance with the erosion and sediment control measures detailed in the Erosion and Sediment Control Plan (Gilbert & Sutherland, July 2012). Temporary stormwater management and treatment measures will be installed prior to disturbance and maintained until such time as the disturbed areas are stabilised by revegetation upon completion of the earthworks. Temporary measures will include the provision of a sediment fence around the perimeter of any disturbed areas.

16.6.6 Compliance with Clause 7(4)

Clause 7(4) of the SEPP (Major Projects) Amendment provides that, when considering whether or not there is a practicable alternative to siting development inside an ecological buffer, the consent authority must consider:

- (a) the design, type and site cover of the proposed development, and*
- (b) the physical characteristics of the land on which the development is proposed to be carried out, and*
- (c) the suitability of the land for the proposed development.*

The objectives for the ecological buffer (per Clause 7(2) of the SEPP Amendment) will be met, considering Clause 7(4) of the SEPP Amendment, having regard for:

- (a) the design, type and site cover of the development, in that:
 - the bulk earthworks are required to provide the substrate of the approved Golf Course and to provide flood immunity to the residentially zoned areas of the site,
 - No bulk earthworks are proposed within the 30m inner buffer with the exception of the Golf Course and the approved roads discussed previously;
 - There will generally be no hard infrastructure (roads, concrete, pipes etc.) located within the inner 30 m portion of the buffer (with the exception of approved roads discussed previously);

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- As detailed in this management plan, the existing vegetation to be removed from the outer 20m buffer zone is predominantly disturbed vegetation
- (b) the physical characteristics of the land on which the development is proposed to be carried out, in that:
 - it generally contains areas of disturbed vegetation,
- (c) based on the above points, the areas within ecological buffers proposed to be impacted by bulk earthworks (i.e. cut/fill batters) are considered to be suitable for the proposed development.

16.6.7 Concept Plan Approval (06-0318)

Condition B3 of the Concept Plan Approval (06-0318) states that:

"Further heathland is to be provided with long-term protection and allowed to naturally regenerate on the site.

The further heathland to be protected is to be that contained within the 50m ecological buffer in the locations depicted as 'Heath to be Naturally Regenerated' in Figure 2A titled 'Heath Regeneration and Revegetation Areas' drawn by James Warren and Associates and dated 22 March 2010. The heathland in these locations is to be protected and regenerated for the full 50m width of the ecological buffer.

The details of this further protection are to be submitted along with the preferred long term protection mechanism, such as land use zoning, to the satisfaction of the Director-General prior to determination of Stage 1".

The BMP (JWA 2009) approved as part of the Concept Plan application established the following principles with respect to ecological buffers (with the exception of the southern zone i.e. Golf Course). Buffers were to consist of a:

- Minimum 30m vegetated inner zone; and
- Maximum 20m outer zone. The outer zone may contain, subject to approval in each case, roads, footpaths and cycle ways, an asset protection zone (APZ), stormwater management and passive recreation areas.

It is therefore proposed, as part of the stage 1 Project Application, that compatible works would be undertaken in the 20m outer buffer. However, to provide for further retention and protection of regenerating heath communities, as shown in Figure 2A (JWA 22nd March 2010), the extent of bulk earthworks and engineering design in the buffers has been minimised as much as is feasible and practicable.

We have reviewed the road/earthworks proposal prepared by Mortons Urban Solutions (Plan no. 12301-ALL-040 Amendment C) with respect to the heath areas shown in Figure 2A (JWA 22nd March 2010). The original plan 2A showing Heath Regeneration and Revegetation Areas is attached as **FIGURE 8 (APPENDIX 2)**. The areas proposed for heath regeneration and revegetation have been revised and are now shown in **FIGURE 9 (APPENDIX 2)**.

It should be noted that continued farming practices (i.e. cattle grazing, periodic slashing etc.) and ongoing weed infestations on the site have resulted in some changes to the heath mapping over the site since 2005. Some areas previously mapped as 'Existing heath to be retained' have become significantly infested with weeds (particularly Slash pine) and

are now mapped as 'Heath to be naturally regenerated'. Conversely, some areas of heath previously mapped as 'Heath to be naturally regenerated' based on 2005 fieldwork are considered to have sufficiently regenerated to now be mapped as 'Existing heath to be retained'.

TABLE 3 below shows a comparison of the 'Heath Regeneration and Revegetation Areas' shown within ecological buffers in the original Figure 2A and the updated version of Figure 2A.

TABLE 3
COMPARISON OF HEATH AREAS WITHIN ECOLOGICAL BUFFERS
BETWEEN FIGURE 2A (MARCH 2010) AND THE UPDATED FIGURE 2A

	Existing heath to be retained within ecological buffers (ha)	Heath to be naturally regenerated within ecological buffers (ha)	Heath to be revegetated within ecological buffers (ha)	TOTAL HEATH AREAS WITHIN ECOLOGICAL BUFFERS (ha)
Figure 2A (March 2010)	0.04	8.16	21.55	29.76
Current Figure 2A (September 2011)	0.34	12.83	19.82	32.99
Net gain/loss	+0.3ha	+4.67ha	-1.73ha	+3.24ha

The re-mapping of the heath communities has resulted in an additional 3.24 ha of heath being retained and protected within the area defined by FIGURE 2A (JWA 22nd March 2010). This additional area of heath is comprised of 0.3 ha of existing heath plus 4.67 ha of heath that will naturally regenerate minus an area of 1.73 previously proposed to be revegetated.

REFERENCES

- Bellairs, S.M. & Bell, D.T. (1993) Seed stores for restoration of species-rich shrubland vegetation following mining in Western Australia. *Restoration Ecology* 1 (pp 231-240).
- Berg, R.Y. (1975) Mymecochorous plants in Australia and their dispersal by ants. *Australian Journal of Botany* 23 (pp – 475-508).
- E par (2009) Review of environmental Management Program Proposed for Kings Forest Golf Course. DRAFT. Prepared for Project 28 Pty Ltd
- Gilbert & Sutherland (2008) Site Based Management Plan Proposed Golf Course Kings Forest Concept Plan. Prepared for Project 28. March 2008.
- Gilbert & Sutherland (July 2012) Erosion & Sediment Control Plan. Kings Forest Stage 1 Project Application. Prepared for Project 28.
- Gilbert & Sutherland (July 2012) Overall Water Management Plan. Kings Forest Stage 1 Project Application. Prepared for Project 28.
- JWA (2009) Buffer Management Plan. Kings Forest. James Warren and Associates. A Report for Project 28 Pty Ltd. August 2009.
- JWA (2012a) Kings Forest Stage 1 Project Application: Precinct 2, 3, 4, 6, 7, 8, 9, 10 & 11 Vegetation Management Plan. James Warren and Associates. A Report for Project 28 Pty Ltd. August 2012.
- JWA (2012b) Kings Forest Stage 1 Project Application: Precinct 2, 3, 4, 6, 7, 8, 9, 10 & 11 Threatened Species Management Plan. James Warren and Associates. A Report for Project 28 Pty Ltd. August 2012.
- JWA (2012c) Kings Forest Stage 1 Project Application: Precinct 2, 3, 4, 6, 7, 8, 9, 10 & 11 Weed Management Plan. James Warren and Associates. A Report for Project 28 Pty Ltd. August 2012.
- JWA (2012d) Kings Forest Stage 1 Project Application: Precinct 2, 3, 4, 6, 7, 8, 9, 10 & 11 Vegetation Management Plan. James Warren and Associates. A Report for Project 28 Pty Ltd. August 2012.
- JWA (2012e) Kings Forest Stage 1 Project Application: Precinct 2, 3, 4, 6, 7, 8, 9, 10 & 11 Threatened Species Management Plan. James Warren and Associates. A Report for Project 28 Pty Ltd. August 2012.
- JWA (2012f) Kings Forest Stage 1 Project Application: Precinct 2, 3, 4, 6, 7, 8, 9, 10 & 11 Weed Management Plan. James Warren and Associates. A Report for Project 28 Pty Ltd. August 2012.
- JWA (2012g) Kings Forest Stage 1 Project Application Feral Animal Management Plan. James Warren and Associates. A Report for Project 28 Pty Ltd. August 2012.
- JWA (2012h) Kings Forest Stage 1 Project Application: Koala Plan of Management. James Warren and Associates. A Report for Project 28 Pty Ltd. August 2012.
- Koch, J.M. & Ward, S.C. (1994) Establishment of understorey vegetation for rehabilitation of bauxite mined areas in the jarrah forest of Western Australia. *Journal of Environmental Management* 41 (pp 1-15).
- Koch, J.M., Ward, S.C., Grant, C.D. & Ainsworth, G.L. (1996) Effects of bauxite mine restoration operations on topsoil seed reserves in jarrah forest of Western Australia. *Restoration Ecology* 4 (pp 368-376).
- Mahesh, M.Q., Upadhyaya, M.K. & Turkington, R. (1996) Dynamics of seedbank and survivorship of meadow salsify (*Tragopogon pratensis*) populations. *Weed Science* 44 (pp 100-108).
- Putwain, P.D. & Gillham, D.A. (1990) The significance of the dormant viable seedbank in the restoration of heathlands. *Biological Conservation* 52 (pp 1-16).
- Rokich, D.P., Dixon, K.W., Sivasithamparam, K. & Meney, K.A. (2000) Topsoil handling and storage effects on woodland restoration in Western Australia. *Restoration Ecology* 8:2 (pp 196-208).
- Thom, R.M. (1997). System-development matrix for adaptive management of coastal ecosystem restoration projects. *Ecol. Eng.* 8, pp. 219–232.
- Ward, S.C., Koch, J.M. & Ainsworth, G.L. (1996) The effect of timing of rehabilitation procedures on the establishment of a jarrah forest after bauxite mining. *Restoration Ecology* 4 (pp 19-24).

APPENDIX 1 – COMPENSATORY HABITAT AREAS

TABLE 1
COMPENSATORY HABITAT AREA CALCULATIONS

Koala Food Tree Planting Areas	Area (ha)
Koala Food Tree Planting Areas - Site excluding golf course	60.48
Koala Food Tree Planting Areas - Golf course only	10.64
Koala Food Tree Planting Areas - TOTAL	71.12

Wallum Sedge Frog Compensatory Habitat	Area (ha)
Wallum Sedge Frog Compensatory Habitat - Site excluding golf course	32.40
Wallum Sedge Frog Compensatory Habitat - Golf course only	6.90
Wallum Sedge Frog Compensatory Habitat - TOTAL	39.30

Wallum Froglet Compensatory Habitat	Area (ha)
Wallum Froglet Compensatory Habitat - Site	9.47
Wallum Froglet Compensatory Habitat - TOTAL	9.47

Heath Rehabilitation	Area (ha)
Heath to be Naturally Regenerated	42.19
Heath to be Revegetated	69.02
Heath Rehabilitation - TOTAL	111.21

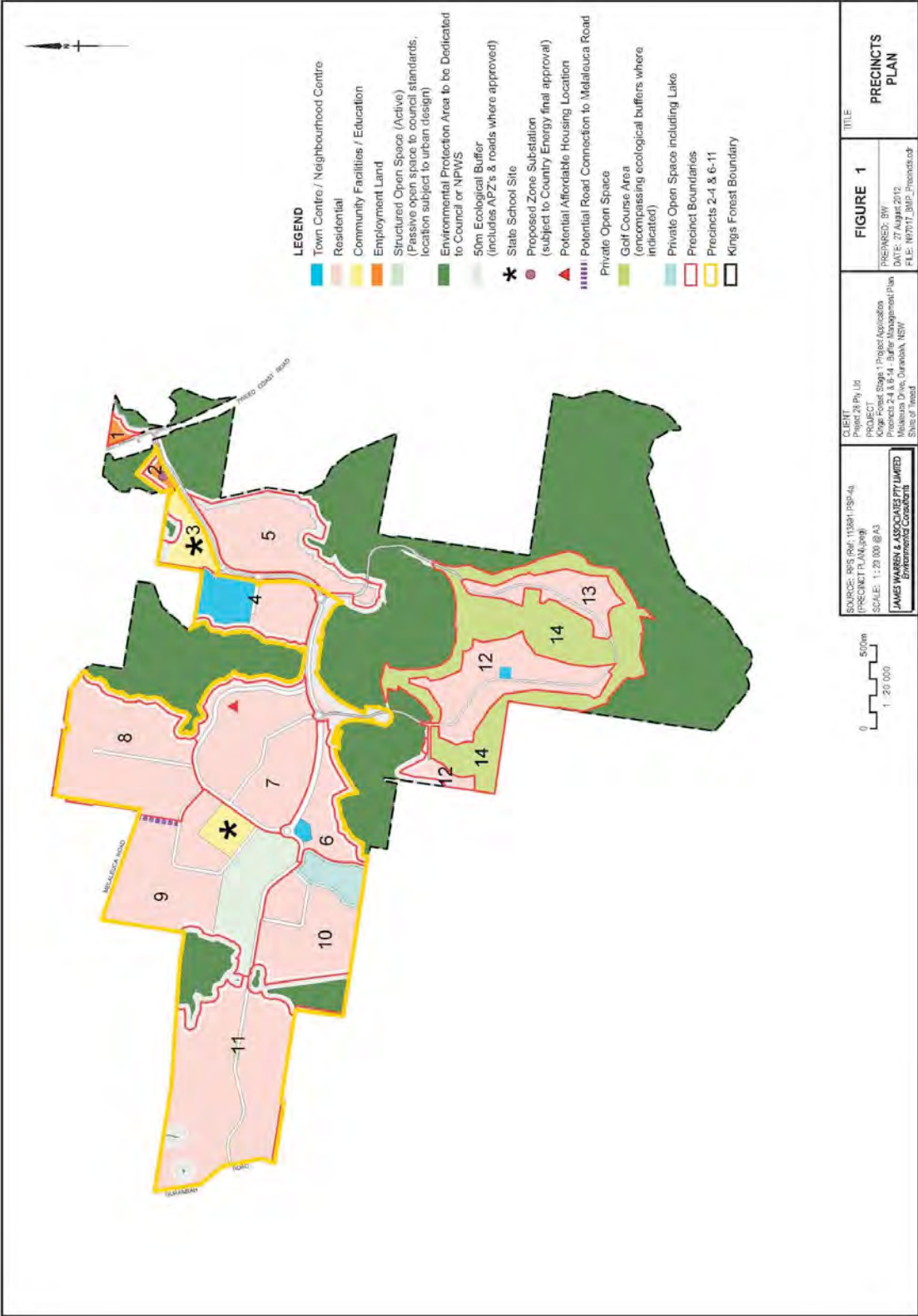
Overlapping Areas	Area (ha)
Overlapping areas of Wallum Sedge Frog, Koala and Heath Compensatory Habitat	40.24
Areas designated for Koala Compo Habitat & Heath Reveg only	10.21
Areas designated for Koala Compo Habitat & Heath Regen only	14.82
Areas designated for Koala Compensatory Habitat only (no overlap)	6.19
Areas designated for Heath Revegetation only (no overlap)	24.74
Areas designated for Heath Regeneration only (no overlap)	21.69

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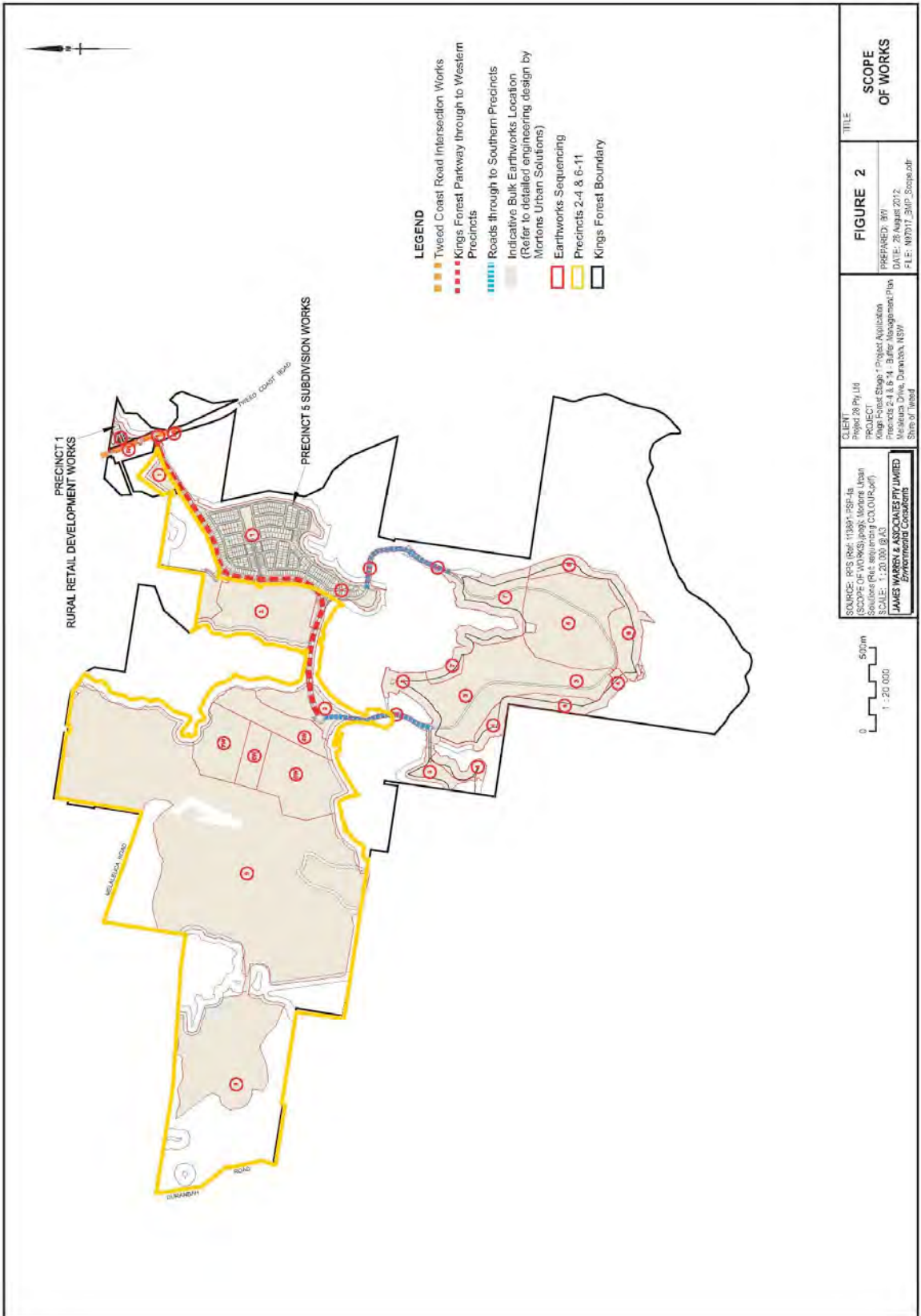
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16-28

APPENDIX 2 – FIGURES



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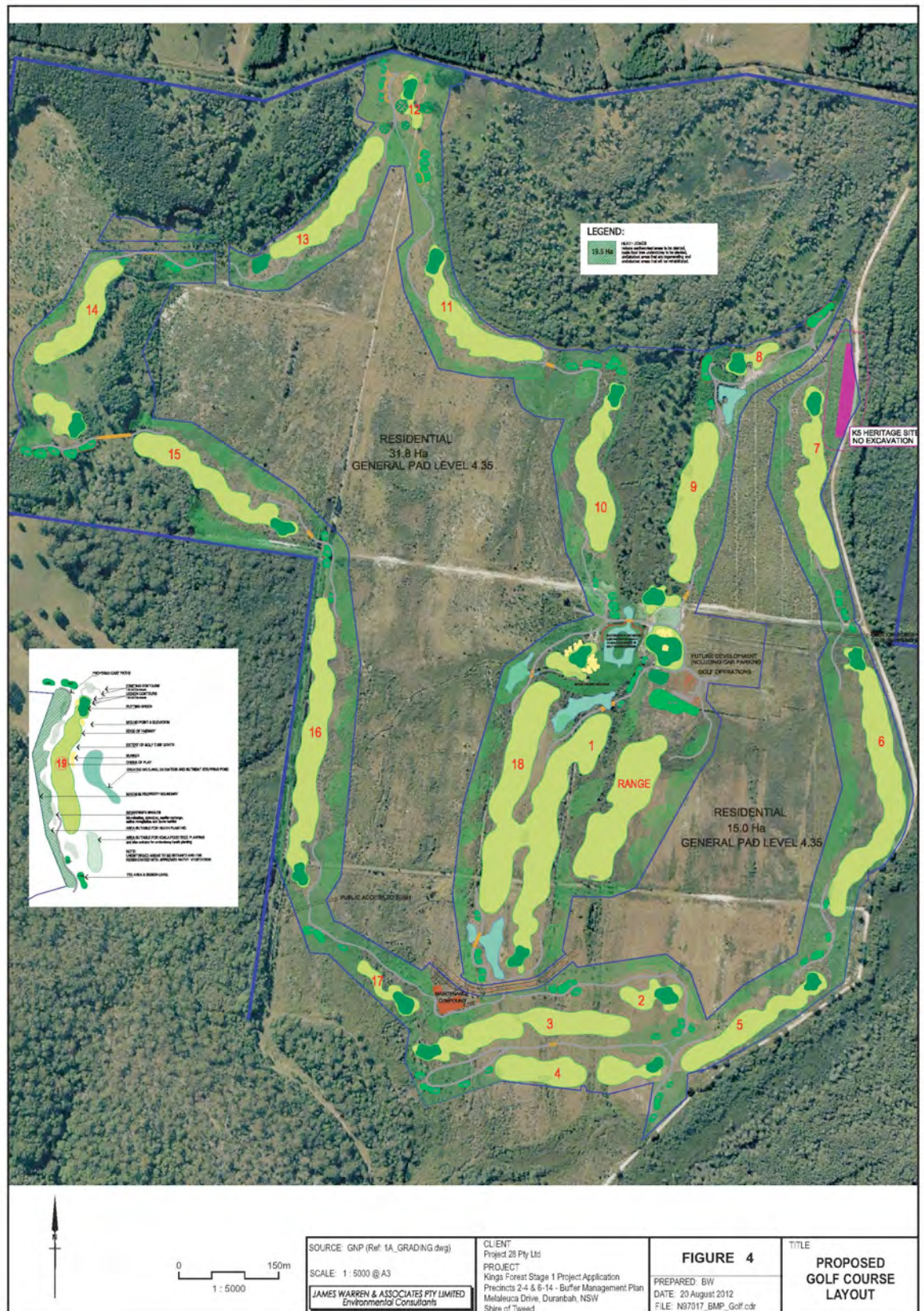


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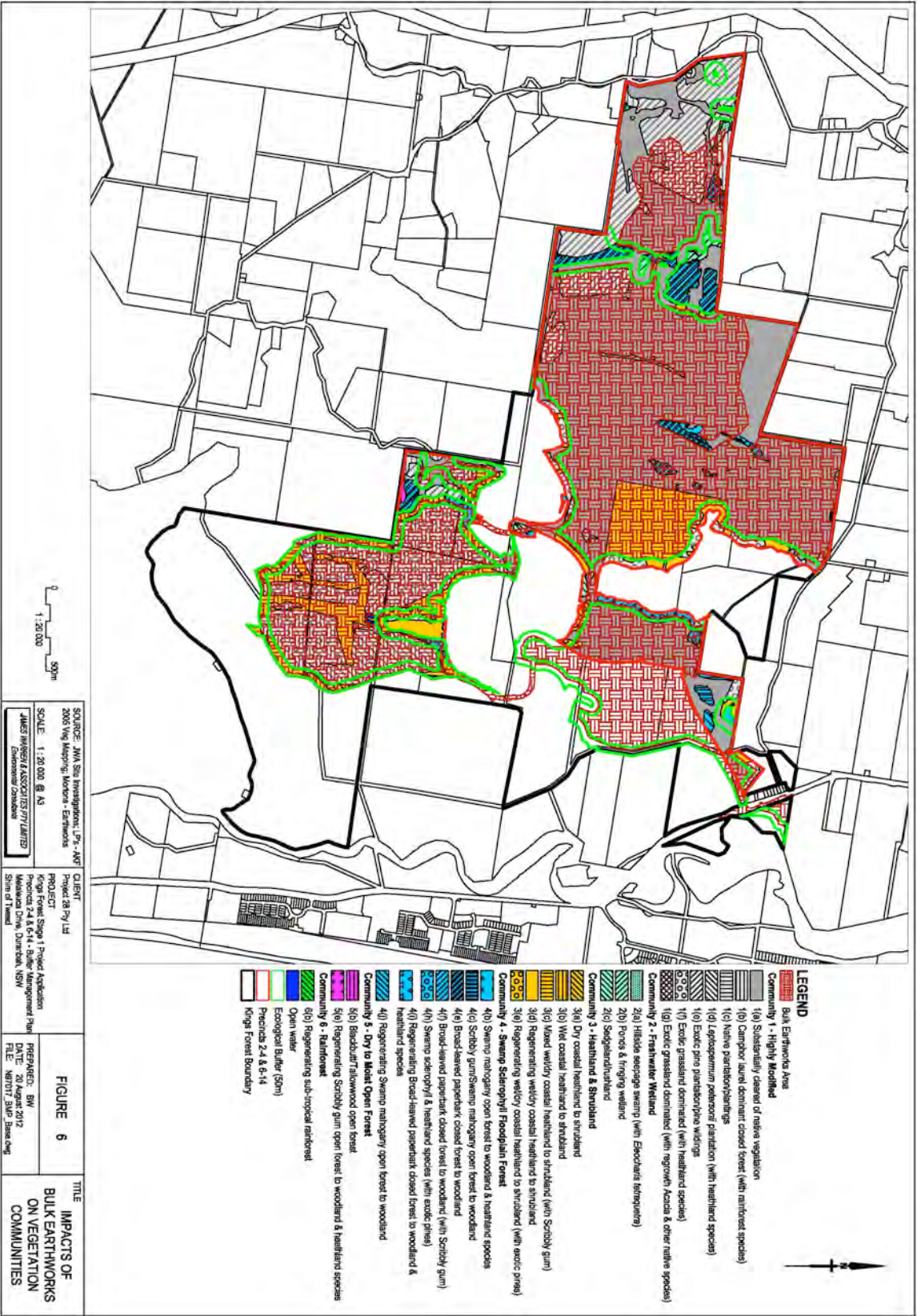
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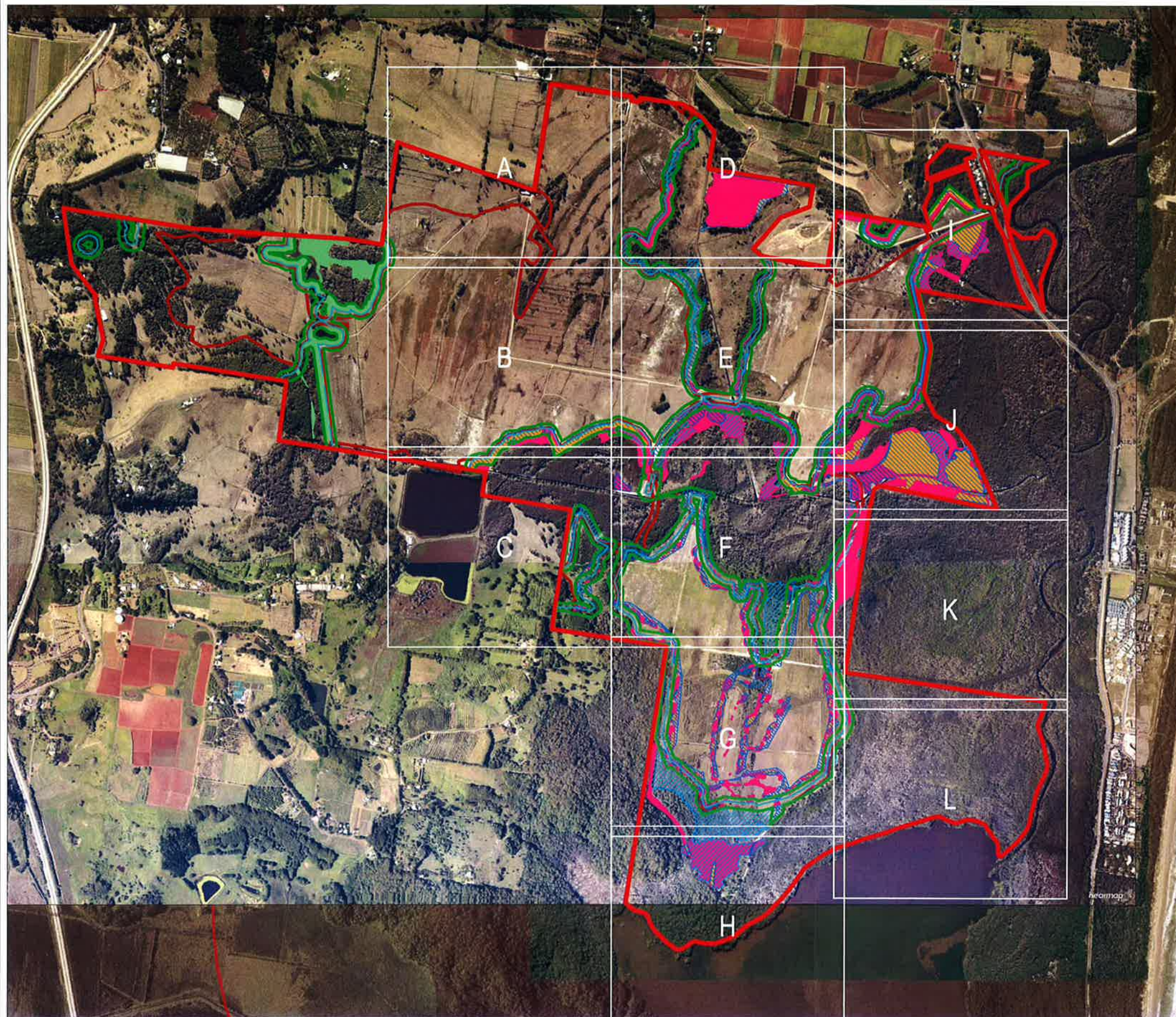
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16-32



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LEGEND

- Heath to be Naturally Regenerated
- Heath to be Revegetated
- Wallum Sedge Frog Compensatory Habitat
- Wallum Froglet Compensatory Habitat
- Koala Food Tree Planting Areas
- Ecological Buffer (50m)
- Inner APZ (30m)
- Extent of Bulk Earthworks
- Kings Forest Boundary

0 500m
1 : 20 000

SOURCE: JWA Site Investigations; Near Map
June 2011 Aerial Photo; LandPartner's 2007
Aerial Photo

SCALE: 1 : 20 000 @ A3

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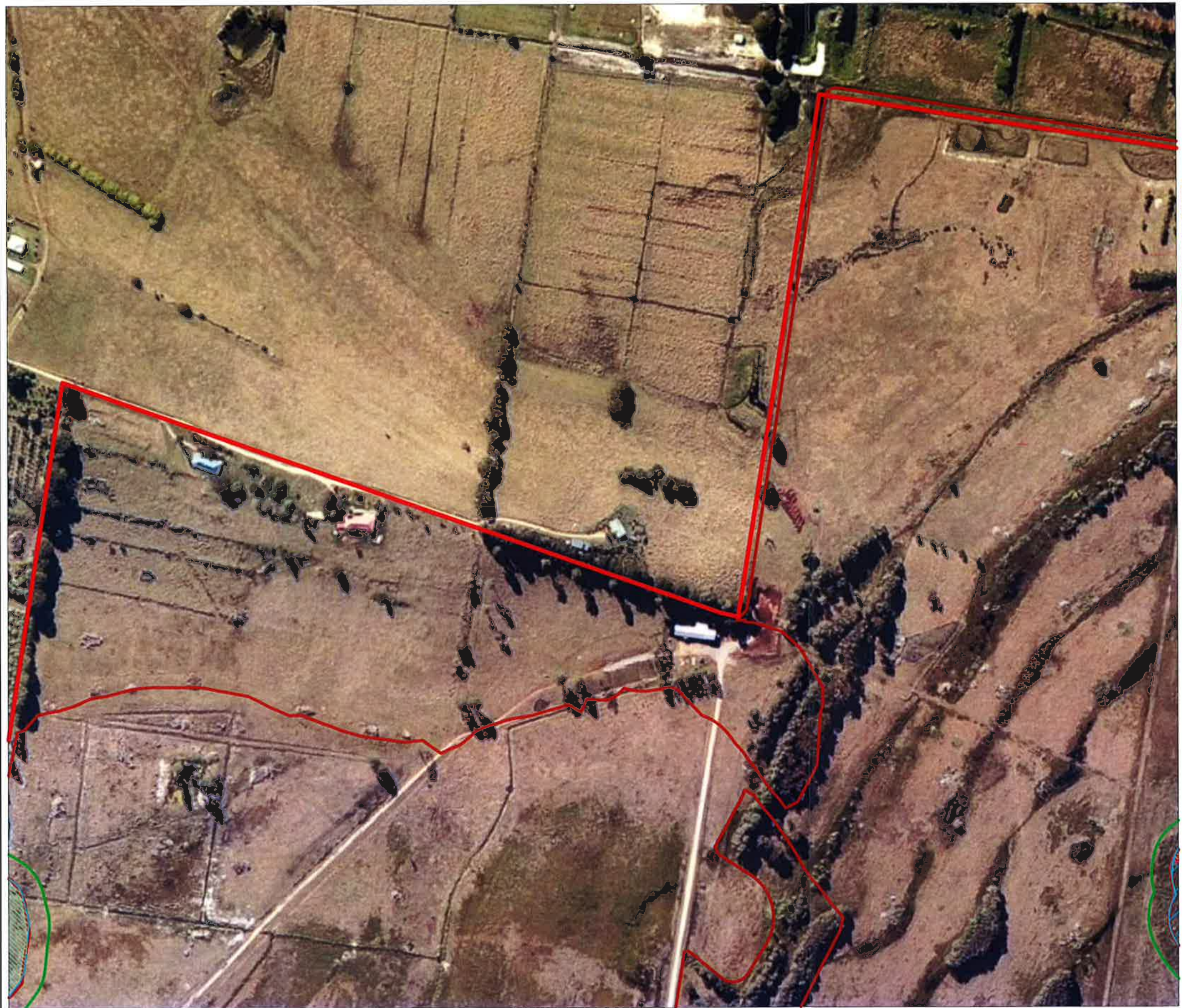
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Melaleuca Drive, Duranbah, NSW
Shire of Tweed

FIGURE 7

PREPARED: BW
DATE: 17 October 2012
FILE: N87017_BMP_Base.dwg

TITLE

PROPOSED
COMPENSATORY
HABITAT



- LEGEND**
- Heath to be Naturally Regenerated
 - Heath to be Revegetated
 - Wallum Sedge Frog Compensatory Habitat
 - Wallum Froglet Compensatory Habitat
 - Koala Food Tree Planting Areas
 - Ecological Buffer (50m)
 - Inner APZ (30m)
 - Extent of Bulk Earthworks
 - Kings Forest Boundary

0 50m 100m
1:4000

SOURCE: JWA Site Investigations; Near Map
June 2011 Aerial Photo; LandPartner's 2007
Aerial Photo

SCALE: 1:4000 @ A3

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Shire of Tweed

FIGURE 7A
PREPARED: BW
DATE: 17 October 2012
FILE: N97017_BMP_Base.dwg

TITLE
PROPOSED
COMPENSATORY
HABITAT



LEGEND

- Heath to be Naturally Regenerated
- Heath to be Revegetated
- Wallum Sedge Frog Compensatory Habitat
- Wallum Froglet Compensatory Habitat
- Koala Food Tree Planting Areas
- Ecological Buffer (50m)
- Inner APZ (30m)
- Extent of Bulk Earthworks
- Kings Forest Boundary

0 50m 100m
1:4000

SOURCE: JWA Site Investigations; Near Map
June 2011 Aerial Photo; LandPartner's 2007
Aerial Photo
SCALE: 1:4000 @ A3
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Melaleuca Drive, Durambah, NSW
Shire of Tweed

FIGURE 7B
PREPARED: BW
DATE: 17 October 2012
FILE: N97017_BMP_Base.dwg

TITLE
PROPOSED
COMPENSATORY
HABITAT



- LEGEND**
- Heath to be Naturally Regenerated
 - Heath to be Revegetated
 - Wallum Sedge Frog Compensatory Habitat
 - Koala Food Tree Planting Areas
 - Ecological Buffer (50m)
 - Inner APZ (30m)
 - Extent of Bulk Earthworks
 - Kings Forest Boundary

0 50m 100m
1:4000

SOURCE: JWA Site Investigations; Near Map June 2011 Aerial Photo; LandPartner's 2007 Aerial Photo SCALE: 1:4000 @ A3 JAMES WARREN & ASSOCIATES PTY LIMITED Environmental Consultants	CLIENT Project 28 Pty Ltd PROJECT Kings Forest Stage 1 Project Application Precinct 2-4 & 6-14 - Buffer Management Plan Melaleuca Drive, Duranbah, NSW Shire of Tweed	FIGURE 7C	TITLE PROPOSED COMPENSATORY HABITAT
		PREPARED: BW DATE: 17 October 2012 FILE: N97017_BMP_Base.dwg	



LEGEND

- Heath to be Naturally Regenerated
- Heath to be Revegetated
- Wallum Sedge Frog Compensatory Habitat
- Koala Food Tree Planting Areas
- Ecological Buffer (50m)
- Inner APZ (30m)
- Extent of Bulk Earthworks
- Kings Forest Boundary

0 50m 100m
1:4000

SOURCE: JWA Site Investigations; Near Map
June 2011 Aerial Photo; LandPartner's 2007
Aerial Photo

SCALE: 1:4000 @ A3

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Precinct 2-4 & 6-14 - Buffer Management Plan
Melaleuca Drive, Duranbah, NSW
Shire of Tweed

FIGURE 7D

PREPARED: BW
DATE: 17 October 2012
FILE: N97017_BMP_Base.dwg

TITLE

PROPOSED
COMPENSATORY
HABITAT



LEGEND

- Heath to be Naturally Regenerated
- Heath to be Revegetated
- Wallum Sedge Frog Compensatory Habitat
- Koala Food Tree Planting Areas
- Ecological Buffer (50m)
- Inner APZ (30m)
- Extent of Bulk Earthworks
- Kings Forest Boundary



0 50m 100m
1:4000

SOURCE: JWA Site Investigations; Near Map
June 2011 Aerial Photo; LandPartner's 2007
Aerial Photo

SCALE: 1:4000 @ A3

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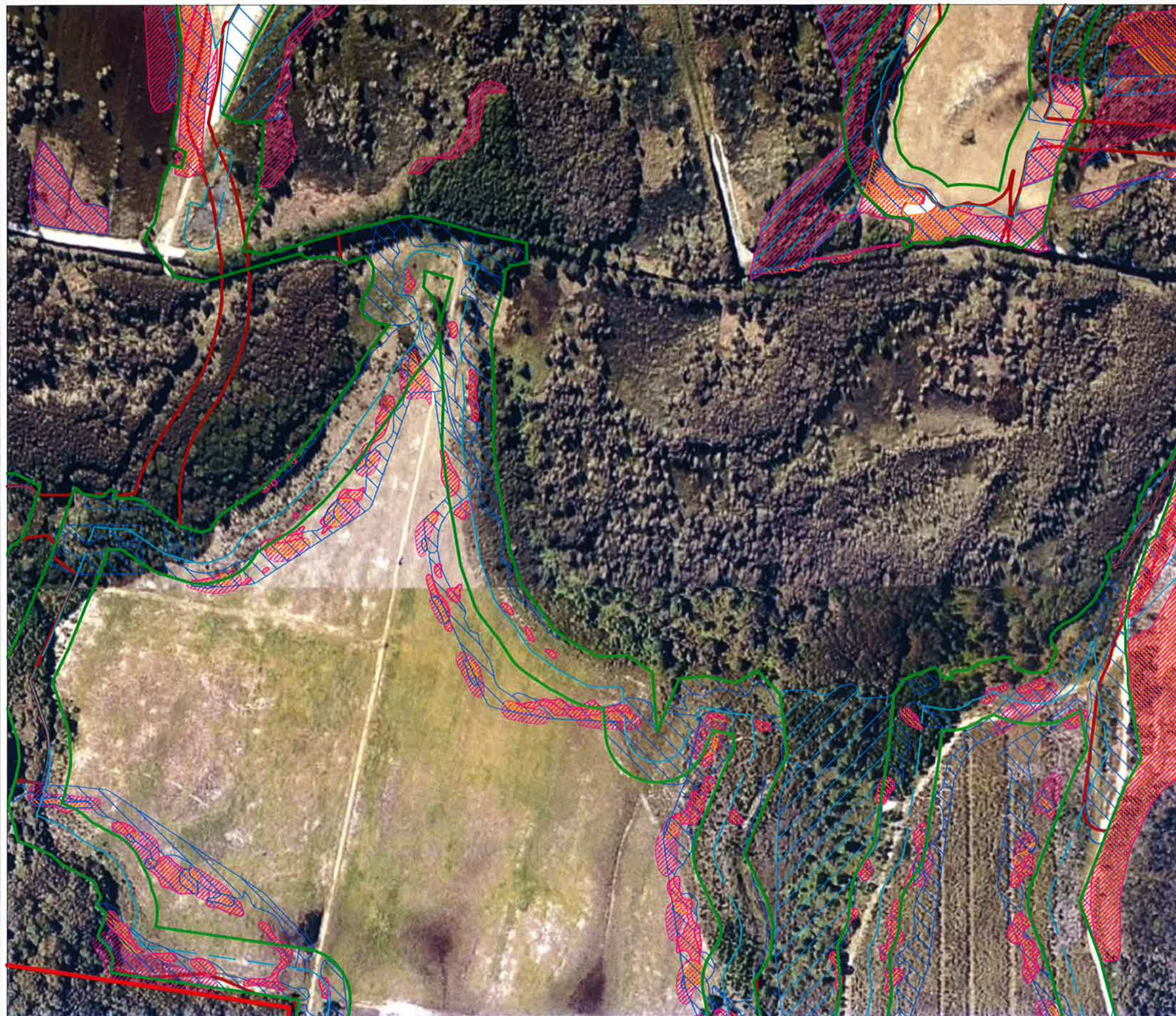
CLIENT
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Melaleuca Drive, Duranbah, NSW
Shire of Tweed

FIGURE 7E

PREPARED: BW
DATE: 17 October 2012
FILE: N97017_BMP_Base.dwg

TITLE

PROPOSED
COMPENSATORY
HABITAT



LEGEND

- Heath to be Naturally Regenerated
- Heath to be Revegetated
- Wallum Sedge Frog Compensatory Habitat
- Koala Food Tree Planting Areas
- Ecological Buffer (50m)
- Inner APZ (30m)
- Extent of Bulk Earthworks
- Kings Forest Boundary



0 50m 100m
1 : 4000

SOURCE: JWA Site Investigations; Near Map
June 2011 Aerial Photo; LandPartner's 2007
Aerial Photo

SCALE: 1 : 4000 @ A3

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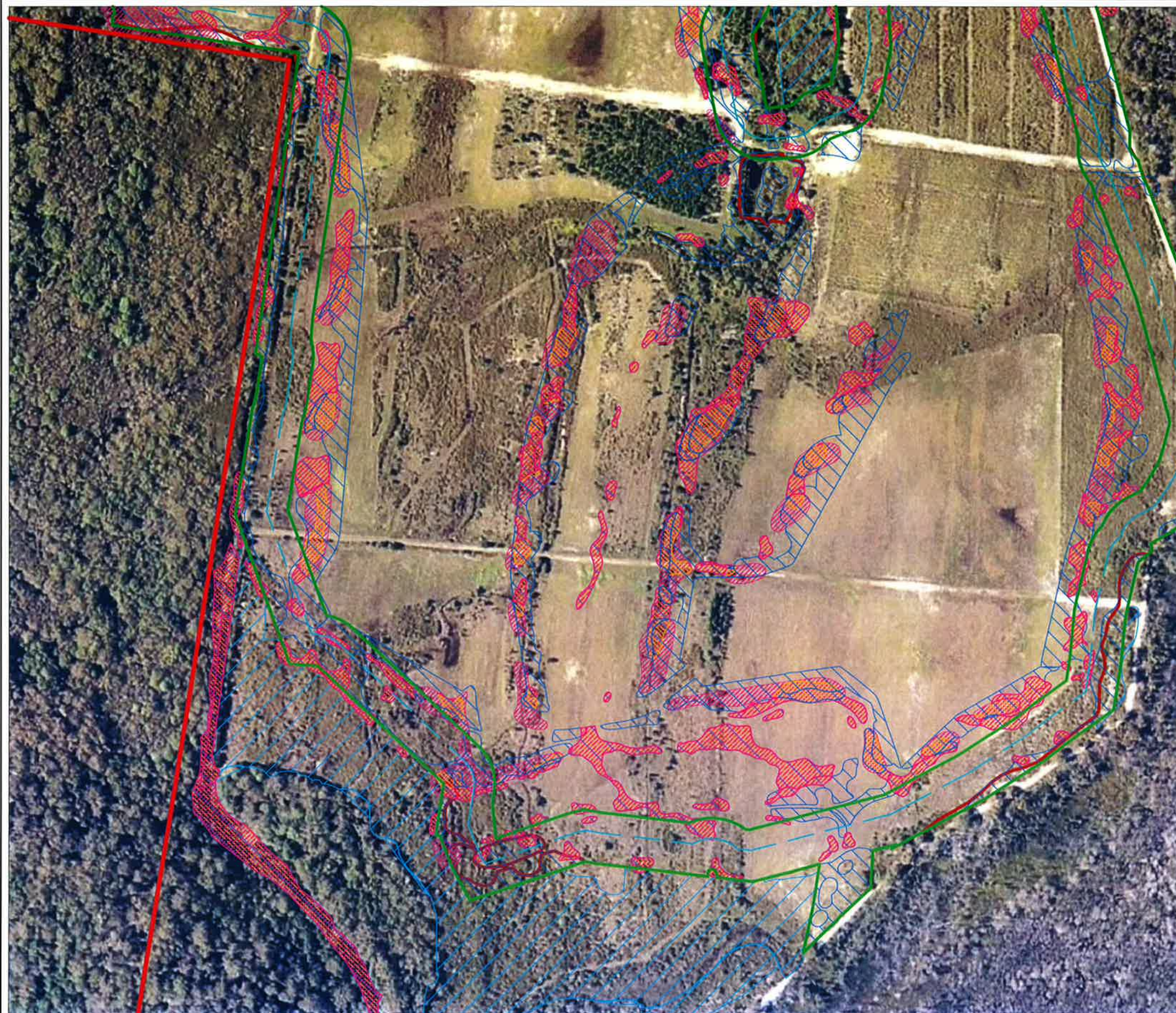
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Melaleuca Drive, Duranbah, NSW
Shire of Tweed

FIGURE 7F

PREPARED: BW
DATE: 17 October 2012
FILE: N97017_BMP_Base.dwg

TITLE

PROPOSED
COMPENSATORY
HABITAT



LEGEND

- Heath to be Naturally Regenerated
- Heath to be Revegetated
- Wallum Sedge Frog Compensatory Habitat
- Koala Food Tree Planting Areas
- Ecological Buffer (50m)
- Inner APZ (30m)
- Extent of Bulk Earthworks
- Kings Forest Boundary



0 50m 100m
1 : 4000

SOURCE: JWA Site Investigations; Near Map
June 2011 Aerial Photo; LandPartner's 2007
Aerial Photo

SCALE: 1 : 4000 @ A3

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Shire of Tweed

FIGURE 7G

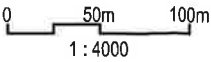
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TITLE

PROPOSED
COMPENSATORY
HABITAT



- LEGEND**
- Heath to be Naturally Regenerated
 - Heath to be Revegetated
 - Wallum Sedge Frog Compensatory Habitat
 - Koala Food Tree Planting Areas
 - Ecological Buffer (50m)
 - Inner APZ (30m)
 - Extent of Bulk Earthworks
 - Kings Forest Boundary



SOURCE: JWA Site Investigations; Near Map
June 2011 Aerial Photo; LandPartner's 2007
Aerial Photo

SCALE: 1 : 4000 @ A3

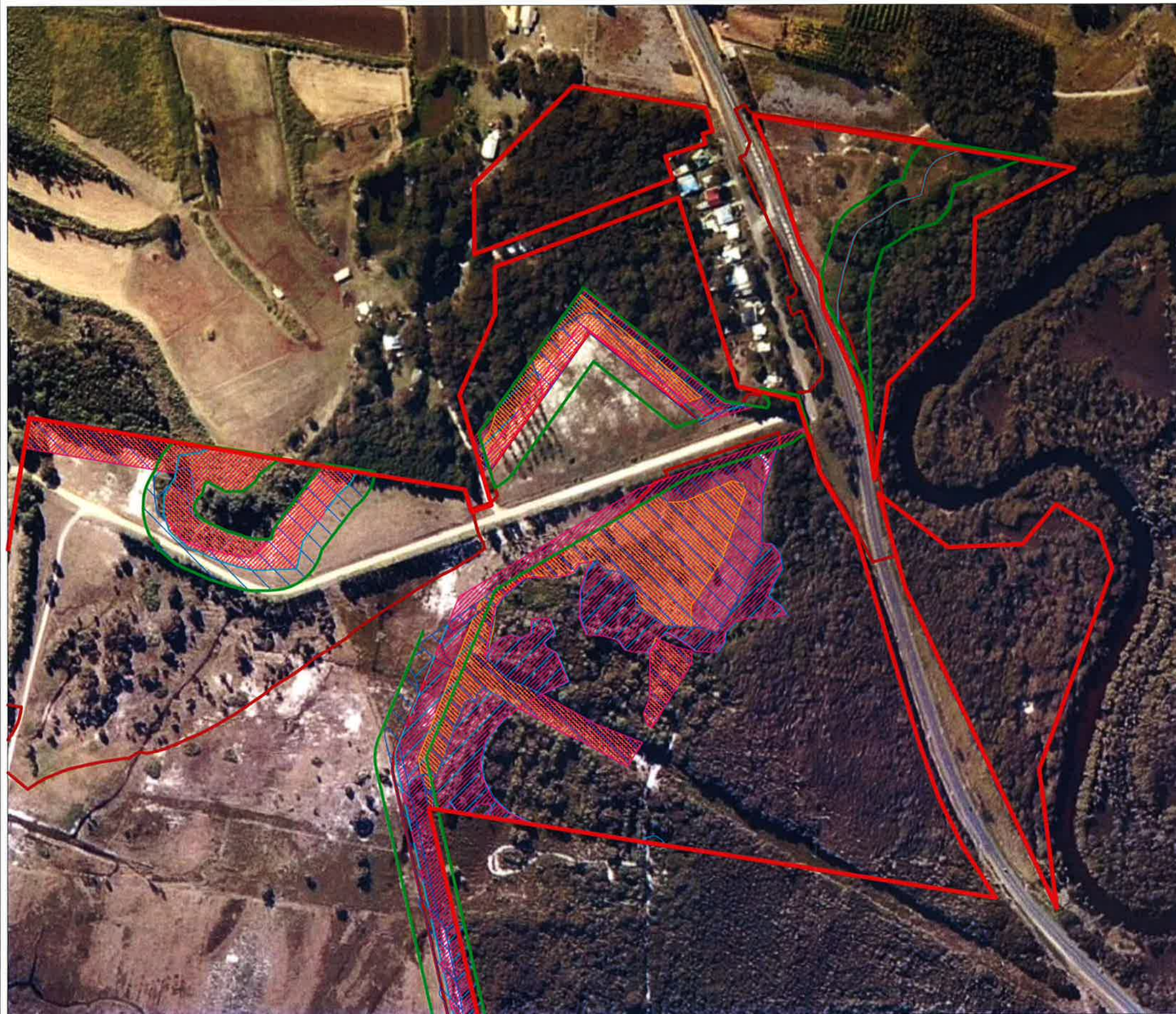
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Melaleuca Drive, Duranbah, NSW
Shire of Tweed

FIGURE 7H

PREPARED: BW
DATE: 17 October 2012
FILE: N97017_BMP_Base.dwg

TITLE
**PROPOSED
COMPENSATORY
HABITAT**



LEGEND

- Heath to be Naturally Regenerated
- Heath to be Revegetated
- Wallum Sedge Frog Compensatory Habitat
- Koala Food Tree Planting Areas
- Ecological Buffer (50m)
- Inner APZ (30m)
- Extent of Bulk Earthworks
- Kings Forest Boundary



0 50m 100m
1:4000

SOURCE: JWA Site Investigations; Near Map
June 2011 Aerial Photo; LandPartner's 2007
Aerial Photo

SCALE: 1:4000 @ A3

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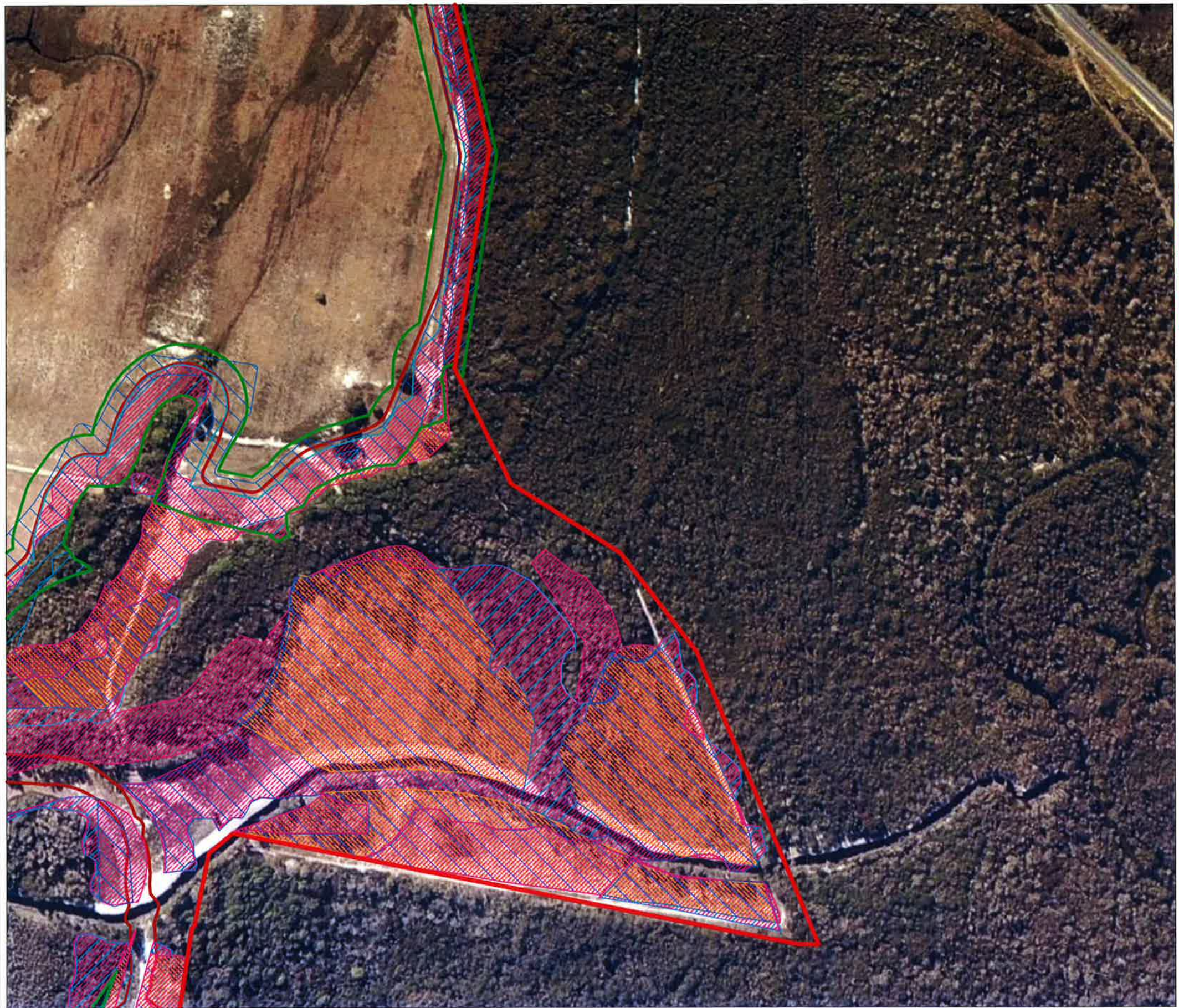
CLIENT
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Kings Forest Stage 1 Project Application
Precinct 2-4 & 6-14 - Buffer Management Plan
Melaleuca Drive, Durambah, NSW
Shire of Tweed

FIGURE 71

PREPARED: BW
DATE: 17 October 2012
FILE: N97017_BMP_Base.dwg

TITLE

PROPOSED
COMPENSATORY
HABITAT



- LEGEND**
- Heath to be Naturally Regenerated
 - Heath to be Revegetated
 - Wallum Sedge Frog Compensatory Habitat
 - Koala Food Tree Planting Areas
 - Ecological Buffer (50m)
 - Inner APZ (30m)
 - Extent of Bulk Earthworks
 - Kings Forest Boundary



SOURCE: JWA Site Investigations; Near Map June 2011 Aerial Photo; LandPartner's 2007 Aerial Photo SCALE: 1:4000 @ A3 JAMES WARREN & ASSOCIATES PTY LIMITED Environmental Consultants	CLIENT Project 28 Pty Ltd PROJECT Kings Forest Stage 1 Project Application Precinct 2-4 & 6-14 - Buffer Management Plan Melaleuca Drive, Duranbah, NSW Shire of Tweed	FIGURE 7J	TITLE PROPOSED COMPENSATORY HABITAT
		PREPARED: BW DATE: 17 October 2012 FILE: N97017_BMP_Base.dwg	



- LEGEND**
- Heath to be Naturally Regenerated
 - Heath to be Revegetated
 - Wallum Sedge Frog Compensatory Habitat
 - Koala Food Tree Planting Areas
 - Ecological Buffer (50m)
 - Inner APZ (30m)
 - Extent of Bulk Earthworks
 - Kings Forest Boundary

0 50m 100m
1 : 4000

SOURCE: JWA Site Investigations; Near Map
June 2011 Aerial Photo; LandPartner's 2007
Aerial Photo

SCALE: 1 : 4000 @ A3

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Precinct 2-4 & 6-14 - Buffer Management Plan
Melaleuca Drive, Duranbah, NSW
Shire of Tweed

FIGURE 7K

PREPARED: BW
DATE: 17 October 2012
FILE: N97017_BMP_Base.dwg

TITLE

PROPOSED
COMPENSATORY
HABITAT



LEGEND

- Heath to be Naturally Regenerated
- Heath to be Revegetated
- Wallum Sedge Frog Compensatory Habitat
- Koala Food Tree Planting Areas
- Ecological Buffer (50m)
- Inner APZ (30m)
- Extent of Bulk Earthworks
- Kings Forest Boundary

0 50m 100m
1 : 4000

SOURCE: JWA Site Investigations; Near Map
June 2011 Aerial Photo; LandPartner's 2007
Aerial Photo

SCALE: 1 : 4000 @ A3

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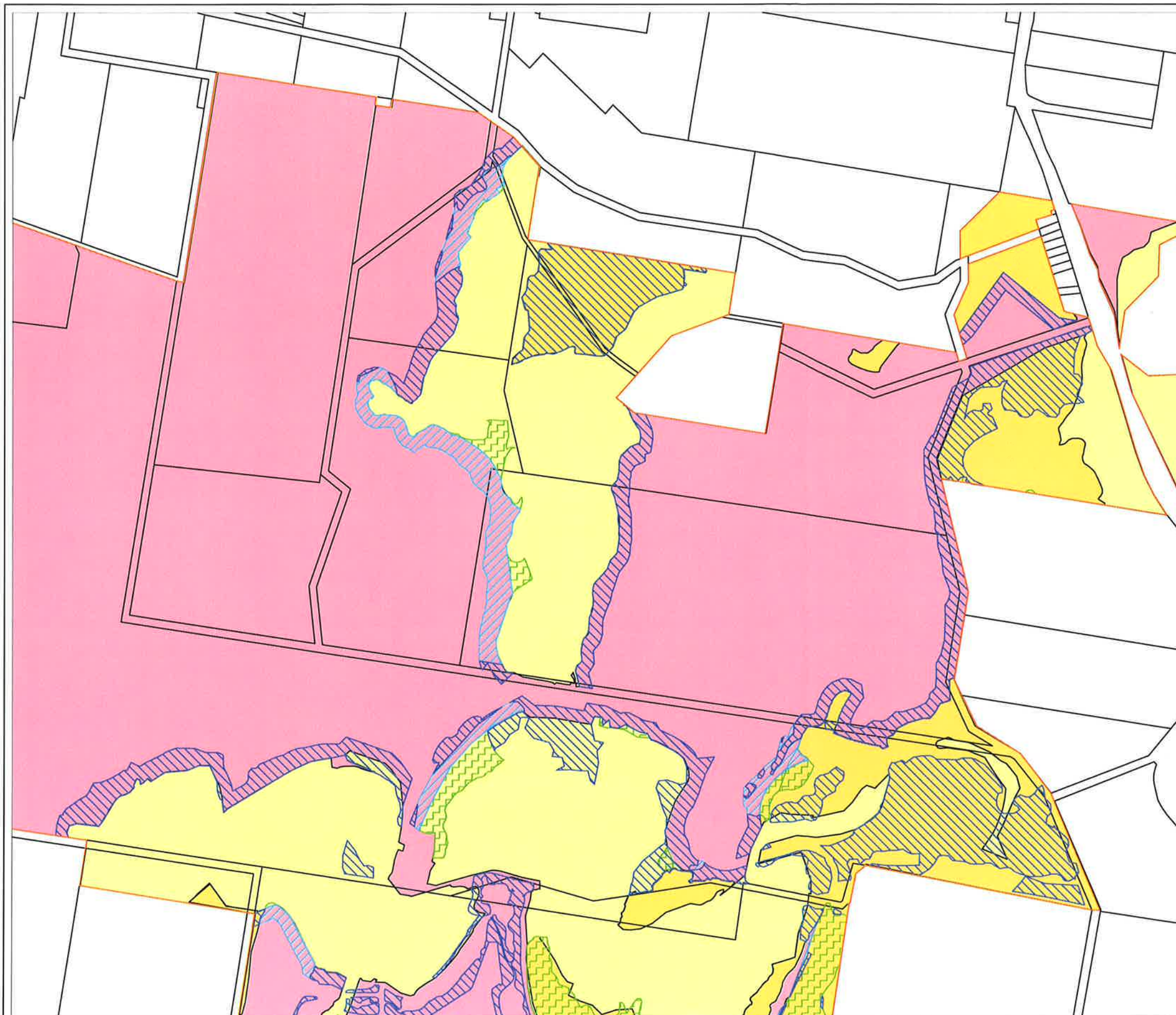
CLIENT
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Precinct 2-4 & 6-14 - Buffer Management Plan
Melaleuca Drive, Duranbah, NSW
Shire of Tweed

FIGURE 7L

PREPARED: BW
DATE: 17 October 2012
FILE: N97017_BMP_Base.dwg

TITLE

PROPOSED
COMPENSATORY
HABITAT



LEGEND

- Existing Heathland & Shrubland to be retained within Environmental Protection Zones (7.08ha)
- Heath to be Naturally Regenerated (8.46ha)
- Heath to be Revegetated (53.279ha)
- 2c Urban Expansion
- 7a Environmental Protection - Wetlands & Littoral Rainforests
- 7i Environmental Protection - Habitat
- Kings Forest Boundary

0 250m
1:10 000

SOURCE: JWA Site Investigations;
Landpartners (Ref: 00001056_C7_
PL4D Proposed Zoning Plan 11.03.08)
SCALE: 1:10 000 @ A3

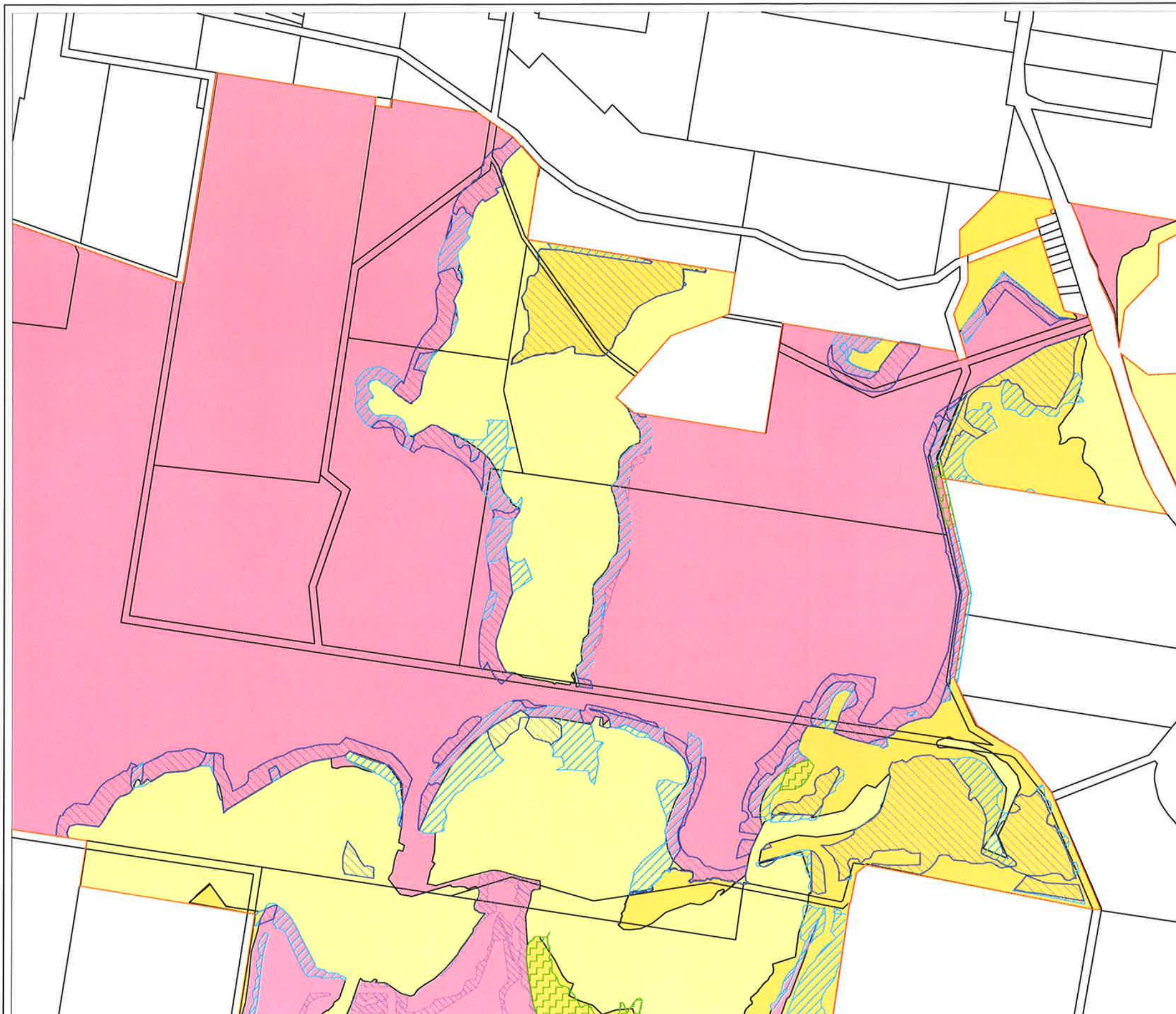
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Precincts 2-4 & 6-14 - Buffer Management Plan
Melaleuca Drive, Duranbah, NSW
Shire of Tweed

FIGURE 8

PREPARED: BW
DATE: 20 August 2012
FILE: N97017_Base.dwg

TITLE
2010 HEATH
REGENERATION
& REVEGETATION
AREAS



LEGEND

- Existing Heathland & Shrubland to be retained within Environmental Protection Zones (2.07ha)
- Heath to be Naturally Regenerated (24.79ha)
- Heath to be Revegetated (41.67ha)
- 2c Urban Expansion
- 7a Environmental Protection - Wetlands & Littoral Rainforests
- 7i Environmental Protection - Habitat
- Kings Forest Boundary

0 250m
1 : 10 000

SOURCE: JWA Site Investigations;
Landpartners (Ref: 00001056_C7_
PL4D Proposed Zoning Plan 11.03.08)

SCALE: 1 : 10 000 @ A3

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Kings Forest Stage 1 Project Application
Precincts 2-4 & 6-14 - Buffer Management Plan
Melaleuca Drive, Duranbah, NSW
Shire of Tweed

FIGURE 9

PREPARED: BW
DATE: 20 August 2012
FILE: N97017_Base.dwg

TITLE
REVISED HEATH
REGENERATION
& REVEGETATION
AREAS