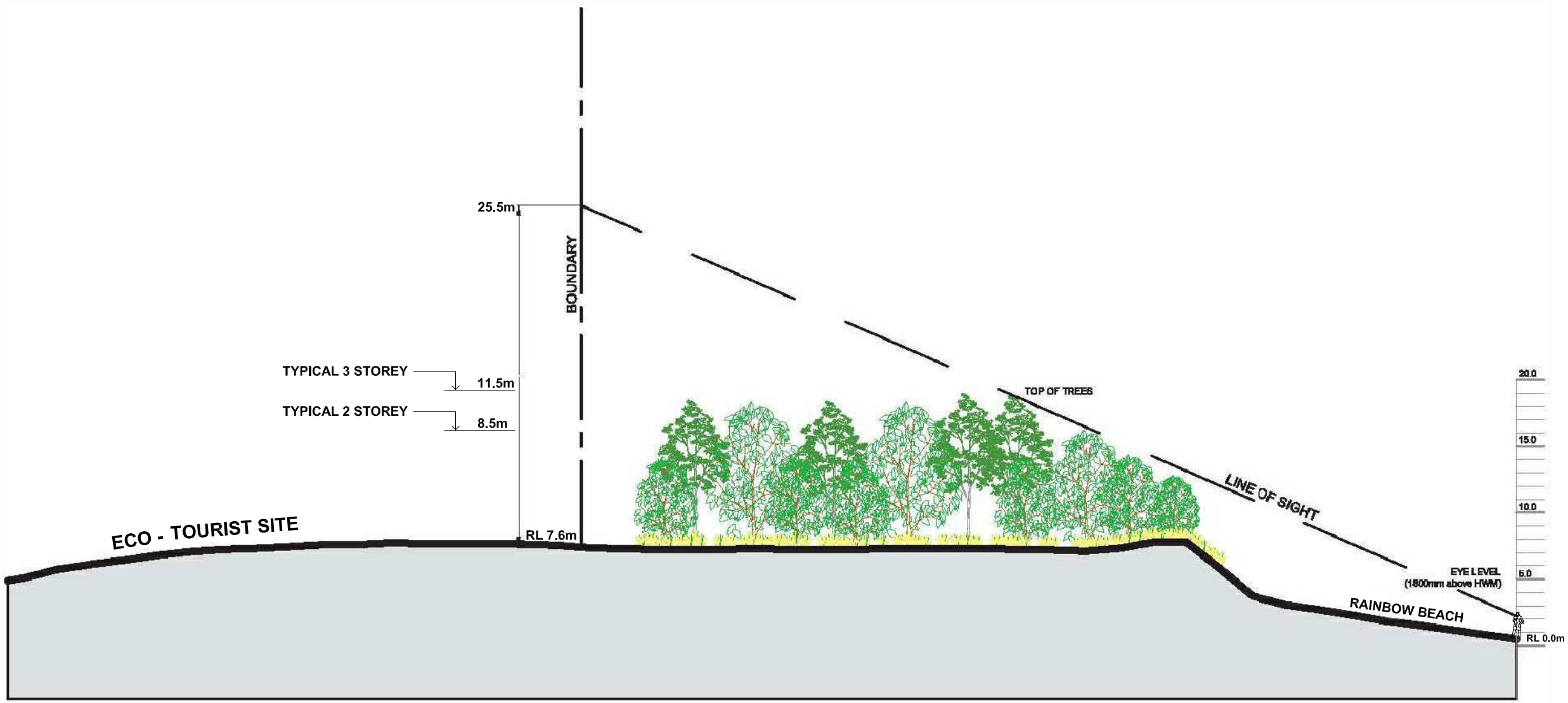
FIGURE 26

CROSS SECTION FROM RAINBOW BEACH



SECTION - FROM RAINBOW BEACH TO PROPERTY BOUNDARY

Rainbow Beach Estate

Concept Plan Application Set

Job. No. 4509:ND Dwn: CM

Luke and Company Pty Ltd

SCALE:
1:20000@A3 1:10000@A1

The stated scale of this drawing maybe altered by copying. The scale should be verified prior to deriving measurements from this drawing

0 100 200 300 400 1000(M)

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KEY ISSUES & ENVIRONMENTAL ASSESSMENT

6 Key Issues & Environmental Assessment

This section of the report considers the Key Issues identified in the Director General's Requirements. The DGR Key Issues are considered in the context of the existing environment of the property, the locality, and the potential impact of the future landuse units identified in the Concept Plan.

The subject land has been the focus of a number of investigations over a period of more than ten years. This includes environmental surveys undertaken in the preparation of a development application for the 'International Sports Centre', including golf course, as well as investigations commissioned by Port Macquarie – Hastings Council for the preparation of the Area 14 Structure Plan.

Therefore, it seems reasonable to assume that the environmental attributes of the subject land are reasonably well known by this time.

Figure 27 shows a variety of photos taken over the subject land. This shows the cleared nature of the majority of the property.

6.1 Landuse Pattern

This section considers the locality of the subject land, and considers the integration and compatibility of the Concept Plan land uses with the existing and future landuses of adjoining and adjacent land. This addresses the requirements of the following DGRs:

DGR 1.1 Provide a structure plan for the site that identifies the location of proposed landuses, densities, road and open space networks, town / neighbourhood centres, urban design principles, schools, playing fields, constructed wetland and tourist site.

DGR 1.3 Consider the integration and compatibility of the proposed land uses (schools, retail / business centre, residential properties, tourist site) across the site with regard to access arrangements, traffic, environmental buffers, density controls and suitability of the landuse with surrounding development.

DGR 1.5 Identify any potential impacts of the development on adjoining rural lands and if necessary, appropriate mitigation measures.

The subject land is in a locality which is either currently developed for urban development, or has been identified for future urban development. Eventually, the land will be almost surrounded by residential development.

The properties to the northwest, which are currently zoned rural, are predominantly used for rural residential style development. These properties were identified as Stage 1A of the new urban land releases under the Area 14 Structure Plan and are the subject of an ongoing environmental study to support a future residential zoning of the land.

The land to the northeast has been vacant for an extensive period of time. This land contains coastal vegetation identified under the provisions of SEPP 26 (Littoral Rainforest). This northern property is the subject of a Project Application under

Part 3A of the Act, and is also the subject of a rezoning application. The land to the west is also identified for future residential development. The land contains dwellings on rural zoned properties. There is also a long established motel. A large property has recently been approved for a manufactured housing estate, which is permissible within the existing rural zone.

A summary of the existing and identified future landuses in the locality of the subject land are shown in Figure 28.

Therefore, it may be seen that the subject land is predominantly adjoining or adjacent to land which is either currently zoned for urban development, or is in the process of being investigated for urban development.

The Area 14 Structure Plan, which identified areas likely to be suitable for residential development, considered the integration of these landuses and did not ascertain any potential landuse conflicts arising from the landuse areas nominated.

It is not envisaged that the landuses identified in this Concept Plan will have any adverse impact on the adjoining rural lands – either at this current time, or when the adjoining rural lands are rezoned to permit residential development. Generally there are conflicts between urban and rural landuses when farming practices generate disturbances to residential occupation of adjoining land. This includes spraying of crops, odour generation from intensive animal husbandry, noise associated with farm machinery, and other similar operations.

However the adjoining and adjacent rural zoned properties are either vacant, or primarily used for residential occupation. The use of land for grazing purposes is the most intensive

agricultural use in the locality. It should also be noted that the areas identified for urban landuses on the subject land, are generally separated from other properties by Ocean Drive.

For these reasons, it is not anticipated that the landuses identified in this Concept Plan will have any adverse impact on adjoining rural lands, and thus no mitigation measures are proposed. This addresses the provisions of DGR 1.5.

This Concept Plan provides for a road connection to the adjoining land to the north east. This will facilitate the urban development of these adjoining lands. Vehicular access to the sporting fields and northern school site will be accessed from an upgraded intersection of Houston Mitchell Drive and Ocean Drive. This access would enable a collector road to service the school site and the playing fields, as well as providing connection to the Village Centre.

The civic landuses on the subject land, such as the branch library and Council offices, will also provide services to the future residents of these adjoining properties. Therefore good vehicular access to the existing residential areas is important. This will be achieved via the three intersection points identified for Ocean Drive, and the additional intersection point identified by Council.

Linkage with the existing and future cycle and pedestrian networks is also paramount. Consultation with adjoining property owners, Council and the Bonny Hills and Lake Cathie Progress Associations, resulted in an integration plan for such a network. This plan was previously shown in Figure 25.

This plan demonstrates a co-ordinated approach to the provision of cycle and pedestrian networks. This reduces reliance on vehicular transport, where practicable.

It is also noted that the landuses identified in the Concept Plan were identified in Council's Urban Release Strategy for the area, known as the Area 14 Structure Plan. As such, provision for these landuses has formed the basis of forward planning decisions in this locality for some time.

Accordingly, it is not envisaged that there are any potentially adverse impacts associated with this Concept Plan on the adjoining properties – either in the short or long term.

6.2 Hazard Management & Mitigation

This section of the Environmental Assessment Report considers DGRs 4.1, 4.2, 4.3, 4.4 and 4.5. The landuses identified in the Concept Plan were considered in relation to the risk and management of bushfires, land contamination, identification and management of potential acid sulphate soils, and also whether the future landuses would be affected by any flood risk, coastal processes including climate change impacts.

6.2.1 Bushfire Hazard Assessment

The requirements of "Planning for Bushfire Protection 2006" (or relevant policy) are to be addressed, in accordance with the provisions of DGR 4.1. The current relevant policy is "Planning for Bushfire Protection 2006" (PfBP 2006).

An assessment of the Concept Plan landuses, the known existing vegetation on site, as well as the proposed Environmental Landuse Management Plan, was considered by Australian Bushfire Protection Planners. This assessment was based on the PfBP 2006 provisions. A complete copy of the report is included in the Appendices section of this report.

The Bushfire Hazard Assessment report noted the vegetation around the sewage treatment plant, and the coastal dunal vegetation, as being Category 2 Bushfire Prone Vegetation. The buffer to this vegetation is partially over the subject land. The ongoing bush regeneration works within the open space / drainage / habitat corridor, will also potentially result in areas of bushfire prone vegetation.

The bushfire hazard assessment report provides recommendations regarding the:

- provision of Asset Protection Zones for future buildings;
- emergency access / egress;
- fire fighting access and water supplies;
- construction standards of the buildings and the
- management of the Asset Protection Zones;
- management of the existing bushfire prone vegetation adjoining the areas of urban development; and
- management of the vegetation within the re-vegetated open space / drainage / habitat corridors.

In undertaking this assessment, the bushfire report also had regard to the significant environmental features of the subject land, including areas of known threatened species habitat, endangered ecological communities, and the location of Aboriginal artefacts.

Based on these issues, the assessment resulted in the asset protection zones shown in Figure 29.

The asset protection zones include the perimeter roads shown in the conceptual subdivision plan. Where perimeter roads are not included in the layout, than fire trail access will be provided.

The Environmental Landuse Management Plan prepared by Cardno Pty Ltd (included in the Appendices) provides for the parkland management of some of the open space / drainage / habitat corridor areas, and this has also been taken into account in determining the asset protection zones.

Under provisions of the PfBP 2006, the two school sites and the eco-tourist site are special protection landuses. These sites directly adjoin bushfire prone vegetation (either existing such as the dunal vegetation, or areas of future bush regeneration). Therefore, the future development of these sites will need to provide for the minimum asset protection zones shown.

The bushfire report also requires the following matters to be incorporated into the environmental landuse management plan for the open space / drainage / habitat corridor:

- Provision of a minimum 30 metre wide Asset Protection Zone as managed parkland adjoining the Seawind Chase existing lots on the adjoining site to the south of the open space / drainage / habitat corridor;

- Ensure a managed parkland regime is maintained on the existing public lands adjoining the existing Rainbow Beach subdivision;

- Ensure parkland along the south-eastern, southern and south-western aspects of the residential precinct and the open space corridors that extend into the residential precinct are fuel managed in order that there is no connection to bushfire prone land within the open space / drainage / habitat corridor.

As noted, the Environmental Landuse Management Plan prepared by Cardno Pty Ltd has incorporated these requirements.

The bushfire hazard assessment report concludes:

The overall design of the Concept Plan Application and the Project Application adequately address and comply with the deemed – to – satisfy provisions of Planning for Bushfire Protection 2006.

6.2.2 Site Contamination Assessment

Properties that have been utilised for agricultural purposes over a number of years may be affected by localised soil contamination as a result of agricultural practices. State Environmental Planning Policy No. 55 – Remediation of Land, includes agricultural uses as a landuse which triggers the need for an initial site assessment to ensure the land is suitable for residential occupation.

Therefore, a Preliminary Site Assessment was undertaken for the subject land, in accordance with the requirements of SEPP 55, and DGR 4.2 which states:

> *Identify any contamination on site and if necessary, appropriate mitigation measures in accordance with the provisions of SEPP 55 – Remediation of Land.*

In order to determine the likelihood of land contamination, a history of the landuses on the site is required.

As previously noted, the subject land was zoned rural prior to being zoned residential in the early 1980s. The land was approved for a golf course estate shortly thereafter. Earthworks commenced on the construction of the golf course, and some of the fairways are still visible on the aerial photography. A large lagoon was also constructed and still remains. Since that time, the land has been fenced and used for the grazing of beef cattle.

A Preliminary Site Assessment of the subject land was undertaken by ERM Pty Ltd. The full report is included in the Appendices section of this report.

The Preliminary Site Assessment did not identify any evidence of the subject land being registered as a contaminated site, nor evidence that the site had been registered as a cattle dip site. Port Macquarie – Hastings Council's section 149 Certificate showed that the land was not identified as a contaminated site, nor was the land identified as being flood prone.

Of the two dwellings located on the subject land, one was observed to contain fibrous cladding that was later identified as containing asbestos. It was considered that the other dwelling may also contain similar material. Therefore, any demolition of these buildings would need to be undertaken in accordance with relevant guidelines and controls.

The overhead powerline which traverses Lot 5 DP 25886 (the area identified as an Eco-Tourist site) was identified as a possible area of localised contamination. A soil sample taken from the base of one of the power poles confirmed a localised contamination consistent with the use of creosote around the base of the pole. This chemical is

used to preserve the timber and was likely used by the electricity authority during construction of the overhead line. Therefore, future residential use of this area of the land would require treatment of the soil around the base of the power poles to ensure the localised contamination is appropriately treated.

The subject land also contained two areas of localised contamination likely associated with waste oil spillage. This is adjoining the garage, and also adjoining the cattle yards. As these areas only impact on a very small area of soil, it is likely that removal of the top few centimeters of soil, and appropriate disposal, during future earthworks will adequately address this issue.

It is noted that Preliminary Site Assessment identified "*…some minor localised areas of impacted soil and fibrous building materials that may warrant remediation, if the site is to be developed for standard residential purposes. However, evidence of significant gross impact across the broader site was not identified in relation to known historical and current land uses*".

Therefore, the contaminations identified on site are common contamination issues associated with the historic landuses. Only minor works will be required during the land development process to remove or treat the contaminants. Therefore, no further assessment under the provisions of SEPP 55 is required.

6.2.3 Potential Acid Sulphate Soils

The future landuses identified in the Concept Plan will require disturbance of the site soils. This triggers an assessment of the soils to determine the presence and extent of potential acid sulphate soils. The DGRs also identified this issue as a matter for consideration in accordance with DGR 4.3.

As previously noted, soil testing over the subject land has been carried out to various extents over some decades. The Earthworks Report prepared by Luke & Company Pty Ltd and included in full in the Appendices section of this report, includes these historical records of soil analysis. The Cardno Pty Ltd Water Engineering and Environment Report also includes an Acid Sulphate Soils Management Plan prepared in accordance with relevant guidelines. In addition, Water Research Laboratory undertook a review of the Acid Sulphate Soils information and provided modelling of same.

In summary, it is noted that much of the upper sedimentary layers of the subject land were deposited from weathering and erosion of the escarpment to the west rather than from estuarine processes. Therefore, potential acid sulphate soils tend to occur at lower depths and be overlaid by more recent deposition processes.

The Water Research Laboratory report concluded that the existing higher risk deposits will remain below the water table following development and as such, these deposits do not present a potential risk. Only an area north west of the proposed wetland, in a location which will be filled, was identified as presenting a small risk. This will be managed via monitoring and the preparation of a response plan should it be required.

Port Macquarie - Hastings Council has identified various classes of land in Hastings LEP 2001 in terms of their potential to develop acid sulphate soils. From the LEP 2001 plan it is directed that the subject land includes Classes 2, 3, 4 and 5 lands. LEP 2001 sets out the various depths of works within each class that require development consent. This is as set out below:

Class 1	Any Works
Class 2	Works below the ground surface Works by which the watertable is likely to be lowered.
Class 3	Works beyond 1 metre below the natural ground surface Works by which the watertable is likely to be lowered beyond 1 metre below natural ground.
Class 4	Works beyond 2 metres below the natural ground surface; Works by which the watertable is likely to be lowered beyond 2 metres below natural ground.
Class 5	Works by which the watertable is likely to be lowered to below 1 metre AHD in adjacent Class 1,2,3 or 4 land.

An extract from Council's LEP mapping for Acid Sulphate soils is shown in Figure 30.

Hastings Development Control Plan No. 34 – Acid Sulphate Soils notes that where it is proposed to carry out any activities that require development consent, the development application must be lodged with a Preliminary Soils Assessment Plan. Subsurface testing has been conducted by Holmes & Holmes, and Coffey Geotechnical Engineering Pty Ltd, the results of which are attached to the Luke & Company Pty Ltd Earthworks Report.

The only major excavations identified in the landuse elements would relate to the proposed Constructed Wetland. The proposed works have been designed to minimise potential for exposure of the deeper soils with high potential acidity.

Figure 31 shows a typical cross section of the constructed wetland. The excavation is to be located above the depth of the potential acid sulphate soils.

Therefore, it may be seen that an assessment of potential acid sulphate soil has been undertaken, and mitigation measures are detailed in the Acid Sulphate Soil Management Plan.

Thus, the soil testing undertaken over an extensive period of time has enabled the identification of the location and depth of potential acid sulphate soils on the subject land, and the Cardno Pty Ltd Acid Sulphate Soil Management Plan has identified appropriate mitigation measures should these be necessary. These investigations and management proposals were also confirmed by Water Research Laboratory in their assessment of potential acid sulphate soils. These works have addressed the provisions of DGR 4.3.

6.2.4 Flood Risk Including Climate Change & Sea Level Rise Impacts

DGR 4.4 requires an assessment of any flood risk on site in consideration of any relevant provisions of the NSW Floodplain Management Manual. Consideration of the potential impacts of any filling on the flood regime of the site and adjacent lands is also required under this DGR.

In undertaking an assessment of flooding over the subject land, it was noted that Council's issued section 149 Certificate does not identify the subject land as floodprone. (A copy of the section 149 Certificates are included in the Appendices section of this report).

It is apparent that the subject land is not subject to inundation from any waterway overflowing its banks, or tidal inundation – but rather, the land contains low lying areas which are occasionally affected by

the large stormwater catchment which drains to Duchess Gully. In this manner, the land is not floodprone.

The subject land is impacted by stormwater which enters the site via several multi-cell box culverts located in the north-western and south western quadrants of the subject land, and then flows easterly across an alluvial plain and constructed lake system and discharges directly to the south arm of Duchess Gully.

Duchess Gully comprises two distinct arms. The northern arm of the creek traverses the eastern side of the subject land before turning westwards into the site in its upper reaches. The northern arm would appear to have been the alignment of the creek proper, prior to past agricultural development of the site. The second, or south arm of the creek would appear to have resulted from the establishment of past formal irrigation channels constructed with a common outlet. This type of “improvement works” of drainage was typical of the type occurring during the 1920’s to 1940’s. The south arm of the creek is currently used as the outlet for the existing lake and drainage system.

The junction of the two arms of the Creek is located at a distance approximately 200m downstream of an existing weir and culvert. From this point, the Duchess Gully alignment follows the Rainbow Beach frontal dune for a distance of some 1.3km before reaching the beach to discharge into the Pacific Ocean.

The Cardno Pty Ltd Water Engineering and Environment Report discusses the results of the MIKE11 hydraulic modelling which was undertaken to “*simulate storm events for both existing and development conditions. The effect of the proposed fill was incorporated in the model*”.

The Cardno report included the following conclusions arising from the modelling:

“A number of flow control structures and channel improvements are included in the development proposals. It is demonstrated that these controls comply with safety requirements of the Floodplain Management Manual”.

“The possible effects of climate change have been assessed and it is demonstrated that climate change does not adversely affect the development”.

“Floodplain risk management factors have been assessed and it is shown that hazard conditions are low”.

Therefore, flood risk on site has been assessed using various data, including modelling. It is also noted that Cardno were provided with the assessment of Climate Change and Sea Level Rise undertaken by SMEC (2010), which is included in the appendices section of this report. Filling impacts have also been considered, both for the subject land and adjoining land. This addresses the requirements of DGR 4.4. The full Cardno Pty Ltd Water Engineering and Environment Report is included in the Appendices section of this report.

The report by SMEC (2010) specifically addressed the issues of coastal hazards, and considered the “*impacts associated with wave and wind action, coastal erosion, climate change, sea level rise and more frequent intense storms*”. Based on these assessments and using a combination of worst-case scenario assessment parameters, the SMEC report concludes “*there would be no impact on the proposed development as a result of coastal hazards as the proposed development is located mostly landward of the coastal hazard zones over a 100 year planning period*”.

Therefore, the provisions of DGR 4.5 have been addressed.

6.3 Heritage

The subject land was assessed with regard to both Aboriginal archaeological and cultural heritage, as well as European heritage significance.

6.3.1 Aboriginal Heritage

The Aboriginal archaeology and cultural heritage of the site has been the subject of a number of investigations over the development history of the subject land. DGR 8.1 required identification of any Aboriginal archaeological or cultural heritage on the site and, if necessary, identify appropriate measures to preserve Aboriginal heritage (with reference to draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Interim Community Consultation Requirements for Applicants).

The following is a brief summary of the results of the various Aboriginal Heritage studies undertaken over the subject land.

In 1983, Cox & Corkhill commissioned a study to identify Aboriginal sites on the subject land. It would appear, from that report, that the eastern portion of the subject land was investigated. At that time, one site was located on the subject land, and one midden site was found within the adjoining dune area.

The next study was completed in 1996 for a proposed 624 lot residential subdivision over the northern portion of the subject land. J. Collins, a local consultant archaeologist, completed this study. The survey aimed "*to determine whether Aboriginal cultural materials were present within the proposed development area, and if so, to*

both assess their significance and recommend appropriate conservation measures for them."

The Collins (1996) study found a total of 10 sites on the northern study area of the subject land and made recommendations specific to each site. The recommendations were for either collection of the artefacts, which were likely to be disturbed by the proposed residential subdivision, or covering and stabilisation of those sites, which were outside the residential development area. The draft report and recommendations were presented to a full Land Council meeting of the Birpai Local Aboriginal Land Council (LALC). The Birpai LALC advised that they did not have any objection to the proposed development and supported the recommendations made in the report.

Collins also consulted with the Bunyah Local Aboriginal Land Council (LALC) at the time as they are the persons responsible for the administration of the southern portion of the subject land. No objections were raised by the Bunyah LALC.

Collins also consulted with the "*only person identified with traditional knowledge of the Port Macquarie – Bonny Hills coastal stretch*", Birpai Elder William (Gulah) Holten. This was to determine the area's anthropological values. Mr Holten advised that "*a large traditional campsite was known to have been situated somewhere in the Rainbow Beach locality, but that the area was not known to contain any ceremonial, mythological or sites of other spiritual significance*".

Collins (1996) also made an assessment of the likelihood of further artefacts on the subject land. This was based on the predominantly cleared nature of the land, and the assumed landuse pattern. The report states " *it seems likely that the northern hills and western lowlands will have very little, if any, further potential, and that any*

significant materials will be limited in their distribution to the general localities where campsites have already been discovered."

Collins was commissioned to update and expand the study area in relation to the current Concept Plan proposal over the subject land. This study was completed in 2006 and included the involvement of representatives of both the Bunyah LALC and the Birpai LALC.

The Collins (2006) report notes: "*Searches of the Commonwealth and National Heritage lists and the Register of the National Estate maintained by the Department of Environment and Heritage (DEH) revealed no registered cultural heritage sites in or near the study area*".

Of the sites located on the land in 1996, eight were open campsites and two were isolated finds. In the 2006 study, Collins was not able to locate artefacts at all of the previously identified sites. This was attributed to less intensive grazing of the property since 1996 and the resultant vegetation growth. The report recommended further investigation of some sites which required a permit under the National Parks & Wildlife Act.

The location of sites found on the subject land during both the 1983 study and the 1996 study are shown in Figure 32. Collins subsequently obtained the required permit and undertook additional subsurface investigation. The additional investigation did not result in any amendment to the recommendations for each site.

Site 4 required an amendment to the layout of the proposed Constructed Wetland. This amendment was undertaken in consultation with J Collins and a member of the Birpai Local Aboriginal Land Council, Mr Lindsay Moran. The recommended treatment of site 4 is as set out in Figure 33. The remediation works

for Site 4 may be undertaken in conjunction with other earthworks on site.

Broader consultation amongst the Aboriginal community was undertaken in 2008 in accordance with the provisions of the Interim Community Consultation Requirements for Applicants. Copies of advertising and correspondence with various members of the Aboriginal community are included in the Appendices section of this report.

In 2009, a further study was undertaken and completed by Collins which covered the southern area of the subject land. This report is also included in the appendices section, and includes correspondence from members of the Aboriginal community which demonstrates the consultation undertaken by Collins during the site assessment and report preparation.

Therefore, in accordance with the recommendations identified by J Collins, the Aboriginal archaeological heritage areas identified on site, may be appropriately managed and preserved where required. This satisfies the requirements of DGR 8.1.

6.3.2 European Heritage

The European Heritage of the subject land has been considered in previous development applications, as well as this Concept Plan application. DGR 8.2 requires the identification of items of European heritage significance and, if necessary, provision of measures for the conservation of these items.

The Port Macquarie – Hastings Council commissioned a comprehensive heritage study several years ago, for the entire Local Government Area. This study related to items of European heritage.

A search of Council's register of heritage items has revealed that no items of European heritage are listed for either Lake Cathie or Bonny Hills. Nor are there any items listed for the subject land.

Council also lists items of European heritage in Schedule 4 of the Hastings LEP 2001. Again, no items of European heritage were identified for either the towns of Lake Cathie and Bonny Hills, or the subject land.

The New South Wales heritage register does not list any items of European heritage for the subject land, nor for the towns of Lake Cathie or Bonny Hills.

The highly disturbed nature of the subject land, along with the numerous and various surveys undertaken over the land, would suggest that should there be any items of European heritage or significant historic records associated with the subject land, that these would have come to light by this time.

Therefore, it is not unreasonable to assume that no items of European heritage are located on the subject land. Therefore, no further investigations in this regard are required. This satisfies the requirements of DGR 8.2.

6.4 Flora and Fauna

In relation to flora and fauna, the DGRs set out the following requirements:

> *DGR 7.1 Describe the potential impacts of the proposal on existing native vegetation (including areas of SEPP 26 littoral*

rainforest) both within and adjacent to the site and identify measures to minimise impacts on this vegetation (eg appropriate buffers).

DGR 7.2 Describe the potential impacts of the proposal on existing aquatic flora and fauna and habitats both within and adjacent to the site and identify measures to minimise impacts on these habitats with consideration of Policy and Guidelines for Aquatic Habitat Management and Fish Conservation 1999.

DGR 7.3 Outline measures for the conservation of flora and fauna and their habitats within the meaning of the Threatened Species Conservation Act 1995.

The subject land has been the subject of numerous development applications since the early 1980s and during this time, a number of flora and fauna investigations have been undertaken over the subject land.

These reports include a Vegetation Survey and Fauna Survey conducted by Greg P. Clancy and Rod Ayres in 1983 prior to initial development in the area, and a Threatened Species Impact Assessment including an 8-part test prepared by Mr. Kel Mackay and David Bray in 1997. These earlier reports are useful in relaying the environmental condition of the land prior to substantial development, and provide information on flora species then present on the site that may be suitable for replanting during landscaping and habitat creation within the open space / drainage / habitat corridor.

Since 1997 (and under the current ownership) the site has continued to be used for grazing purposes and has not been subjected to any further significant landform modifications.

The 1997 (Mackay & Bray) report concluded that the existing conservation values of the land were considered to be low with no recovery potential. There were no endangered fauna and flora species identified within the subject land and were not considered likely to occur in the future due to the absence of suitable habitat on the subject land. The report concluded that development of the subject land would not significantly affect endangered flora and fauna species due to the lack of habitat on the land.

More recently, the subject land was considered during the various studies undertaken by Port Macquarie – Hastings Council for the Area 14 Urban Growth Strategy, and the resultant Area 14 Structure Plan. The land was generally found to be unconstrained for urban development. A small area of regenerating swamp mahogany was identified in the south-western area of the subject land. This regenerating swamp mahogany area will be fully contained within the proposed open space / drainage / habitat corridor.

The most comprehensive site study of the subject land was completed in 2008 by Darkheart Eco-consultancy. This concluded a number of field inspections and preliminary investigations undertaken by Darkheart which ultimately informed the design of the proposed development of the land. A complete copy of the Darkheart Eco-Consultancy 2008 report is included in the appendices section of this report.

The Darkheart investigations analysed the potential impact of the proposed constructed wetland and associated filling on the subject land. These works are the subject of the separate Project Application, however the investigations undertaken by Darkheart covered the entire subject land, hence the report results have been included in the consideration and assessment of this Concept Plan.

It should be noted that the Darkheart report suggests that the vegetation on site has been subjected to disturbance of some form or other such that some 84% of the subject land is open pasture.

Despite the numerous investigations, no threatened flora species have been identified on the subject land. However, the work undertaken by Biolink, on behalf of Port Macquarie – Hastings Council, identified areas of Endangered Ecological Communities (EEC). Darkheart adopted this mapping in the assessment of impacts. The location of the threatened species identified on the site throughout the various studies, along with the location of EECs as mapped by Council's consultant, Biolink, are shown in Figure 34.

The two EECs identified on site were: Swamp sclerophyll forest on coastal floodplain (10.4 ha of the subject land); and Swamp oak floodplain forest (4.3 ha of the subject land). Darkheart describes these EECs as being of low to medium quality.

In accordance with the requirements of the DGRs, the Darkheart report summarises the potential impact of the development of the land in accordance with the Concept Plan, as follows:

- *Loss of some 1.58 hectares of vegetated areas, plus some 62.85 hectares of land which contains pasture and pastoral woodland. This is as a result of excavation and filling of the land.*

This vegetation loss includes approximately 0.4 hectares of Swamp Oak Floodplain Forest EEC, and loss of 0.4 hectares of Swamp Sclerophyll Forest EEC and loss of approximately 14 hollow bearing trees within the pastoral woodland. Darkheart also notes the follow losses:

- *Loss of two small dams which provide limited foraging habitat for some migratory birds and potentially the Jabiru.*

- *Loss of an area of seasonally waterlogged grassy poorly drained land which offers potential foraging habitat for the Jabiru, several migratory birds… and perhaps Microchiropteran bats.*

- *Relatively minor reduction in current terrestrial east-west connectivity due to placement of a large waterbo*dy and clearing of scattered woodland trees.

The Darkheart report also notes the following positive impacts arising from the development proposal:

- *Creation of a relatively large area (about 13 ha including the two small constructed wetlands) of potential habitat for waterfowl including a number of threatened species (eg Black Bittern, Australasian Bittern, Osprey), migratory species (eg Great Egret and White Bellied Sea Eagle); potential foraging habitat for the Southern Myotis; fish; and a range of potential habitats for frogs (most likely common species tolerant of water with residues from roads, etc).*

- *Increased buffering to Duchess Gully from urban and agricultural runoff from the future urbanised catchment.*

- *Increased linkages and habitat for a range of threatened fauna (eg Koala, Squirrel Glider, etc) due to habitat creation via landscaping / bushland regeneration with native species including food species (eg Tallowwood, Forest Red Gum and Swamp Mahogany); reinforcing linkages from the southeast dry sclerophyll to the central patch of swamp forest.*

- *Creation of about 53.8 ha of habitat (mostly swamp forest) via current and ongoing bush regeneration works and landscape works.*

The Darkheart Report also sets out a number of appropriate ameliorative measures to minimise any adverse impacts arising from the proposed site works. These are set out in the full copy of the report included in the appendices section. The regeneration of existing EEC vegetation, along with expansion of existing areas of EEC vegetation is part of the Darkheart recommendations. This is shown in Figure 35. It should be noted that some of these works are already been undertaken as part of the Bush Regeneration works program for the subject land.

The Darkheart report concludes:

> *Overall, the PA proposal will have relatively minimal negative impacts on the current capacity of the property to support the recorded and potentially occurring threatened species and the viable EECs. The net effect of the proposal is considered likely to be an overall increase in biodiversity in the long term with a benefit to the biodiversity values of the locality as opposed to a net loss which is typically associated with urban developments, provided the appropriate mitigation measures are implemented.*

Thus, the Darkheart report has addressed the matters identified in DGR 7.1 which required a description of the potential impact on existing native vegetation, as well as the provisions of DGR 7.3 – which required the measures for conservation of flora and fauna and their habitats.

The report also addresses DGR 7.4 such that measures for the conservation or enhancement of existing wildlife corridors and / or the connective importance of vegetation on the subject land are also provided for in the report. Some of the measures recommended are already being put in place as part of the Bush Regeneration works on site, as well as incorporated into the Environmental Landuse Management Plan prepared by Cardno Pty Ltd as part of their Water Engineering and Environment Report.

The potential impacts of the proposal on existing aquatic flora and fauna, and their habitats was considered in the Cardno Pty Ltd Water Engineering and Environment Report. Base survey data of the existing waterbodies was undertaken by Ecology Lab Pty Ltd (full report included in the Appendices), and this information was used to inform the design of the Constructed Wetland and associated infrastructure. The following extract from the Cardno Pty Ltd report summarises the manner in which the DGR is addressed:

"The extent of direct physical disturbance to existing aquatic habitats within the site will be limited to:

- *realignment of a small section of a constructed drainage line in the western portion of the site for the purposes of establishing the district sporting fields; and*
- *the removal of a constructed drainage line associated with the north-eastern portion of Duchess Gully for the purposes of establishing the proposed residential subdivision.*

The remaining water features on site are to be retained and protected within the Open Space Corridor. A preliminary assessment of the existing lagoon has been completed and the results indicate that the lagoon is currently in a healthy condition as reflected by:

- *low density and diversity of introduced aquatic fauna;*
- *acceptable levels of water quality parameters;*
- *the diversity of native species in the macrophyte and submerged zones; and*
- *the diversity of waterbirds utilising the waterbodies for habitat diversity.*

The only major issues associated with the existing lake system is the predominance of introduced Torpedo grass (Panicum repens) noted on inspection of the macrophyte and submerged zones of the waterbody and a low diversity of benthic fauna.

Overall, the extensive revegetation and rehabilitation works proposed for the Open Space Corridor combined with ongoing management as detailed in the Open Space Management Strategy are expected to enhance existing fisheries habitat value of aquatic features within the site through:

- *the removal of weed species from the macrophyte zone (ie Torpedo grass);*
- *increasing the density and diversity of native plant species in the macrophyte zone;*
- *the provision of supplementary habitat features such as logs and snags (to be sourced from areas of the site to be cleared) as breeding, roosting and feeding areas;*
- *increasing the coverage of woody vegetation around the edges of the water bodies to provide cover, litter and debris for aquatic organisms;*
- *increasing public surveillance of the waterbodies which will reduce degrading activities such as refuse dumping and construction of 'cross-overs' using dumped refuse; and*
- *controlling human and domestic animal access to the waterbodies.*

The existing lagoon will connect to the proposed constructed wetland by a control weir. During major storms, when high water levels occur, flow will also continue to discharge from the existing lagoon via the existing 'overflow' channel direct to Duchess Gully. The outlet structure will be reconstructed to increase capacity."

Thus, the Cardno Pty Ltd Water Engineering and Environment Report addresses the matters relevant to DGR 7.2 and concludes that the extensive revegetation and rehabilitation works are expected to enhance the existing fisheries habitat value of the aquatic features within the subject land.

6.5 Constructed Wetlands & Water Cycle Management

The Concept Plan is primarily for the delineation of landuses over the subject land. However, in order to achieve the landuses as identified, there is a need to undertake a significant area of excavation and filling of the land. The fill material is sourced from the Constructed Wetland. The ongoing management of this Constructed Wetland and its impact on the surrounding environment is assessed within the Cardno Pty Ltd Water Engineering and Environment Report.

This section is relevant to the following DGRs:

DGR 2.1 – Justify the constructed wetland in the context of the IWCM plan proposed for the site.

DGR 2.2 – Consider the functioning of the wetland including the responsibility for ongoing management, any potential risk to public safety and potential environmental impacts such as groundwater, water quality and hydrology.

DGR 2.3 – Consider alternative sources of fill for the residential subdivision.

DGR 3.1 – Address and outline measures for Integrated Water Cycle Management (including stormwater) based on Water Sensitive Urban Design principles, including impacts on the surrounding environment.

DGR 3.2 – Address and outline measures for Integrated Water Cycle Management (including stormwater) based on Water Sensitive Urban Design principles, including impacts on the surrounding environment.

The Cardno report notes that the proposed development, which incorporates end of pipe wetlands for stormwater treatment, was adopted as the most advantageous overall. Investigations into a possible WSUD stormwater treatment using bioinfiltration was not found to be feasible, particularly due to the significant amount of fill material which would need to be imported, in addition to the fill material sourced from the constructed wetland. Therefore, the proposal provided the required residential area, satisfactory WSUD solutions, and remained economically viable.

In this manner, the Cardno report has addressed the requirements of DGR 2.1.

The functioning of the wetland including issues of responsibility and safety, are also assessed within the Cardno report. Restriction of access to the existing and future waterbodies on the subject land is to be achieved using physical vegetative barriers to the existing lagoon and constructed wetland. The details of this are set out in the Open Space Management Strategy which forms part of the Cardno report.

Signage will also be installed which complies with the relevant Australian Standard. This will convey the purpose of the wetland (being for wildlife habitat and stormwater treatment), the environmental significance of the wetland areas, and the prohibition of domestic animals from the wetland areas.

The potential environmental impacts of the wetland on hydrology, water quality and groundwater have been assessed and are discussed within the Cardno Pty Ltd Water Engineering and Environment Report.

Essentially, the assessment determined that impacts of the constructed wetland were found to be minimal, or beneficial.

The ongoing management of the constructed wetland is detailed in the Open Space Management Strategy. This document details the maintenance tasks that will be required and the approximate regularity of each action. This enables a cost to be associated with the overall maintenance of the structures. The final details for ongoing management, maintenance and ownership will be included in the Voluntary Planning Agreement being prepared with the Project Application for the open space area.

Thus, the requirements of DGR 2.2 have been addressed.

An assessment of the potential impacts on the water quality of both surface and groundwater, included an analysis of the existing lagoon. This large waterbody was constructed as part of the historic golf course approval, and thus has been in place for a number of years. The health or otherwise of this waterbody is a good indicator for the possible outcomes for the proposed constructed wetland.

The Cardno Pty Ltd report notes:

- *"Historical recorded data show that water quality in the existing lagoon is good and satisfies desirable water quality limits given in Council and ANZECC guidelines to ensure a sustainable appropriate freshwater coastal ecosystem. The data show the existing lagoon is well-mixed and not liable to stratification.*
- *The recorded data show that the Sewage Treatment Plant (STP) does not affect existing water bodies on the site.*
- *Water quality in proposed water bodies was predicted by a variety of methods (namely, comparison with existing water bodies, mathematical modelling and comparison with water bodies at other similar sites). The results show that the proposed constructed wetland will exhibit good water quality similar to the existing water bodies. The results also show that conditions in the existing water bodies will not be affected by the proposed development.*
- *The proposed redirection of flows from the existing lagoons in the "upper" reaches of Duchess Gully into the proposed constructed wetlands will re-establish the original flow path and is expected to improve surface water quality conditions in the 'middle' reaches of Duchess Gully.*
- *The effects of the proposed development on groundwater systems were predicted using a calibrated groundwater model. The results show that the proposed constructed wetland does not materially affect the regional groundwater regime or groundwater flow patterns. Groundwater levels are reduced only in some areas local to the constructed wetlands. These findings have been corroborated by a separate investigation by the Water Research Laboratory UniNSW.*
- *The local drawdown in groundwater levels does not expose high-activity potential acid sulphate soils to oxidation. This material remains below the water table.*

- *The proposed constructed wetland does not affect the operation of the STP exfiltration system where the groundwater flows are not changed and are not re-directed into the site.*
- *There are no significant adverse groundwater effects during the dewatering operations for the proposed constructed wetland. Drawdown is temporarily increased but still confined to areas close to the excavation.*
- *Groundwater impacts will be monitored under a comprehensive monitoring program."*

Thus, the provisions of DGR 3.1 have been addressed.

DGR 3.2 requires consideration of Port Macquarie – Hastings Council's Integrated Water Cycle Management (IWCM) plan for Area 14, and how the development of the subject land complies. The Cardno Pty Ltd report notes the following:

> *The proposed development complies fully with Council's IWCM (Integrated Water Cycle Management) policy for Area 14, as amended on 5 November 2007 by incorporating the following features:*
>
> - *Use of reclaimed water to dwellings for outdoor use, toilet flushing and laundry cold water.*
> - *Irrigation of district sports fields with reclaimed water sourced from Port Macquarie – Hastings Council.*
> - *Water sensitive urban design (WSUD) in residential areas by incorporating stormwater treatment using vegetated swales, bioinfiltration areas and treatment wetlands.*
> - *The proposed development using end-of –pipe wetlands for stormwater treatment was adopted as the most advantageous overall because it is the only option*

providing the required residential areas along with satisfactory WSUD solutions whilst remaining economically feasible in terms of minimising total earthworks which avoids the necessity for imported fill.

- *WSUD stormwater treatment options using bioinfiltration treatment are not feasible because of the increased volume of earthworks required including large volumes of imported material".*

Therefore, the constructed wetland and associated structures, is able to comply with the Council requirements for Water Cycle Management, and thus the requirements of DGR 3.2 have been addressed.

FIGURE 27

CONCEPT PLAN

SUBJECT LAND

Rainbow Beach Estate

Concept Plan Application Set

Job. No. 4509:ND Dwn: RM

Luke and Company Pty Ltd

SCALE:
1:8000@A3 1:4000@A1

The stated scale of this drawing maybe altered by copying. The scale should be verified prior to deriving measurements from this drawing

0 20 40 100 200 400(M)