Local Environmental Study

Old Bar Precinct 2A

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Prepared for:

GREATER TAREE CITY COUNCIL

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by

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Section 1.0
Introduction

This section of the report provides relevant background information, lists the objectives of the study and sets the structure of this report.

1.1 BACKGROUND

Greater Taree City Council resolved to prepare a draft Local Environmental Plan to facilitate urban development in north Old Bar following endorsement of the Old Bar Wallabi Point Development Strategy (GTCC, 2001) by the then Department of Urban Affairs and Planning. The area investigated in this study was identified in the Old Bar Wallabi Point Development Strategy (GTCC, 2001) as an area suitable for residential development.

Terra Consulting (Aust) Pty Ltd (Terra) was engaged by Greater Taree City Council (Council) to prepare a Local Environmental Study (LES) for the proposed rezoning of Old Bar Precinct 2(a) (hereafter referred to as the site) in accordance with the requirements of Section 57 of the Environmental Planning and Assessment Act 1979. The location of the site is shown in Figure 1.1 while a detailed plan of the site is shown in Figure 1.2.

As a result, this LES was commissioned to amend the current zones of the site, Part 1(a) Rural General and Part 7(a) Environmental Protection Habitat pursuant to the Greater Taree Local Environmental Plan (LEP) 1995. The potential for future residential development of this precinct is the primary basis for this study. The objectives of this Local Environmental Study are therefore:

- To identify the biophysical, cultural and socio-economic features of the site and the surrounding land;
- To identify opportunities and constraints for the development of the site;
- To assess the impact of development on the character and setting of the area with particular reference to impact;
- To prepare a "Development Principles Plan" showing in conceptual form appropriate land uses, design features, public facilities, traffic management; and
- To support and justify recommendations on land that could be rezoned for residential development.

1.2 STRUCTURE AND SCOPE OF REPORT

This Local Environment Study has been structured to provide information consistent with the requirements of the Environmental Planning & Assessment Act 1979. The report is structured as follows:

- **Section 1** - provides an introduction to the study;
- **Section 2** - of this report provides a brief description of the site and its planning context;
- **Section 3** – sets out an examination of the statutory and planning policies relating to the site;
- **Section 4** – describes the methodologies of the field surveys and other assessments undertaken during the study;
- **Section 5** - provides an assessment of the key planning, environmental and social factors relevant to the site, as well as describes the results of the field surveys;
- **Section 6** – identifies potential impacts of the development and recommends mitigation measures to reduce or alleviate impacts on the surrounding habitats; and
- **Section 7** – undertakes a general review of the site and summation as to the suitability of the land for residential development having regard to the environmental and social factors applying to the site and land use needs in the locality.

1.3 CONSULTATION

In accordance with Section 62 of the Environmental Planning & Assessment Act 1979, Terra, on behalf of Greater Taree City Council and other landholders consulted with Public Authorities and other agencies as part of this study. The authorities that were invited to provide comments on this study included:

- Roads and Traffic Authority;
- Environment Protection Authority;
- National Parks and Wildlife Service;
- Department of Mineral Resources;
- NSW Agriculture;
- MidCoast Water;

- Department of Land and Water Conservation;
- NSW Heritage Office;
- Coastal Council of NSW;
- Telstra;
- Country Energy;
- Purfleet- Taree Local Aboriginal Land Council;
- Mid North Coast Area Health Service; and
- Koala Preservation Society.

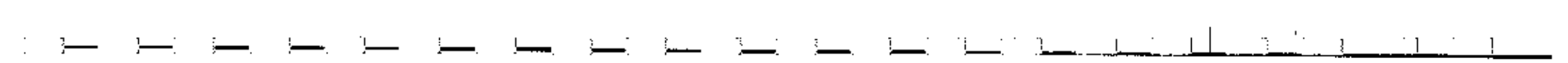
Responses received from this consultation process are included in Appendix A.

1.4 SPECIALIST TECHNICAL ADVICE

The Purfleet-Taree Local Aboriginal Land Council provided specialist advice on the Aboriginal heritage significance of the site. Their report is contained in Appendix B. Survey information that assisted with the flood modelling was supplied by Collins Walshe Fitzsimmons Pty. Ltd. Flora investigations were undertaken by Place Planning and Design Pty Ltd. Their report is provided in Appendix C.

1.5 FURTHER INFORMATION

Should Council require any additional information, or wish to clarify any matter raised by this Local Environmental Study, please contact Justin Meleo or Tony Fish of Terra Consulting (Aust) Pty Ltd, Tuncurry on (02) 6555 3577.



Section 2.0

The Site and its Context

This section of the report identifies the site and describes its environmental planning context.

2.1 CADASTRAL DESCRIPTION

The site for the LES is described as Lot 9 DP 703118 and Lot 111, DP 815853, Banyula Drive, Old Bar. A detailed plan of the site is shown in Figure 1.2.

2.2 SITE CONTEXT

The site directly adjoins the north western extent of the current township of Old Bar, approximately 13 km south east of the Taree CBD (Figure 1.1). The site has a total area of approximately 32.5 ha and is irregular in shape, bounded by Banyula Drive to the south and rural holdings to the west and north east. The eastern boundary is bordered by residential development. Oyster Creek, which drains the western area of Old Bar, flows through the lower (northern) portion of the property into the SEPP 14 wetlands and Oyster Arm, a tributary of the Manning River South Channel (Figure 1.2).

The site dips gently from south to north towards Oyster Creek, and slightly more steeply towards the east. Average slope on the site to the north is approximately 1.3 °, while to the east is approximately 0.6 °. To the east, the site drains towards Banyula Creek, which drains some of the existing urban area of Old Bar and flows through the site, eventually draining to the SEPP 14 wetlands and Oyster Arm.

The northern extents of the site are covered by a low lying coastal wetland that forms part of the fluvio-deltaic complex of the lower Manning River South Channel (Figure 1.2). The wetlands are constrained to the south by bedrock which underlie the more elevated areas of the site.

The site contains only limited areas of remnant native vegetation, confined to the lower (northern) portions of the property, where high water tables and Oyster Creek provide conditions conducive for salt marsh and mangrove communities. A variety of Eucalypt trees are scattered towards the southern end of the site adjacent to the cattle yards and sheds.

2.3 LAND USE HISTORY OF THE SITE

The majority of the site has been used for cattle grazing, dairying and limited agricultural activities for at least the last 100 years (B. Lauder, *pers. comm.*). The site is currently used for limited grazing activities. Information provided by the Purfleet-Taree Local Aboriginal Land Council (Appendix B) indicates that European settlement in the region commenced in the 1830's.

Several old machinery and dairy sheds are still located at the southern end of the site, though dairying activities on the site have ceased.

Section 3.0

Statutory and Policy Planning

This section identifies statutory and policy planning instruments relevant to any future development on the site.

3.1 GREATER TAREE CITY COUNCIL STRATEGIC PLANNING

3.1.1 Old Bar Wallabi Point Development Strategy

The Old Bar Wallabi Point Development Strategy (GTCC, 2001) was undertaken to establish a plan for future residential development and services for Old Bar/Wallabi Point that is cost-efficient, sustainable and avoids detrimental impacts to the environment.

The Strategy identified the site as a potential development area in Option A, as Phase 1 Urban release rezonings, pending investigation of various environmental constraints, as presented in this LES. Part of the land was also identified as Phase 2 urban release.

The Strategy also highlighted the potential limitations of the area for development as:

- potential for acid sulfate soils and flood prone lands, which occur in the area.

3.1.2 GTCC Rural Residential Strategy and Release Program

The Rural Residential Strategy and Release Program (GTCC, 2000a) comprehensively addressed the appropriateness of future rural residential land releases in the Greater Taree Local Government area. It also nominated a range of criteria to be used for choosing locations for any future release areas, and, based on these criteria, nominated sites for further investigation.

The site was not identified in this strategy as a potential area for rural residential development, due to its proximity to existing urban development. This strategy outlines that rural residential zoning of land adjacent to existing urban development should be carefully considered so as not to hinder or prevent future expansion of urban development.

The rezoning of land on the site for rural residential dwellings would therefore not be consistent with the Greater Taree Rural Residential Strategy and Release Strategy.

3.2 GREATER TAREE LOCAL ENVIRONMENTAL PLAN (1995)

The Site is currently zoned as 1(a) Rural General and 7(a) Environmental Protection Habitat, under the provisions of Greater Taree Local Environmental Plan 1995 The zones of the site and surrounding areas are shown in Figure 3.1.

3.2.1 Provisions of 1(a) Rural General Zoned Lands

The objectives of the 1(a) Rural General zoning generally relate to agricultural activities, the sustainable and efficient use of agricultural lands and the preservation of prime agricultural land. Urban or rural residential development on the site is inconsistent with the objectives of the current zones. Therefore, the site would need to be rezoned to allow residential development.

Rural Provisions Applicable

The following special provisions of the Greater Taree Local Environmental Plan 1995 guide and regulate plan making and development control with respect to rural residential development.

Clause 13 Subdivision within certain rural zones

(1) The Council may consent to the subdivision of land zoned 1(a), 1(b1) or 1(b2) but only if the area of each allotment to be created by the subdivision is not less than:

(a) 100 hectares for land zoned 1(b2), or

(b) 40 hectares for land zoned 1(a) or 1(b1).

(2) Where land referred to in this clause has frontage to an arterial road, the Council may consent to the subdivision of that land but only if that frontage is not less than 200 metres.

Residential development within the site is not consistent with the current 1(a) Rural General zoning, which encompasses a large proportion of the lands. The land would need to be rezoned to 2(a) Residential to accommodate any future residential development on the site.

Clause 14 Subdivision within Zone No 1(a), 1(b1) or I (b2)

Despite Clause 13, the Council may consent to the subdivision of land zoned:

(a) 1(a) or 1 (b1) to create an allotment of less than 40 hectares, or

(b) 1(b2) to create an allotment of less than 100 hectares,

if it is satisfied that the allotment is intended to be used for a purpose (other than agriculture, a dwelling or a duplex dwelling) for which it may be used with or without the consent of the Council.

The creation of allotments less than 40 ha on the land for residential development is not consistent with this clause and would therefore not be permissible within the existing zones covering the land. Therefore, the site would need to be rezoned to 2(a) Residential to accommodate any future residential development on the site.

3.2.2 Provisions of 7(a) Environmental Protection Habitat

The objectives of the 7(a) Environmental Protection Habitat zoning relate to maintaining the environmental attributes of lands that are considered to be environmentally sensitive or of particular environmental interest. In addition the zoning seeks to regulate development so that inappropriate land uses that would destroy sensitive habitat are avoided, in particular those of wetlands and significant ecosystems.

Urban development is inconsistent with the objectives of this zone. The area of the site zoned 7(a) is also a SEPP 14 wetland and is subject to flooding. These additional constraints would prohibit rezoning of this area for residential purposes.

3.2.3 Provisions of 2(a) Residential Zoned Land

The objectives of the zone are to encourage development of housing and associated development that are compatible within an urban living area and which preserves residential and visual amenity.

The site adjoins a residential area along the eastern boundary that is currently zoned as 2(a) Residential. Rezoning of the site as residential would be in keeping with the character of the local area.

3.2.4 Additional LEP Provisions Applicable to the Site

The following additional provisions in the LEP guide and regulate plan making and development control with respect to development in a variety of zones. Provisions from the LEP applicable to the site are outlined below.

Clause 36 Provision of services to development

The Council may grant consent to the development of any land but only if it is satisfied that, where appropriate:

(a) a water supply, sewerage and drainage facilities are available to that land; or

(b) arrangements satisfactory to the Council and to the water supply authority have been made or are required to be made, for the provision of that supply and those facilities.

The site is within the existing service area of the Old Bar/Wallabi Point locality. The site is within the catchment of Sewerage Pump Station 3.

Reticulated water could be made available to the site, as the existing urban areas of Old Bar/Wallabi Point are serviced by reticulated water supply. Development on the site could be serviced from the delivery mains on Old Bar Road (GTCC, 2001a).

Clause 47 Conservation Incentive

(1) In this clause, "land of environmental conservation value" includes:

(a) a wetland or land within an environmental protection zone;

(b) land identified as containing aboriginal archaeological relics, or of aboriginal mythological significance, as identified by the National Parks and Wildlife Service; or,

(c) land required for riverbank protection or public access to foreshores.

(2) The Council may consent to the carrying out of development for any purpose which, but for this clause, would be prohibited, if the development will have the effect to;

(a) achieving the dedication of land of environmental conservation value to public ownership if the Council determines it appropriate to accept the land for public purposes; or,

(b) otherwise ensuring that land of environmental conservation value is protected, enhanced or otherwise permanently conserved.

(3) *The Council shall not grant consent under this clause unless it is satisfied that:*

(a) *the development will not adversely affect that land or the amenity of land in the locality; and,*

(b) *the protection of that land could not be reasonably achieved by other means.*

Any development on the site would need to ensure that it does not result in any adverse impacts on the amenity of the land in the locality. Areas of the site have been identified as SEPP 14 Wetland, therefore the impact of future development on these areas must be considered in detail prior to any development. The potential Aboriginal and European cultural significance of the site and the potential impacts of future development on Threatened fauna species, must also be considered in detail prior to any future development. These issues are addressed in Chapter 5.

Clause 48 Development of flood liable land

The objectives of this clause are to minimise future potential flood damage and adverse effects of flooding on the community. If land is likely to be subject to flooding, then Council must consider the following:

(1) *For the purposes of this clause, "minor additions" means additions to a building work where the additions have a floor area of not greater than 10 percent of the floor area of the existing building or work.*

(2) *A person shall not erect a building or carry out a work on flood liable land recorded at the office of the Council without the consent of the Council.*

(3) *The Council may, as a condition of its consent, require the floor of the building or work to be erected at a height sufficient, in the opinion of the Council, to prevent or reduce the incidence of flooding of that building or work or of adjoining land.*

(4) *The Council shall take into account as a matter for consideration in determining a development application the effect of the proposed development on flooding.*

(5) *The consent of the Council under this clause is not required for development involving minor additions to a building or work.*

Areas within the vicinity of Banyula Creek and the SEPP 14 wetland are subject to flooding based on the 100 year AEP flood level and have been identified in this report (Section 5.9). The majority of the site is above this level and is therefore suitable for development in terms of this clause, provided that residential development does not encroach on flood liable areas and complies with the requirements of Council's *Interim Flood Management Policy* 1987, and the NSW Government Floodplain Management Manual (2001).

Clause 49 Bushfire hazard

(1) The Council may consent to the development of land zoned 1(c1) where it has identified a bush fire hazard only where provision is made for:

(a) a road through that land to which individual access roads are linked; and,

(b) fire trails which link individual access roads or a through road, or both.

(2) The Council may consent to the development of land in an urban zone where it has identified a bush fire hazard only where provision is made for:

(a) a perimeter road or reserve which forms the perimeter of the hazard side of the land intended for the development,

(b) a sufficient fire radiation zone managed for hazard reduction and located on the bushland side of the perimeter road,

(c) residential lot depths appropriate to the fire hazard for lots adjoining the perimeter road,

(d) a definition of that part of the land exposed to the bush fire hazard which may not be developed for urban purposes, and

(e) controls which avoid placing inappropriate components of developments in hazardous areas.

Section 5.16 assesses the potential bushfire risk on the site and outlines the Asset Protection Zones and other measures required for residential development to comply with the Rural Fire Service guidelines (RFS/Planning NSW, 2001).

Clause 55 Appearance of Development

(1) The Council may consent to the development of land in conspicuous view of any waterway or arterial road, railway, public reserve or land zoned 6(a) only if it is satisfied as to the likely appearance of the proposed development when viewed from those locations.

(2) The Council may consent to development on or near any significant ridgeline only if it is satisfied that the development would not be likely to detract substantially from the visual amenity of the locality.

The site is currently in view from the local road network within the Old Bar urban area, in particular Banyula Dr., Medowie Rd., Molong Rd. and Gannet Cr. Any future residential development on the site would need to be particularly sympathetic to the character of the locality, to ensure that development on the site is consistent with the nature of the area. It is likely that appropriate landscape plans for any future development on the site would address this Clause.

Clause 58 Heritage items and heritage conservation areas

(1) The consent of Council must be obtained to carry out the following development:

(a) to demolish, alter or damage a heritage item or a building or work within a heritage conservation area,

(b) to move a relic or excavate land for the purpose of discovering or moving a relic, or

(c) to erect a building, or subdivide land, on which a heritage item is located, or within a heritage conservation area.

(2) When determining a development application required by this clause, the Council shall take into consideration the extent to which the carrying out of the proposed development would affect the heritage significance of the heritage item or heritage conservation area.

(3) The Council's consent is not required if it is of the opinion that the proposed development would not adversely affect the heritage significance of the heritage item or heritage conservation area.

Detailed assessment of the site was undertaken by the Purfleet-Taree Local Aboriginal Land Council (LALC). The LALC raised no objection to development occurring on the site. Notwithstanding, the consent of Council is required to carry out development on the site where items of Aboriginal cultural heritage are to be removed or destroyed. Development on the site should be sympathetic to the Aboriginal heritage of the area, and ensure that any identified items, are preserved. During this site walk a number of artefacts were found at two locations and were identified as having potential archaeological significance. A full report prepared by the Purfleet-Taree LALC is contained in Appendix B.

There are no items of European cultural heritage significance on the site.

3.3 GREATER TAREE CITY COUNCIL DEVELOPMENT CONTROL PLANS

The following Greater Taree City Council Development Control Plans regulate and guide residential and rural residential development in the Greater Taree LGA.

DCP No. 41 Subdivision

Section 2 of this DCP sets out a range of general requirements that should be addressed when considering urban subdivision, including design principles, site hazards, road designs, landscaping, services, drainage, existing development and heritage and environmental protection. These requirements are addressed in detail in Section 5 of this report.

DCP No. 43 Greater Taree City Council Erosion and Sediment Control Policy

DCP No. 43 outlines Council's policy regarding erosion and sedimentation control. The DCP outlines the requirements of erosion and sedimentation control plans and provides a code of practice for erosion and sediment control in the Greater Taree City LGA. Section 5.6 of this report addresses erosion and sedimentation control in relation to the site.

DCP No. 45 Procedures for the Handling of Development Applications and Draft Local Plan Requests Involving Contaminated Land.

This DCP sets out guidelines for land contamination assessment. Section 6 of the DCP outlines the requirements of an initial site evaluation with regard to land contamination. An initial site investigation, without soil sampling, was undertaken for this Local Environmental Study. The findings of this investigation are set out in Section 5.12 and Appendix E.

3.4 HUNTER COASTAL URBAN SETTLEMENT STRATEGY

The Hunter Coastal Urban Settlement Strategy has been prepared to guide urban growth within coastal areas of the Hunter region, to ensure that environmental attributes of the coastal area are maintained for future generations (Dept. of Planning 1994).

The basic principles of the Settlement Strategy are:

- To recognise environmental limitations to development;
- To concentrate population in the major existing centres to make the best use of public and private investment; and
- To permit urban extension around the perimeter of those centres which can expand economically without environmental detriment.

The site is located within the area covered by the Hunter Coastal Urban Settlement Strategy, therefore, it is subject to the range of guidelines and principles set out in the strategy for the management of growth.

The site has been delineated on maps which identify areas for potential urban development (GTCC, 2001a). Its location is consistent with the principles of the Hunter Coastal Urban Settlement Strategy for urban development as the site adjoins the current township of Old Bar. The suitability of this type of development in terms of the potential for environmental impact is discussed in Section 6.

3.5 HUNTER REGIONAL ENVIRONMENTAL PLAN

The aims and objectives of Hunter Regional Environmental Plan 1989 are:

(a) to promote the balanced development of the region, the improvement of its urban and rural environments and the orderly and economic development and optimum use of its land and other resources, consistent with conservation of natural and man made features and so as to meet the needs and aspirations of the community;

(b) to co-ordinate activities related to development in the region so there is optimum social and economic benefit to the community; and

(c) to continue a regional planning process that will serve as a framework for identifying priorities for further investigations to be carried out by the department and other agencies.

The following summary identifies the relevant matters within the Hunter Regional Environmental Plan (REP) applicable to future residential development of the site, and comments on the consistency of any residential development with the REP.

PART 2 - SOCIAL DEVELOPMENT

Division 1-Housing

The Hunter REP requires that a draft Local Environmental Plan for residential purposes should only be prepared where Council is satisfied that adequate health, education and other community facilities and services are available or where they can be provided. Clause 10 specifies that development consent for residential purposes should not be granted unless the availability of health, education and welfare facilities have been assessed. Response to these issues and those raised by Mid North Coast Area Health Service are provided in Section 5.21.

PART 4 - LAND USE AND SETTLEMENT

Division 1-Rural Land

Clause 26 of the Hunter REP indicates that land being considered for subdivision that is prime agricultural land should be identified and protected from alienation, fragmentation, degradation and sterilisation. Clause 27 specifies that in the case of prime agricultural land, before granting development consent, Council should consult with the Department of Agriculture and be satisfied that the agricultural potential of the land will not be significantly reduced. The response from NSW Agriculture to this LES is provided in Appendix A and discussed in Section 5.2.5.

Division 2-Urban Land

Under Clause 30, the rezoning of rural land should only occur where the land is included in an urban development program or where Council is satisfied that there is insufficient land available to cater for projected population growth.

The Old Bar/Wallabi Point Development Strategy identifies a need for additional residential lots to satisfy the increasing demand for allotments associated with the current and predicted future population growth within the Greater Taree Local Government Area.

PART 7 - ENVIRONMENT PROTECTION

Division 1-Pollution Control

Clauses 46 and 47 of the Hunter REP relate to pollution control. Consideration should be given to the protection of significant surface waterways and groundwater, and minimisation of air and noise pollution prior to rezoning land or granting development consent. The effect of proposed residential development on these environmental attributes is discussed in Section 5.

Division 3-Environmental hazards

Pursuant to Clause 53, Council should consider the likelihood of erosion, land slip, flooding, coastal erosion or storm damage, bushfire hazards, mine subsidence and cumulative catchment impacts, together with means of controlling and managing such impacts.

Preliminary investigations suggest that the site is not subject to land slip, significant erosion, coastal hazards, storm damage or mine subsidence.

The potential for flooding and bushfire risk to proposed residential development on the site is outlined in Sections 5.9 and 5.16 respectively.

No cumulative impacts within the catchments covering the site are anticipated. The retention and improvement of existing vegetation on the site and the implementation of high quality stormwater management measures would reduce the potential for significant cumulative impacts to occur in the locality as a result of residential development on the site.

PART 8 - CONSERVATION AND RECREATION

Division 1-Natural Areas

Clause 61 stipulates that a draft Local Environmental Plan should include environmental protection zones to protect important wetlands, forests, water catchments, scenic and historic landscapes, escarpment and foreshore areas, archaeological, historic and scientific sites and wildlife habitats.

Clause 62 specifies that Council shall not consent to development on lands zoned open space or bushland unless it has assessed the need to protect the land and is satisfied that disturbance is necessary and in the public interest, is minimal and can be rehabilitated.

Figure 6.1 shows areas that are proposed for environmental protection based on the findings of this study. One area within the site is currently zoned as 7(a) Environmental Protection Habitat, which contains a SEPP 14 wetland.

3.6 STATE ENVIRONMENTAL PLANNING POLICIES

The following provides an outline of the State Environmental Planning Policies applicable to any future development of the site, and provides comments on matters required for consideration under these policies.

State Environmental Planning Policy No. 11— Traffic Generating Developments

The aims and objectives of this policy are to ensure that the Traffic Authority (RTA) is made aware of and is given an opportunity to make representations in respect of developments listed under Schedules 1 or 2 of this policy.

Any subdivision of the subject land of residential allotments in excess of 200 lots or, a subdivision in excess of 50 lots which adjoins or is within 90m of an arterial road, must be referred by the consent authority to the RTA, prior to the determination of the development application.

As the proposed development of the land would be less than 200 lots and is not within 90 m of an arterial road, there is no requirement to seek concurrence from the RTA.

State Environmental Planning Policy No. 44— Koala Habitat Protection

The objective of this policy is to encourage the conservation and management of areas of habitat for koalas, to ensure the current distribution of koalas is maintained.

A SEPP 44 assessment involves:

- Determination of whether the subject site occurs within the Local Government Areas (LGA's) listed on Schedule 1 of SEPP 44;
- Determination of Potential Koala Habitat within the subject site;
- Determination of Core Koala Habitat; and
- Consideration of the need for a Koala Plan of Management.

The site is situated within the Greater Taree LGA, which is listed on Schedule 1 of SEPP 44, therefore a Koala assessment must be undertaken in accordance with this policy.

SEPP 44 also makes provision for the preparation of a Koala Management Plan. Greater Taree City Council's Draft Comprehensive Koala Plan of Management (CKPoM) has recently been prepared for the Greater Taree Local Government Area. The CKPoM has been prepared in accordance with SEPP 44 and has the following objectives:

- Evaluating and ranking Koala habitat in the LGA;
- Identifying and prioritising conservation areas and strategies to protect Koala habitat;
- Identifying principle threats to Koalas and Koala habitat areas;

- Devise conservation strategies to address principle threats to Koalas and Koala habitat;
- Provide for the restoration of degraded Koala habitats;
- Promote a balanced approach to Koala conservation and development;
- Provide adequate guidelines and development standards to protect Koala habitat;
- Provide effective public awareness and education programs concerning Koala conservation issues; and
- Identifying potential funding sources for implementation of the CKPoM.

As the site for this LES occurs within the site of the CKPoM, this plan should be considered in relation to any proposed development on the site. The draft CKPoM currently identifies a small area near the north west corner of the site as Koala Planning "Class 5" habitat (buffers and links for Classes 1, 2, and 3).

The Koala survey methodology undertaken on the site and results of the SEPP 44 Assessment are outlined in Section 4.4.7, Section 5.4.6 and Table 5.1.

State Environmental Planning Policy No. 55— Remediation of Land

The objective of this policy is to encourage a consistent State-wide approach to the remediation of contaminated land. Clause 6 of the policy is applicable to the consideration of contamination and remediation in relation to rezoning proposals. Council is required to consider whether there is the possibility that the land may be contaminated due to past land uses, and if so, whether the land is suitable for its proposed use in its current or remediated state.

A preliminary investigation into the previous land uses of the property have identified agricultural land use, which is listed as a potentially contaminating activity, as identified in Councils DCP No. 45 and State Environmental Planning Policy No. 55.

Agricultural land use of the site has been limited to cattle grazing, though no dip sites are located on or in close proximity to the site.

Potential site contamination issues are discussed in Section 5.12, while a completed DCP No. 45 Potential for Site Contamination Checklist is provided in Appendix E.

State Environmental Planning Policy No. 71 — Coastal Protection

The objective of State Environmental Planning Policy No. 71 - Coastal Protection (SEPP 71) is to further the implementation the NSW Coastal Policy (1997). SEPP 71 establishes a number of matters for consideration in relation to any land to which the policy applies that:

(a) should be taken into account by a Council, when it prepares a draft Local Environment Plan that applies to land which this policy applies, and

(b) are to be taken into account by a consent authority when it determines a development application to carry out development on land to which this Policy applies.

The goals of this policy and their relevance to the site are discussed in Section 5.1.1.

3.7 NSW BIODIVERSITY STRATEGY (1999)

The NSW Biodiversity Strategy was launched in 1999 and commits all Government Agencies to biodiversity conservation across all landscapes of NSW. The Strategy recognises that conservation reserves are important refuges for biodiversity, though also focuses on areas external to the reserve system. It also promotes partnerships between government and local communities.

Although the site has a low density agricultural usage and is totally modified from its original state, there is opportunity to rehabilitate areas of native riparian vegetation, which could form part of an important corridor link for koalas and other fauna species. The goals of the Biodiversity Strategy are considered in the assessment of the importance this vegetation and in determining mitigation measures to improve corridor linkages throughout the site. These issues are discussed further in Section 6.

3.8 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 ASSESSMENT

The Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) requires assessment and provides an approvals system for:

- Actions that have a significant impact on matters of national environmental significance (NES);
- Actions that have a significant impact on the environment of Commonwealth land; and
- Actions carried out by the Commonwealth Government.

Matters of national environmental significance (NES) under the EPBC Act are:

- World Heritage areas;
- Wetlands protected by international treaties (*ie.* the Ramsar Convention);
- Nationally listed threatened species and ecological communities;
- Nationally listed migratory species (*ie.* CAMBA, JAMBA agreements);
- All nuclear actions; and
- The environment of Commonwealth marine areas.

The relevance of each matter of NES when considering the proposed activity is discussed in Section 5.5.

3.9 SECTION 117 (2) DIRECTIONS

The Minister for Urban Affairs and Planning can provide direction to Local Government on matters of environmental planning significance under the provisions of Section 117 (2) of the Environmental Planning and Assessment Act (1979).

The directions relate to inclusion "*in a draft local environmental plan prepared by the council, provisions which will achieve or give effect to such principles or such aims, objectives or policies, not inconsistent with this Act, as are specified in the direction*". Several of the Ministerial Directions are relevant to the proposed development of the site for residential purposes and are summarised below.

3.9.1 S26 Coastal Policy

The NSW Coastal Policy is designed to establish a framework to provide for population growth and economic development in the coastal zone without putting the natural, cultural and heritage values of the coastal environment at risk. The policy's central focus is the ecologically sustainable development (ESD) of the NSW Coastline, which is addressed by the four principles of ESD. These include;

- Conservation of biological diversity;
- Inter-generational equity;
- Improved valuation, pricing and incentive mechanisms; and
- The precautionary principle.

Pursuant to Section 79C of the Environmental Planning and Assessment Act 1979 and Clause 92 of the Regulation made under the Act, the NSW Coastal Policy must be taken into consideration for any development application on land within the Coastal Zone. As the Site is within 1 km of a tidal coastal river, Oyster Arm, the Coastal Policy must be considered in the in the preparation of this Local Environmental Study. The Coastal Policy has determined nine goals to give expression to the vision of the policy. The goals of this policy and their relevance to the site are discussed in Section 5.1.1.

3.9.2 C1 Acid Sulfate Soils (ASS)

This Direction applies to all land identified as having a probability of containing ASS, as indicated on maps produced by the (then) Department of Land and Water Conservation. The site is located in an area that is identified as having a probability of containing ASS.

Therefore, the nature of ASS occurring on the site needs to be investigated and an assessment made as to the appropriateness of developing the site for residential purposes. This issue is addressed in Section 5.2.4 of the report.

3.9.3 G20 Planning for Bushfire Protection

The Rural Fires and Environmental Assessment Legislation Amendment Act 2002 commenced in August 2002 and amended both the Environmental Planning and Assessment Act 1979 and the Rural Fires Act 1997. The changes cover hazard reduction activities as well as planning and development control matters on land that is identified as being prone to bushfire.

Direction G20 complements the legislative changes, such that Councils are required to consult with the NSW Rural Fire Service when preparing draft LEP's for land identified as being bushfire prone, and comply with specific planning provisions (*ie.* RFS/PlanningNSW, 2001). Issues surrounding bushfire are addressed in Section 5.16.

3.10 LOWER NORTH COAST CATCHMENT BLUEPRINT (2002)

A total of four (4) major catchments and three (3) Local Government Areas (LGA) are covered by the plan, which provides direction for actions and investment by all stakeholders, to improve the management of the catchments' natural resources.

A number of first order objectives are articulated in the plan, which are addressed through the setting of catchment and management targets. The relevance of each target to development of land on the site for residential purposes is discussed below:

Terrestrial Biodiversity Catchment Target

"By 2012, 100 % of Regionally Significant Ecosystems are protected by an environmental planning instrument or conservation agreement".

No Regionally Significant Ecosystems or corridors are located on the site.

Soils Catchment Target

"By 2012, the area affected by soil degradation in identified high priority areas (benchmarked at 2001) is reduced by 9300 ha".

There are potential Acid Sulfate Soils located in the SEPP 14 wetland area on the site, though these areas would not be disturbed by any development on the site. Details regarding Acid Sulfate Soil issues are addressed in Section 5.2.4.

Aquatic Health Catchment Target

"No decline in assessed Aquatic (freshwater, estuarine and marine) Condition Functioning as reflected in key indicators, benchmarked at 2004".

Strict stormwater management measures outlined in Section 5.11 will ensure that there will be no decline in the health of receiving waters of the SEPP 14 wetlands and Manning River.

Water Quality Catchment Target

"By 2012, achieve a 10 % reduction in total phosphorus in high priority rivers (Myall and Wallamba) and no increasé (and where possible reduction) in other river systems, based on the 80th percentile results measured at the freshwater end-of-system monitoring points".

Stormwater management measures will ensure that phosphorus is removed from stormwater entering the receiving waters of the SEPP 14 wetlands and Manning River.

Section 4.0
Study Methodology

This section of the report outlines the methodologies undertaken for investigating physical impacts of the proposed development during the study.

4.1 DESKTOP REVIEW AND BACKGROUND RESEARCH

The desktop component of the study involved the review of available information from surveys and assessments that have previously been conducted in the vicinity of the site. This desktop review also includes a search of the records held by the National Parks and Wildlife Service, listing of Heritage Sites, the Taree Heritage study, DIPNR Soil and Land Information, Greater Taree City Council Development Control Plans, Greater Taree City Council Digital mapping information including Acid Sulphate Risk mapping, and similar specific studies. Additional sources of information included:

- Atlas of NSW Wildlife (NPWS 2002);
- State Heritage Inventory (NSW Heritage); and
- Soils and Land Information – SPADES.

4.2 STATUTORY AND POLICY PLANNING

A review of all relevant statutory planning instruments as detailed in Section 3 was undertaken with respect to the potential for residential development of the site. Where possible, each instrument was addressed in the context of the relevant results section. Section 117(2) Directions, however, were addressed separately (Sections 5.1.1, 5.2.4 and 5.16).

4.3 FLORA SURVEY

General flora surveys of the site were conducted using the random meandering transect method (Cropper, 1993). All taxa encountered were recorded in the field, those species not able to be identified in the field were sampled for later identification.

In addition, target surveys were conducted for Threatened Flora species known or potentially occurring in the local area including *Cynanchum elegans, Allocasuarina defungens, Allocasuarina simulans, Eucalyptus glaucina, Senna acclinis, Asperula asthenes and Melaleuca biconvexa.*

4.4 FAUNA SURVEY

Due to the disturbed nature of the habitats on the site, the field survey methodologies employed were limited to surveys to target the Threatened species potentially occurring within the site. Microchiropteran Bat surveys, however, were not undertaken due to the survey period occurring in winter, a period of extended torpor for most species. The site is also only expected to be used for foraging purposes and as there were no hollow bearing trees for potential roost sites, therefore, the occurrence of Threatened bat species would not pose a constraint to the development of the site. The methods undertaken for fauna survey on the site are outlined below.

4.4.1 Spotlighting Surveys

Spotlighting surveys for arboreal mammals and owl species was conducted by two personnel using 100 watt spotlights on two non-consecutive nights for a period of approximately 15 mins within the vegetated areas of the site. In total, 1 person hour of spotlighting surveys were conducted within the site.

4.4.2 Call Playback Surveys

Call Playback surveys were conducted to target Threatened species previously recorded or potentially occurring within in the local area, including the Powerful Owl (*Ninox strenua*), Masked Owl (*Tyto novaehollandiae*), Eastern Grass Owl (*Tyto capensis*) and Squirrel Glider (*Petaurus norfolcensis*).

After an initial listening period of 10 minutes, calls of each species targeted were broadcast for a period of 5 minutes, followed by a 5 minute listening period.

4.4.3 Fauna Transect Surveys

Fauna transects searches were conducted through all habitat types occurring within the study site, targeting fauna signs including tracks, scats, nest sites and signs of Threatened species. In total approximately 2 km of fauna transects were conducted over the site.

4.4.4 Amphibian Surveys

Amphibians were also targeted during the spotlighting surveys, concentrating on the water bodies within the site. In addition, all amphibian species observed/heard incidentally during other survey types were recorded.

4.4.5 Avifauna (Bird) surveys

Specific bird surveys were conducted by one observer using binoculars over two non-consecutive days. All calls heard and identified were also recorded. In total, approximately 1 person-hour of specific Avifauna surveys were conducted within the site. All additional species observed incidentally during other survey types were also recorded.

4.4.6 Reptile Surveys

Reptiles were targeted through active searches of leaf litter, decorticating bark and general farm refuse. All other reptile species observed incidentally during other survey types were recorded.

4.4.7 Koala Scratch and Scat Surveys- SEPP 44 Assessment

As the site is located in an LGA listed under Schedule 1 of SEPP 44 (Section 3.6), the site is considered potential Koala Habitat under SEPP 44, as this is defined as '*areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15 percent of the total number of trees in the upper or lower strata of the tree component*'. The dominant tree species on the site are the Tallowwood (*Eucalyptus microcorys*), White mahogany (*Eucalyptus eugenoides*), Pink Bloodwood (*Eucalyptus intermedia)* Turpentine (*Syncarpia glomulifera*) and Swamp Mahogany (*Eucalyptus robusta*), some Broad-leafed Paperbarks (*Melalueca quinquenervia*) occur along the drainage channel within the site (Appendix C). Only Tallowwood and the Swamp Mahogany are listed on Schedule 2.

At least 15 % of the total number of trees within the site were Tallowwood or Swamp Mahogany therefore the site was deemed to be *'potential koala habitat'*. As *'potential koala habitat'* was identified within the site, further investigations were conducted to assess the presence of *'core koala habitat'*. These investigations involved searches for scratches on trees and searches for Koala scats within one metre of the base of trees for approximately one-person minute per tree. All of the trees targeted during these scat searches were over 10 cm DBH, the majority of which were known Koala food trees.

4.5 AQUATIC ECOLOGY ASSESSMENT

Aquatic ecology surveys were undertaken in accordance with the project brief and the principles of the Draft Guidelines for the assessment of Aquatic Ecology in EIA prepared by DUAP (1998). This assessment within the site included:

- Aquatic habitat mapping, undertaken using aerial photo interpretation and field surveys, including the identification of linkages within and through the site;
- Description of the aquatic habitats occurring on the site including flow characteristics, including any seasonal variations and description of the bed substrate and width;
- Assessment of water quality based on field observations;
- Fish habitat assessment; and
- Assessment of the likelihood of occurrence of Threatened species, within the site and aquatic linkages.

4.6 ABORIGINAL/EUROPEAN CULTURAL HERITAGE

A site walk was conducted on 8 May 2003 with representatives of the Purfleet-Taree Local Aboriginal Land Council. The site walk involved a traverse of much of the proposed development area searching for aboriginal artefacts. A report from the LALC is provided in Appendix B, while a summary of the findings are provided in Section 5.13.

European cultural heritage was investigated through a search of on-line heritage databases held by the NSW Heritage Office. Results of the cultural heritage assessment are provided in Section 5.13.

4.7 SOILS

A desktop assessment was undertaken based on draft soil landscape information for the Old Bar area, prepared by staff of the Kempsey DIPNR office (Eddie, *in prep.*).

4.8 ACID SULFATE SOILS

A desktop assessment to determine the presence of Acid Sulfate Soils (ASS) was prepared with reference to published information regarding location, geomorphology and geology of the site, soils types, DLWC mapping and Council's ASS Planning maps to characterise the site. Details are provided in Section 5.2.4.

4.9 TRAFFIC IMPACTS

Traffic generation from the proposed development was assessed with respect to the ability of the local road network to cope with additional traffic volumes. The desktop assessment was undertaken with reference to Council's urban road requirements (AUSTROADS, 1989) and RTA specifications (RTA, 1995).

4.10 FLOOD RISK

The effects of flooding on the proposed development were assessed having regard to flood height and behaviour in the vicinity of the site. Flood levels for the peak 100 year ARI flood in the vicinity of Oyster Arm were provided by Council and are set at 2.3 m AHD. Flood levels across the site were determined based on catchment flows with a tailwater levels set at 2.3 m AHD. Results are provided in Section 5.9 and Appendix D.

4.11 SURFACE HYDROLOGY/GROUNDWATER/STORMWATER

Surface hydrologic and groundwater characteristics were assessed during a site inspection. Peak discharge for the existing and post development conditions was calculated using the hydrologic model XP-RAFTS 2000 to develop the rainfall-runoff model and perform the calculations. Rainfall losses were modelled as initial and continuing losses.

A reservoir module in the model was used to assess the performance of the design stormwater management system for the proposed development. Input data for this analysis included stage-storage and stage-discharge relationships and outlet configurations for the storage basins. Full details of the methodology are provided in Appendix D.

An hydraulic model was developed to simulate stormwater flows for the developed catchment. The hydraulics of the existing drainage lines of Banyula Creek, Oyster Creek and Old Bar Park were modelled using HEC-RAS. Full details of the hydraulic modelling are provided in Appendix D.

4.12 SOIL CONTAMINATION

Assessment of potentially contaminating activities on the site were undertaken through site inspection and investigation of the history of agricultural activities on the site. Details regarding the assessment of factors in accordance with the requirements of SEPP 55 are provided in Section 5.12.

4.13 BUSHFIRE HAZARD

An assessment of the potential bushfire hazard posed to any proposed development was undertaken during the site inspection. This assessment was conducted in relation to the existing surrounding vegetation and hazard reduction measures currently undertaken on the site and the adjoining properties, and whether the hazard is likely to be altered as a result of the proposed development. The assessment was undertaken in accordance with the Planning for Bushfire Protection (RFS/PlanningNSW, 2001) guidelines.

4.14 SOCIO-ECONOMIC IMPACTS

A socio-economic impact assessment of the proposed development was undertaken which addressed issues raised by the development of the site for residential purposes including economic impacts, employment generation, investment, community networks, public domain, human services and access. Results of the assessment are presented in Section 5.21.

4.15 VISUAL AMENITY

An assessment of the visual impact of proposed residential development was undertaken based on the site inspection and proposed conceptual plan for residential development outlined in the rezoning application for the site (CWF, 2002) land. The visual assessment examines the existing landscape character and elements of the site, and assesses the sensitivity of individual landscape units within each element. Based on this assessment, visual management zones are identified for the site. Respectively, these assessments yield a synthesis of scenic quality, sensitivity zones and visual quality objectives, which provides the basis of the visual impact assessment (Section 5.17).

Section 5.0
Results

This section of the report details the results of the desktop review and field surveys conducted for the site and includes an analysis of environmental, cultural and socio-economic issues associated with the site.

5.1 SECTION 117(2) DIRECTIONS

Three Ministerial Directions under Section 117(2) of the Environmental Planning and Assessment Act (1979) are applicable to the proposed development. The significance of Direction S26 – Coastal Policy to the proposed development is discussed below, along with recommendations regarding compliance with the Directions. Ministerial Directions C1 - Acid Sulfate Soils and G20 – Planning for Bushfire Protection are discussed in Sections 5.2.4 and 5.16 respectively.

5.1.1 S26 – Coastal Policy

There are nine goals that give expression to the vision of the NSW Coastal Policy (1997). Measures to mitigate any impacts of the proposed development in the context of these goals are discussed below.

Goal 1 - Protecting, rehabilitating and improving the natural environment of the coastal zone.

Any development on the site should be sympathetic to the natural environments occurring on the site. The only remnant area on the site is the SEPP 14 wetland (# 571) that drains Banyula and Oyster Creeks, located on the lower northern elevations of the site. The development should seek to minimise impacts on this wetland. Measures to protect the receiving waters of this wetland from stormwater leaving the site are provided in Section 5.11.

Goal 2 - Recognizing and accommodating the natural processes of the coastal zone.

The periodic flooding of the wetland from Oyster and Banyula Creeks and tail-water flooding of Oyster Arm is the only coastal process occurring on the site. Any proposed residential development of the site would not impact upon flooding of the wetland, given the stormwater retention measures for the proposed development outlined in Section 5.10. In addition, the proposed development area would be located outside of any identified ASS areas on the site.

Goal 3 - Protecting and enhancing the aesthetic qualities of the coastal zone.

Any development on the site should address potential visual impacts of the development and attempt to retain and enhance the existing aesthetic qualities of the site. As the majority of the site has been modified through grazing activities and is in a non-natural state, and is located adjacent to an existing urban area, there is limited scope for protecting the aesthetic qualities of the coastal zone. Visual impacts of proposed development of the site are addressed in Section 5.17.

Goal 4 - Protecting and conserving the cultural heritage of the coastal zone.

An assessment of the cultural heritage significance of the site is addressed in Section 5.13.

Goal 5 - Providing for ecologically sustainable use of resources.

The proposed development is for residential use of the land and does not include the use of any material resources of the coastal zone. The site is classified as Class 4 Agricultural lands (Riddler, 1996). The impact of the proposed development on agricultural resources is addressed in Section 5.2.5. Re-use options for stormwater are discussed in Section 5.11.

Goal 6 - Providing for ecologically sustainable human settlement in the coastal zone.

Residential or rural residential development of the site is consistent with Council's Old Bar/Wallabi Point Development Strategy (GTCC, 2001). Development of the type outlined in the Strategy could be carried out in a manner which ensures that the intrinsic ecological values of the site are retained. Development of the site should address at the concept stage the environmental and cultural aspects of the site and be undertaken according to the development principles outlined in this study. Further, information contained in the Coastal Design Guidelines is considered in the development principles addressed in Section 6.2.

Goal 7 - Providing for appropriate public access and use.

The site and surrounding areas are privately owned at present. Any future development of the site should incorporate areas for public access and use.

Goal 8 - Providing information to enable effective management of the coastal zone.

This study is consistent with this goal of the NSW Coastal Policy. This study provides a description of the existing environment and describe the social, economic and environmental issues associated with any future development of the site for residential purposes.

Goal 9 - Providing for integrated planning and management of the coastal zone.

This study is consistent with this goal of the NSW Coastal Policy. This study addresses all relevant planning policies in the region that may impact upon the proposed development.

In addition to the above nine goals, any development of the site would need to address at DA stage, the matters for consideration that are relevant to the site, as listed under Clause 8 of SEPP 71 and summarised as follows:

(i) the aims of the Policy, including;

- the protection and management of natural, cultural, recreational and economic attributes of the NSW coast;
- the protection and improvement of public access to and along the coastal foreshores compatible with the natural attributes of the coastal foreshore;
- the protection and preservation of the visual amenity of the coast including beach environments, native coastal vegetation, the marine environment and rock platforms;
- the management of the coastal zone in accordance with the principles of ecologically sustainable development;
- to ensure that the type, bulk, scale and size of the development is appropriate for the location and protects and improves the natural scenic quality of the surrounding area; and
- to encourage a strategic approach to coastal management.

(ii) retention and improvement of public access to and along the coastal foreshore for pedestrians or persons with a disability;

(iii) the suitability of [new] development given its type, location and design and its relationship with the surrounding area;

(iv) measures to conserve animals (within the meaning of the Threatened Species Conservation Act 1995) and plants (within the meaning of that Act), and their habitats;

(v) existing wildlife corridors and the impact of development on these corridors;

(vi) measures to protect the cultural places, values, customs beliefs and traditional knowledge of Aboriginals;

(vii) likely impacts of development on the water quality of coastal water bodies; and

(viii) the conservation and preservation of items of heritage, archaeological or historic significance.

It is submitted that proposed residential development of the site would not conflict with any of the goals of the NSW Coastal Policy if undertaken in accordance with the development principles outlined in this study (Section 6.2), and that development of the site would in no way impact adversely upon the coastal zone.

5.2 LANDFORM AND SOILS

5.2.1 Landform and slope

The site is located on the central and eastern side of a bedrock knoll that dips gently to the north and east, with average slopes 1.3 ° and 0.6 ° respectively. Elevation over the site ranges from 16 m AHD at the southern end of the site on the bedrock high, to 2 m AHD where the site adjoins a wetland. Elevation of the wetland is < 1 m AHD. Topographic detail of the site and surrounding area is shown in Figure 1.2. Development of the site is not constrained by slope.

The site is bisected by Banyula Creek to the east, which drains the central area of Old Bar and to the north by Oyster Creek, which drains a larger catchment to the west of Old Bar.

These two creeks drain to a SEPP 14 wetland (# 571), that forms part of the fluvio-deltaic complex of the lower Manning River South Channel. The wetland drains to Oyster Arm, a tributary channel of the Manning River South Channel.

5.2.2 Geology and Soils

As indicated in Section 5.2.1, the site is partially underlain by bedrock, with the lower elevations forming the surface deposits of a Quaternary infilled barrier estuary system. Bedrock lithology comprises a variety of carbouiferous meta-sediments of the Koorainghat beds, including lithic sandstone, siltstone, tuff and laminite (Eddie, *in prep.*). Quaternary sediments on the site comprise alluvial muds and silts overlying marine sand deposits.

Figure 5.1 shows that the site is located within the Pelican Bay and Diamond Head variant Soil Landscape Groups (Eddie, *in prep.*). The residual Diamond Head variant Soil Landscape Group is located on the more elevated sections of the site and is described as a residual landscape of undulating rises on coastal headlands on various rock types. Soils of this group are 0.5 - 1 m deep, imperfectly drained, and comprise Yellow Podzolics, Soloths, Lithosols and Black Headland Soils, dependant upon parent material (Eddie, *in prep.*).

The significant soil and land qualities associated with the Diamond Head variant Soil Landscape Group include high erodibility, sodicity/dispersibility, low available water holding capacity, low fertility, hard setting surfaces and foundation hazards.

The lower elevations of the site are underlain by the estuarine Pelican Bay Soil Landscape Group. This Group is described as level intertidal and supratidal flats on Holocene sands and muds. Soils are >2 m, waterlogged and comprise Sulfidic Intertidal and Supratidal Hydrosols on muddy sediments, with Arenaceous Intertidal Hydrosols on the sand flats.

The significant soil and land qualities associated with the Pelican Bay Soil Landscape Group include low wet bearing strength, sodicity, high erodibility, with extreme acid sulfate potential and extreme engineering hazards.

DIPNR mapping also indicates that the areas of lower elevation on the site (wetland and drainage lines) have a "High" probability of Acid Sulfate Soil (ASS) occurrence. ASS issues are discussed in Section 5.2.4.

5.2.3 Suitability of Soils for Development

The suitability of soils on the site for construction of dwellings and infrastructure for residential development can be assessed generally from information provided by DIPNR complied for the draft Camden Haven 1:100000 soil landscape sheet. Of the two Soil Landscape Groups described above, only the Diamond Head variant group is suitable for development. General limitations of soils in this group relevant to construction on the site are:

- High erodibility, sodicity/dispersibility;
- Low subsoil permeability;
- Strong acidity;
- Localised mass movement;
- High run on; and
- Foundation hazard.

Comments from DIPNR (Appendix A), however, indicate that these soils should not have major urban development constraints and that this landscape group has been cleared for housing development in the past.

5.2.4 Acid Sulfate Soil (ASS) Potential

Ministerial Direction C1 – Acid Sulfate Soils under Section 117(2) of the Environmental Planning and Assessment Act (1979) directs Councils to ensure that *'the use of any land that is mapped as having a probability of containing ASS will not result in significant environmental impacts'*. Consequently, the constraints posed to development on the site by ASS are investigated in this LES.

Acid Sulfate Soil (ASS) is the term given to naturally occurring soils and sediments containing iron sulfides. When these natural sulfides are disturbed or exposed to air through excavation or drainage works, oxidation occurs and sulphuric acid is ultimately produced. This sulphuric acid can acidify soils and drain into waterways causing severe short and long-term environmental and socio-economic impacts.

The majority of acid sulfate sediments are formed by natural processes in anoxic conditions that generally exist beneath mangroves, saltmarsh vegetation and in the benthic sediments of coastal rivers and lakes. Accordingly, the occurrence of ASS is generally limited to low lying parts of coastal floodplains, rivers and creeks.

Maps prepared by the DLWC indicate that the low lying area of the site is an Estuarine Supratidal Flat (HEu1) with a High Probability of occurrence of ASS, between 1 - 2 m AHD elevation (Figure 5.2). Greater Taree City Council's (GTCC) Acid Sulfate Soils Planning Map classifies the majority of this area of the site as Class 2. This classification triggers provisions of the GTCC LEP which places development controls on:

- Works below the ground surface; and
- Works likely to lower the watertable.

A small portion of the site located further north where Oyster Reach is permanently wet is classified as Class 1.

In addition, the Executive Summary of Council's Old Bar/Wallabi Point Development Strategy (GTCC, 2001) states that the strategy provides for '*no development in areas containing Class 1, 2, and 3 Acid Sulfate Soils*'.

The area classified as potentially containing ASS is located outside of any potential development area, being within the boundaries of the SEPP 14 wetland. As such, a preliminary assessment of ASS on the site was not considered necessary.

5.2.5 Agricultural Suitability

The site contains land which is classified in terms of Agricultural Suitability as Class 4 (Figure 5.3). NSW Agriculture did not provide a response to a request for comments on the LES. A site level assessment of the agricultural quality of the land was deemed unnecessary in light of its current classification and the low intensity grazing activities that currently occur on the site.

Class 4 lands are described by Riddler, (1996) as: "*Land suitable for grazing but not cultivation. Native or improved pastures established using minimal tillage techniques*".

Based on the above description, the site therefore has low level agricultural potential. It is therefore considered that there will be no loss of economically important agricultural land as a result of the future development of the site. This is due to a number of factors.

The major agricultural activities in the area are dairying and beef cattle production. The only agricultural activity occurring on the site is low intensity beef cattle grazing. Therefore, there would be no loss of high value grazing lands as a result of the proposed residential development of the site.

In addition, the site is surrounded on two sides by established residential development, while land to the west is included in Old Bar Development Precinct 2B, currently the subject of a LES to determine its suitability for residential development. Therefore, the agricultural lands in the vicinity of the site have already been fragmented, and residential development of the site would not contribute unduly to fragmentation of agricultural lands.

5.3 FLORA

5.3.1 Terrestrial Flora Vegetation Communities

Results of the flora survey are provided in Appendix C. A summary of the results of the flora survey is provided below.

The site has been historically cleared for agricultural/grazing activities and is dominated by extensive areas of grazing land comprising introduced Buffalo (*Stenotaphrum secundatum*) and Paspalum (*Paspalum dilatatum*) grasses. Occasional remnant Eucalypt and *Syncarpia* are present as scattered paddock trees.

The other communities which are present include a small area of fringing mangrove forest along Oyster Creek and an area of salt marsh in the northern part of the site. The mangrove community is dominated by Grey mangrove (*Avicennia marina var. australasica*) and River mangrove (*Aegiceras corniculatum*). The salt marsh community is dominated by Salt couch (*Sporobolus virginicus*) and Sea rush (*Juncus krausii*). These two communities are mapped as a single community (mangroves and some salt marsh) on GTCC vegetation map extract for the area. This appears inappropriate given the obvious floristic and edaphic differences between the two communities. The location of each of the vegetation communities is shown in Figure 5.4.

In total, 25 flora species were identified on the site, however, due to the season of the survey some species were not able to be identified due to the lack of flowering or fruiting material.

5.3.2 Threatened Flora Species Target Surveys

The targeted Threatened flora surveys conducted during the surveys did not locate any Threatened or significant flora species occurring within the site.

5.4 FAUNA

5.4.1 Fauna

During the fauna surveys a total of 39 vertebrate fauna species were recorded within the site, including one (1) species listed as Vulnerable Species, Schedule 1, *Threatened Species Conservation Act (1995)*. The location of Threatened fauna species recorded during the surveys and searches of NPWS Atlas of NSW Wildlife database are shown in Figure 5.5.

5.4.2 Avifauna Surveys

A total of 25 bird species were recorded, either observed or identified from calls, during the specific Avifauna surveys. One species, the Square-tailed Kite, which is listed as Vulnerable Schedule 2 of the Threatened Species Conservation Act (1995) was recorded during these surveys. It is also expected that a number of species listed as 'Migratory species' under the Commonwealth Environmental Protection and Biodiversity Conservation Act (1999) would occur on the site (Section 5.5).

A total of 27 bird species were recorded during all survey types (combined results of specific, opportunistic and call broadcast surveys) within the site.

5.4.3 Spotlighting Surveys

Only one species was detected during the spotlighting surveys conducted on the site, the introduced Brown Hare (*Lepus capensis*).

5.4.4 Call Playback Surveys

Two species were recorded responding to the Call Playbacks which were broadcast within the site, the Southern Boobook Owl (*Ninox novaseelandiae*) and the Barn Owl (*Tyto alba*). Both species responded to the calls broadcast of the Threatened Owls' (Section 4.4.2) during the surveys undertaken on the site.

5.4.5 Reptile and Amphibian Surveys

A total of three Amphibian species and one reptile species were recorded during the surveys undertaken on the site.

5.4.6 SEPP 44 Surveys - Koala Scat and Scratch Surveys

In total, 40 trees were surveyed for the presence of Koala scratches and scats, as shown in Table 5.1. Although no Koala scats were detected during the surveys it is possible that this area is utilised periodically by the Koala.

5.4.7 Habitat Value

The site was found to offer very little in terms of habitat value to Threatened species and is not considered as an important habitat for any of the Threatened species occurring in the area. Despite this, the site is likely to be used by a number of Threatened species for foraging purposes, particularly bats, as many of these species forage in a variety of habitats, including over open areas and agricultural crops.

As no native forest communities occur, the site offers little in terms of feeding resources for nectivorous or frugivorous species occurring within the locality, except during the flowering and fruiting period of the scattered eucalypts and melaleucas occurring on the site. In addition, as the site contains no hollow bearing trees, the site offers no roosting, denning or nesting habitats.

In terms of habitat for reptiles, the site does not contain leaf litter, rocky outcrops or fallen timber and therefore, there is a lack shelter and foraging resources for reptiles. In terms of habitat resources for amphibians, the aquatic habitats provide potential resources for a number of common frog species, which inhabit cleared and other disturbed areas. It is not expected, however, that Threatened amphibian species would utilise these habitats.

Based on the habitat preferences of the species potentially utilising the site, an assessment of likelihood of occurrence was undertaken for the Threatened species known or potentially occurring within 10 km of the site, as listed under the Threatened Species Conservation Act (1995) (Table 5.2), as well as those listed under the provisions of the Environment Protection and Biodiversity Conservation Act (1999) (Section 5.5).

5.4.8 Opportunistic Results

A number of species were recorded opportunistically during the field program including a Cat (*Felis cattus*), the White-striped Mastiff Bat (*Tadarida australis*) and the Dark-flecked Garden Sunskink (*Lampropholis delicatus*).

TABLE 5.1 RESULTS OF SEPP 44 ASSESSMENT – KOALA SCAT SEARCHES

Tree Species	No. of Trees searched at DBH (cm)			Total No. of Trees searched	No. of trees with Scratch marks	No. of trees with Koala Scats	Percent of Trees with Scats	Comments
	10-30	30-60	>60					
Tallowwood (*Eucalyptus microcorys*)	1	7	17	25	0	0	0%	No scats or scratches identified
Swamp mahogany (*Eucalyptus robusta*)	0	1	2	3	0	0	0%	No scats or scratches identified
White Mahogany (*Eucalyptus eugeniodes*)	2	4	2	8	0	0	0%	No scats or scratches identified
Pink Bloodwood (*Eucalyptus intermedia*)	1	2	0	3	0	0	0%	No scats or scratches identified
Turpentine (*Syncarpia glomulifera*)	0	0	1	1	0	0	0%	No scats or scratches identified

Key:

DBH : Diameter at Breast Height

TABLE 5.2 THREATENED SPECIES RECORDED WITHIN THE LOCAL AREA AND AN ASSESSMENT OF THE LIKELIHOOD OF OCCURRENCE ON THE SITE

Common Name	Species Name	Likelihood of Occurrence	Source	Habitats and Identification of Subject Species for the site and potential for impact on these species
Dwarf Heath Casuarina	*Allocasuarina defungens*	Not recorded during target flora surveys	NPWS	Generally confined to dry habitats such as tall heath. This species was not recorded within the site during target surveys for this species.
Unnamed Woodrush	*Asperula asthenes*	Not recorded during target flora surveys	NPWS	Found in damp sites, often along riverbanks. This species was not recorded within the site during target surveys for this species.
	Cynanchum elegans	Not recorded during target flora surveys	NPWS	Generally found in dry, littoral or subtropical rainforest, occasionally scrub or woodland. No appropriate habitat occurs within the site.
	Senna acclinis	Not recorded during target flora surveys	NPWS	Generally found in or on the edges of dry or subtropical rainforest. No appropriate habitat occurs within site.
Wallum Froglet	*Crinia tinnula*	Highly Unlikely to Occur	NPWS	Generally found in Wallum swamps and wetlands with highly acidic waters. No appropriate habitat occurs within the site.
Black-necked Stork	*Ephippiorhynchus asiaticus*	Potentially Occurring	NPWS	Known to forage in open wetland habitats and nests in large trees adjoining wetlands. Limited habitat occurs within the site.
Magpie Goose	*Anseranas semipalmata*	Potentially Occurring	NPWS	Known to forage in open wetland habitats and nests in large trees adjoining wetlands. Limited habitat occurs within the site.
Little Tern	*Sterna albifrons*	Highly Unlikely to Occur	NPWS	Generally confined to beaches, mudflats and sandflats. No appropriate habitat occurs within the site.
Leathery Turtle	*Dermochelys coriacea*	Highly Unlikely to Occur	NPWS	Confined to oceanic habitats. No appropriate habitat occurs within the site.
Black-browed Albatross	*Thalassarche melanophris*	Highly Unlikely to Occur	NPWS	Confined to oceanic habitats. No appropriate habitat occurs within the proposed development area.

TABLE 5.2 THREATENED SPECIES RECORDED WITHIN THE LOCAL AREA AND AN ASSESSMENT OF THE LIKELIHOOD OF OCCURRENCE ON THE SITE

Common Name	Species Name	Likelihood of Occurrence	Source	Habitats and identification of Subject Species for the site and potential for impact on these species
Black Bittern	*Ixobrychus flavicollis*	Unlikely to Occur	NPWS	Generally found in swamps and estuarine habitats. No appropriate habitat occurs within the proposed development area.
Square-tailed Kite	*Lophoictinia isura*	Known to Occur	Obs	Occurs in a variety of Sclerophyll forest types where suitable populations of prey species occur. No appropriate habitat occurs within the study site
Osprey	*Pandion haliaetus*	Potentially Occurring	NPWS	Occurs in Estuarine, Riverine and Oceanic habitats and adjoining forest areas for roosting and nesting. Limited habitat occurs within the site.
Black-tailed Godwit	*Limosa limosa*	Highly Unlikely to Occur	NPWS	Generally confined to mudflats and sandflats. No appropriate habitat occurs within the site.
Terek Sandpiper	*Xenus cinereus*	Highly Unlikely to Occur	NPWS	Generally confined to estuarine mudflats and sandflats. No appropriate habitat occurs within the proposed site.
Sooty Oystercatcher	*Haematopus fuliginosus*	Highly Unlikely to Occur	NPWS	Generally confined to rocky shores, beaches, mudflats and sandflats. No appropriate habitat occurs within the site.
Pied Oystercatcher	*Haematopus longirostris*	Highly Unlikely to Occur	NPWS	Generally confined to beaches, mudflats and sandflats. No appropriate habitat occurs within the site.
Lesser Sand Plover	*Charadrius mongolus*	Highly Unlikely to Occur	NPWS	Generally confined to beaches, mudflats and sandflats. No appropriate habitat occurs within the site.
Powerful Owl	*Ninox strenua*	Potentially Occurring	NPWS	Occurs in a variety of Sclerophyll forest types where suitable populations of arboreal/scansorial prey occur. Limited potential habitat occurs within the site.
Masked Owl	*Tyto novaehollandiae*	Potentially Occurring	NPWS	Occurs in a variety of Sclerophyll forest types where suitable populations of arboreal/scansorial prey occur. Limited Potential habitat occurs within the site.
Eastern Grass Owl	*Tyto capensis*	Potentially Occurring	NPWS	Generally occurs in Grasslands, sedgelands, heaths and adjoining habitats. The habitat occurring within the site.
Koala	*Phascolarctos cinereus*	Potentially Occurring	NPWS	Occurs in a variety of forest types that contain appropriate food tree species.

TABLE 5.2 THREATENED SPECIES RECORDED WITHIN THE LOCAL AREA AND AN ASSESSMENT OF THE LIKELIHOOD OF OCCURRENCE ON THE SITE

Common Name	Species Name	Likelihood of Occurrence	Source	Habitats and Identification of Subject Species for the site and potential for impact on these species
Brush-tailed Phascogale	*Phascogale tapoatafa*	Potentially Occurring	NPWS	Occurs in variety of Forest and Woodland habitats. Although a small area of suitable foraging habitat occurs within the site, minimal potential den sites are available.
Squirrel Glider	*Petaurus norfolcensis*	Potentially Occurring	NPWS	Occurs in variety of Forest and Woodland habitats. Although a small area of suitable foraging habitat occurs within the site, minimal potential den sites are available.
Grey-headed Flying-fox	*Pteropus poliocephalus*	Likely to occur	NPWS	Found in a wide variety of habitats from tall heaths and mangroves to rainforests, migrating between food resources. Roosting sites are usually found in rainforest and mangrove communities. This species is likely to feed on eucalypts and *Melaleucas* occurring on the site during the flowering period of these species.
Common Blossom Bat	*Syconycteris australis*	Highly Unlikely to Occur	NPWS	This species is known to forage in Heathlands with suitable nectar/pollen resources such as Melaleucas and Banksias and roosts in adjoining Rainforest. The site does not contain any potential roosting habitat nor is any potential roosting area within suitable distance to the site.
Little Bentwing Bat	*Miniopterus australis*	Likely to occur	NPWS	This species is known to forage in a wide variety of habitats including Dry Sclerophyll Forest, however primarily roosts in caves and tunnels The site potentially offers limited foraging habitat and does not contain any potential roosting habitat.
Common Bentwing-bat	*Miniopterus schreibersii*	Likely to occur	NPWS	This species is known to forage in a wide variety of habitats including Heathlands, however is only known to roosts in caves and tunnels. The site potentially offers foraging habitat and does not contain any potential roosting habitat.
Eastern Freetail Bat	*Mormopterus norfolcensis*	Likely to occur	NPWS	This species is known to forage in a wide variety of habitats including dry sclerophyll forest. The Eastern Freetail Bat primarily roosts in tree hollows. The site potentially offers limited foraging habitat and negligible potential roosting habitat.
Greater Broad-nosed Bat	*Scoteanex rueppellii*	Likely to occur	NPWS	This species is known to forage in a wide variety of habitats including dry sclerophyll forest. The Greater Broad-nosed Bat primarily roosts in tree hollows. The site provides a limited area of foraging habitat.

Key: NPWS – National Parks and Wildlife Atlas of NSW Wildlife database (as of May 2002)

5.5 EPBC ACT (1999) ASSESSMENT

Environmental Protection and Biodiversity Conservation Act 1999

AN assessment under the provisions of the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) is required for actions that may affect matters of environmental significance, particularly where the Commonwealth has entered into international agreements. Actions that apply to the present assessment include nationally Threatened species, communities and migratory species protected under international agreements (JAMBA/CAMBA), and potential impacts on World Heritage Areas.

The relevance of each matter of National Environmental Significance when considering the site and environs is discussed below. This assessment was undertaken with reference to a Environment Protection and Biodiversity Conservation Act Online Database search, with a buffer area of 10 km.

World Heritage Areas

No World Heritage Areas are located within 10 km of the site. The closest World Heritage Area is Barrington Tops, situated approximately 90 km west of the site. Any development on the site would not impact on this World Heritage Area.

Ramsar Wetlands

No Ramsar listed wetlands are located within 10 km of the site. The nearest Ramsar wetlands are located at Myall Lakes, approximately 50 km south of the site. These wetlands would not be adversely affected by the proposed activity.

Listed Threatened Species

A total of 34 Threatened species listed under the EPBC Act (1999) have been identified by the EPBC Act Online Database Search as likely to occur within 10 km of the site (Figure 5.5). These species are listed in Table 5.3, which provides a preliminary assessment of the likelihood of these species being adversely impacted by the proposal.

Based on the habitat assessment undertaken for the study, it was determined that the majority of these listed Threatened species are considered as "not likely to occur" in the site, based on the habitat requirements of the species and the lack of these features within the study site. The site exhibits habitat characteristics suitable only for the Grey-headed Flying-fox. Although this species was not detected during the field surveys undertaken for the study, it is considered as likely to occur, and any development on the site should consider this species and provide suitable foraging habitat through the planting of tree species in the landscaping which provide food for the Grey-headed Flying-fox.

Listed Ecological Communities

No Threatened Ecological Communities were identified within 10 km of the site.

Listed Migratory species

A total of 14 Marine Birds, 10 Marine species (mammals, Reptiles and Sharks), 7 Terrestrial and 2 Wetland migratory species listed have been identified as likely to occur within the 10 km of the site of the site. All listed species are shown in Table 5.4, which provides an assessment of the likelihood of occurrence of these species on the site or in adjoining habitats.

One migratory species, the Cattle Egret, was recorded on the site during the surveys. However, as this species utilises a variety of habitats and potential habitat is abundant in the region, it is considered that any proposed development on the site would not impact on this species.

As the site contains wetlands and adjoins estuarine habitats, it is considered that a number of other species could potentially utilise these areas of the site and its environs. These species include the White-bellied Sea Eagle and the Latham Snipe, which could utilise the estuarine habitats and the wetland areas located in the site. In addition the White-throated Needletail, was considered as likely forage above the site and adjoining habitats. As no potential habitat for roost or nest sites for the White-throated Needletail occur within the site and foraging habitat for this species is found in all areas of the region, the proposed development of the site is not considered as likely to have a negative impact on this species.

Nuclear actions

Any proposed development on the site would not include any nuclear actions as defined under the EPBC act.

Marine provisions

A total of 47 species covered by the marine provisions of the EPBC Act (1999) were identified as likely to occur within the locality. These species are listed in Table 5.5 which provides an assessment of the likelihood of these species occurring within the site or adjoining habitats.

Although estuarine habitats adjoining the site, these habitats are not considered appropriated for whales and other cetaceans. It is therefore considered that an assessment of the significance of the impact of the proposed activity under the administrative guidelines criteria for marine provisions would not be required for these species.

TABLE 5.3 - EPBC ACT (1999) THREATENED SPECIES OCCURRENCE WITHIN 10KM OF THE SITE

Common Name	Species Name	Status	Likelihood of Occurrence within the site or adjoining habitats
Green and Golden Bell Frog	*Litoria aurea*	Vulnerable	Considered extremely unlikely to occur within site.
Stuttering Frog	*Mixophyes balbus*	Vulnerable	Considered extremely unlikely to occur within site or adjoining habitats.
Giant Barred Frog	*Mixophyes iteratus*	Endangered	Considered extremely unlikely to occur within site or adjoining habitats.
Amsterdam Albatross	*Diomedea amsterdamensis*	Endangered	Considered extremely unlikely to occur within site or adjoining habitats.
Antipodean Albatross	*Diomedea antipodensis*	Vulnerable	Considered extremely unlikely to occur within site or adjoining habitats.
Tristan Albatross	*Diomedea dabbenena*	Endangered	Considered extremely unlikely to occur within site or adjoining habitats.
Wandering Albatross	*Diomedea exulans*	Vulnerable	Considered extremely unlikely to occur within site or adjoining habitats.
Gibsons Albatross	*Diomedea gibsoni*	Vulnerable	Considered extremely unlikely to occur within site or adjoining habitats.
Swift Parrot	*Lathamus discolor*	Endangered	Considered extremely unlikely to occur within site or adjoining habitats.
Southern Giant-Petrel	*Macronectes giganteus*	Endangered	Considered extremely unlikely to occur within site or adjoining habitats.
Northern Giant-Petrel	*Macronectes halli*	Vulnerable	Considered extremely unlikely to occur within site or adjoining habitats.
Gould's Petrel	*Pterodromra leucoptera*	Endangered	Considered extremely unlikely to occur within site or adjoining habitats.
Kermadec Petrel (western)	*Pterodroma neglecta neglecta*	Vulnerable	Considered extremely unlikely to occur within site or adjoining habitats.
Buller's Albatross	*Thalassarche bulleri*	Vulnerable	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Shy Albatross	*Thalassarche cauta*	Vulnerable	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Campbell's Albatross	*Thalassarche impavida*	Vulnerable	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Salvins Albatross	*Thalassarche salvini*	Vulnerable	Considered extremely unlikely to occur within site or adjoining aquatic environs.
White-capped Albatross	*Thalassarche steadi*	Vulnerable	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Regent Honeyeater	*Xanthomyza phrygia*	Endangered	Considered extremely unlikely to occur within the site.

TABLE 5-3 EPBC ACT (1999) THREATENED SPECIES OCCURRENCE WITHIN 10KM OF THE SITE

Common Name	Species Name	Status	Likelihood of Occurrence within the site or adjoining habitats
Grey Nurse Shark (east coast population)	*Charcharius taurus*	Critically Endangered	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Great White Shark	*Carcherodon carcharias*	Vulnerable	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Whale Shark	*Rhincodon typus*	Vulnerable	Considered extremely unlikely to occur within site or adjoining aquatic environs
Large-eared Pied Bat, Large Pied Bat	*Chalinolobus dwyeri*	Vulnerable	Considered extremely unlikely to occur within the site.
Spotted-tail Quoll (SE mainland)	*Dasyurus maculatus maculatus*	Vulnerable	Considered extremely unlikely to occur within the site.
Blue Whale	*Balaenoptera musculus*	Endangered	Considered extremely unlikely to occur within adjoining aquatic environs
Southern Right Whale	*Eubalaena australis*	Endangered	Considered extremely unlikely to occur within adjoining aquatic environs
Humpback Whale	*Megaptera novaeangliae*	Vulnerable	Considered extremely unlikely to occur within adjoining aquatic environs
Long-nosed Potoroo (SE mainland)	*Potorous tridactylus tridactylus*	Vulnerable	Considered extremely unlikely to occur within the site.
Grey-headed Flying-fox	*Pteropus poliocephalus*	Vulnerable	**Considered as likely to occur within the site.**
Green Turtle	*Chelonia mydas*	Vulnerable	Considered extremely unlikely to occur in adjoining aquatic environs.
Leathery Turtle, Leatherback Turtle	*Dermochelys coriacea*	Endangered	Considered extremely unlikely to occur in adjoining aquatic environs.
Sheoak	*Allocasuarina defungens*	Endangered	Not recorded during target flora surveys on the site.
Leafless Tongue-orchid	*Cryptostylis hunteriana*	Vulnerable	Not recorded during target flora surveys on the site.
White-flowered Wax Plant	*Cynanchum elegans*	Endangered	Not recorded during target flora surveys on the site.

TABLE 5-4 EPBC ACT 1999 SPECIES LISTED UNDER MIGRATORY PROVISIONS WITHIN 10 KM OF THE SITE

Common Name	Species Name	Likelihood of Occurrence within the Site or Adjoining Waterways
Marine bird species		
Amsterdam Albatross	*Diomedea amsterdamensis*	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Antipodean Albatross	*Diomedea antipodensis*	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Tristan Albatross	*Diomedea dabbenena*	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Wandering Albatross	*Diomedea exulans*	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Gibsons Albatross	*Diomedea gibsoni*	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Southern Giant-Petrel	*Macronectes giganteus*	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Northern Giant-Petrel	*Macronectes halli*	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Gould's Petrel	*Pterodromra leucoptera leucoptera*	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Buller's Albatross	*Thalassarche bulleri*	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Shy Albatross	*Thalassarche cauta*	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Black-browed Albatross	*Thalassarche melanophris*	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Salvins Albatross	*Thalassarche salvini*	Considered extremely unlikely to occur within site or adjoining aquatic environs.
White-capped Albatross	*Thalassarche steadi*	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Marine species		
Great White Shark	*Carcharodon carcharias*	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Whale Shark	*Rhincodon typus*	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Bryde's Whale	*Balaenoptera edeni*	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Blue Whale	*Balaenoptera musculus*	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Pygmy Right Whale	*Caperea marginata*	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Southern Right Whale	*Eubalaena australis*	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Humpback Whale	*Megaptera novaeangliae*	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Killer Whale	*Orcinus orca*	Considered extremely unlikely to occur within site or adjoining aquatic environs.

TABLE 5.4 EPBC ACT (1999) SPECIES LISTED UNDER MIGRATORY PROVISIONS WITHIN 10 KM OF THE SITE		
Common Name	Species Name	Likelihood of Occurrence within the Site or Adjoining Waterways
Green Turtle	*Chelonia mydas*	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Leathery Turtle, Leatherback Turtle.	*Dermochelys coriacea*	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Terrestrial species		
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	**Considered likely to occur within site or adjoining habitats.**
White-throated Needletail	*Hirundapus caudacutus*	**Considered as likely to forage over the site however no appropriate habitat for roosting or breeding occurs on the site or in adjoining habitats.**
Black-faced Monarch	*Monarcha melanopsis*	Considered unlikely to occur within site or adjoining habitats.
Spectacled Monarch	*Monarcha trivirgatus*	Considered unlikely to occur within site or adjoining habitats.
Cattle Egret	*Ardea ibis*	**Recorded on the site.**
Satin Flycatcher	*Myiagra cyanoleuca*	Considered unlikely to occur within site or adjoining habitats.
Rufous Fantail	*Rhipidura rufifrons*	Considered unlikely to occur within site or adjoining habitats.
Regent Honeyeater	*Xanthomyza phrygia*	Considered unlikely to occur within site or adjoining habitats
Wetland species		
Latham's Snipe, Japanese Snipe	*Gallinago hardwickii*	**Considered as potentially occurring within site or adjoining wetlands.**
Painted Snipe	*Rostratula benghalensis s. lat.*	Considered extremely unlikely to occur within site or adjoining aquatic environs.

TABLE 5-5 - EPBC ACT 1999 MARINE PROTECTED SPECIES OCCURRENCE WITHIN 5 KM OF THE SITE			
Common Name	Species Name	Status	Likelihood of Occurrence within the Site or Adjoining Waterways
Hairy Pygmy Pipehorse	*Acentronura tentaculata*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Girdled Pipefish	*Festucalex cinctus*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Tiger Pipefish	*Filicampus tigris*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Upside –down Pipefish	*Heraldia nocturna*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Madura Pipefish	*Hippichthys heptagonus*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Beady Pipefish	*Hippichthys penicillus*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
White's Seahorse	*Hippocampus whitei*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Briggs crested Pipefish	*Histiogamphelus briggsii*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Javelin Pipefish	*Lissocampus runa*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Sawtooth Pipefish	*Maroubra perserrata*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Duncker's Pipehorse	*Solegnathus dunckeri*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Spiny Pipehorse	*Solegnathus spinosissimus*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Blue-finned Ghost Pipefish	*Solenostomus cyanopterus*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Harlequin Ghost Pipefish	*Solenostomus paradoxus*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Wide-bodied Pipefish	*Stigmatopora nigra*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Double-ended Pipehorse	*Syngnathoides biaculeatus*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Bend Stick Pipefish	*Trachyrhamphus bicoarctatus*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Hairy Pipefish	*Urocampus carinirostris*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Mother-of-pearl Pipefish	*Vanacampus margaritifer*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Great Skua	*Catharacta skua*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.

TABLE 5-5 EPBC ACT (1999) MARINE PROTECTED SPECIES OCCURRENCE WITHIN 5 KM OF THE SITE			
Common Name	Species Name	Status	Likelihood of Occurrence within the Site or Adjoining Waterways
Amsterdam Albatross	*Diomedea amsterdamensis*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Antipodean Albatross	*Diomedea antipodensis*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Tristan Albatross	*Diomedea dabbenena*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Wandering Albatross	*Diomedea exulans*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Gibsons Albatross	*Diomedea gibsoni*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Latham's Snipe, Japanese Snipe	*Gallinago hardwickii*	Listed - overfly marine area	Considered as potentially occurring within site or adjoining wetlands.
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	Listed	Considered likely to occur in adjoining estuarine habitats.
White-throated Needletail	*Hirundapus caudacutus*	Listed - overfly marine area	Considered as likely to forage over the site however no appropriate habitat for roosting or breeding occurs on the site or in adjoining habitats.
Swift Parrot	*Lathamus discolor*	Listed - overfly marine area	Considered unlikely to occur within site or adjoining habitats.
Southern Giant-Petrel	*Macronectes giganteus*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Northern Giant-Petrel	*Macronectes halli*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Black-faced Monarch	*Monarcha melanopsis*	Listed - overfly marine area	Considered unlikely to occur within site or adjoining habitats.
Spectacled Monarch	*Monarcha trivirgatus*	Listed - overfly marine area	Considered unlikely to occur within site or adjoining habitats.
Satin Flycatcher	*Myiagra cyanoleuca*	Listed - overfly marine area	Considered unlikely to occur within site or adjoining habitats.
Rufous Fantail	*Rhipidura rufifrons*	Listed - overfly marine area	Considered unlikely to occur within site or adjoining habitats.
Painted Snipe	*Rostratula benghalensis s. lat.*	Listed - overfly marine area	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Buller's Albatross	*Thalassarche bulleri*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Shy Albatross	*Thalassarche cauta*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.

TABLE 5-5 - EPBC ACT (1999) MARINE PROTECTED SPECIES OCCURRENCE WITHIN 5 KM OF THE SITE

Common Name	Species Name	Status	Likelihood of Occurrence within the Site or Adjoining Waterways
Yellow-nosed Albatross	*Thalassarche chlororhynchos*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Campbell's Albatross	*Thalassarche impavida*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Black Browed Albatross	*Thalassarche melanohris*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Salvins Albatross	*Thalassarche salvini*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
White-capped Albatross	*Thalassarche steadi*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Green Turtle	*Chelonia mydas*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Leathery Turtle, Leatherback Turtle	*Dermochelys coriacea*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Elegant Seasnake	*Hydrophis elegans*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.
Yellow-bellied Seasnake	*Pelamis platurus*	Listed	Considered extremely unlikely to occur within site or adjoining aquatic environs.

Potential for Significant effect on Matters of NES

It is submitted that the proposed activity would not pose a significant effect on *Matters of NES* and therefore would not require Commonwealth approval under the provisions of the EPBC Act (1999).

5.6 NATIVE VEGETATION CONSERVATION ACT (1997)

The NSW Native Vegetation Conservation Act (1997) provides for an assessment and development consent process in relation to clearing native vegetation.

The main objectives of this Act are:

- The provision of conservation and management of native vegetation on a regional basis;
- To encourage and promote native vegetation management in the social, economic and environmental interests of the State;
- To protect native vegetation of high conservation value;
- To improve the condition of existing native vegetation;
- To encourage the revegetation of land, and the rehabilitation of land with appropriate vegetation;
- To prevent the inappropriate clearing of vegetation;
- To promote the significance of native vegetation; and
- Promote ecologically sustainable development.

One of the main features of the Act is the provision for preparation of Regional Vegetation Management Plans (RVMP). These plans are developed by community-based Regional Vegetation Committees. The RVMP for the Manning Region has finalized its report and is awaiting government review of the committee's recommendations before gazettal.

The plan has identified areas in the north of the site as 'Special Protection Zone' on the Regulatory Map of the Manning Regional Vegetation Management Plan (MRVMP). This area, however, was overlain by a category described as "Land excluded from the RVMP", as this area corresponds with the SEPP 14 wetlands and is therefore already subject to the provisions of SEPP 14.

5.7 IMPLICATIONS OF FLORA/FAUNA STUDY FINDINGS FOR DEVELOPMENT

Residential development within the site, in the absence of mitigation measures, would be likely to have the following impacts:

- Habitat loss and modification;
- Increased barrier to fauna movement;
- Increased predation and competition from non-native species;
- Increased road strike;
- Increased noise;
- Increased opportunity for key threatening processes (Schedule 3, Threatened Species Conservation Act 1995); and
- Water quality degradation.

Development of the site, without the retention of the areas identified as being environmentally sensitive (primarily the wetland areas), would have an impact on local biodiversity, including Threatened fauna species, as outlined above. However, if appropriate areas are retained in their current state, these impacts can be minimised.

5.8 AQUATIC ECOLOGY

Threatened Aquatic Species

The Fisheries Management Act (1994) lists the following 14 aquatic species as Threatened. These are listed either under Part 1 of Schedule 4 as endangered, or under Part 1 of Schedule 5 as vulnerable. Table 5.6 contains an assessment of the likelihood of occurrence of these species on or adjoining the site, with respect to the habitat requirements of each species.

Aquatic habitats which occur on the site are largely degraded. The aquatic habitats and ephemeral water courses drain into Oyster Reach and ultimately Manning River South Channel. The Manning River is an estuarine habitat with marine and brackish waters with varying salinity, depending upon rainfall in the upper catchment. Based on the assessment provided here, no Threatened aquatic species are likely to occur within the site or likely to occur in the Manning River in the vicinity of the site.

TABLE 5.6 LIKELIHOOD OF THREATENED AQUATIC SPECIES OCCURRENCE WITHIN THE SITE

Common Name	Species Name	Status	Habitat	Likelihood of Occurrence within the site or Adjoining Waterways
Grey Nurse Shark	Carcharias taurus	E	Subtropical to cool temperate coastal waters	Considered extremely unlikely to occur within site or adjoining aquatic environs
Murray Hardyhead	*Craterocephalus fluviatilis*	E	In still or slow flowing lowland rivers, lakes, billabongs and backwaters with thick vegetation in the Murray and Murrumbidgee river system	Considered extremely unlikely to occur within site or adjoining aquatic environs
Eastern Freshwater Cod	*Maccullochella ikei*	E	Occurs in clear, slow flowing rivers or creeks with abundant in-stream habitat features of the Clarence catchment.	Considered extremely unlikely to occur within site or adjoining aquatic environs
Trout Cod	*Maccullochella macquariensis*	E	Inland streams with relatively fast currents and a high abundance of large woody debris or snags	Considered extremely unlikely to occur within site or adjoining aquatic environs
Oxleyan Pygmy Perch	*Nannoperca oxleyana*	E	Restricted to small brackish creeks in Wallum Habitats from Northern NSW to Fraser Island	Considered extremely unlikely to occur within site or adjoining aquatic environs
Unnamed River Snail	*Notopala sublineata*	E	Only known from the Murray Darling river system but has not been recorded in the last ten years	Considered extremely unlikely to occur within site or adjoining aquatic environs
Green Sawfish	*Pristis zijsron*	E	Occurs in freshwater and estuarine habitats along of northern coastline extending to northern NSW	Considered extremely unlikely to occur within site or adjoining aquatic environs
Adams Emerald Dragonfly	*Archaeophya adamsi*	V	Small creeks with gravely or sandy bottoms, only recorded from the Sydney Basin	Considered extremely unlikely to occur within site or adjoining aquatic environs
Silver Perch	*Bidyanus bidyanus*	V	Fast-flowing, open waters of the Murray Darling system, especially where there are rapids and races	Considered extremely unlikely to occur within site or adjoining aquatic environs
Buchanans Fairy Shrimp	*Branchinella buchananensis*	V	Temporary (intermittent) Salt lakes in the West regions of NSW and Qld.	Considered extremely unlikely to occur within site or adjoining aquatic environs

TABLE 5.6 LIKELIHOOD OF THREATENED AQUATIC SPECIES OCCURRENCE WITHIN THE SITE

Common Name	Species Name	Status	Habitat	Likelihood of Occurrence within the site or Adjoining Waterways
Great White Shark	*Carcharodon carcharias*	V	Occur in inshore waters in the vicinity of rocky reefs and islands often near seal colonies	Considered extremely unlikely to occur within site or adjoining aquatic environs
Black Cod	*Epinephelus daemelli*	V	Occurs around rocky reefs and Bombies and in warm temperate and sub tropical parts of the south western Pacific	Considered extremely unlikely to occur within site or adjoining aquatic environs
Macquarie Perch	*Macquaria australasica*	V	Occurs widely in riverine and lake habitats, particularly the upstream reaches of rivers and tributaries	Considered extremely unlikely to occur within site or adjoining aquatic environs
Southern Pygmy Perch	*Nannoperca australis*	V	Along the edges of slow flowing lowland rivers and in lakes billabongs and backwaters of the Murray and Murrumbidgee river system	Considered extremely unlikely to occur within site or adjoining aquatic environs

Key:
E – Endangered Species- Schedule 4, Fisheries Management Act (1994)
V – Vulnerable species, Schedule 5, Fisheries Management Act (1994)

Endangered Populations

To date only two Endangered populations are listed on Part 2, Schedule 4 of the Fisheries Management Act (1994). These populations are the Western Population of the Purple Spotted Gudgeon (*Mogurnda adspersa*) and Western Population of the Olive Perchlet, (*Ambassis agassizii*). Neither population occurs within the region and would therefore not be affected by any development on the site.

Endangered Ecological Communities

There is currently one Endangered Ecological Community listed on Part 3, Schedule 4 of the Fisheries Management Act (1994), which is the aquatic ecological community in the natural drainage system of the lower Murray catchment. This community does not occur in the region and would therefore not be affected by development on the site.

Species Presumed Extinct

To date only one species is listed as a species presumed extinct, Part 2, Schedule 4 of the Fisheries Management Act (1994), being the Bennetts Seaweed (*Vanvoorstia bennettiana*). No appropriate habitat for this species occurs within the site or adjoining waterways.

Key Threatening Processes

To date four Key Threatening Processes are listed on Schedule 6 of the Fisheries Management Act (1994). These Key Threatening Processes are:

- The introduction of fish to fresh waters within a river catchment outside their natural range;
- The removal of large woody debris;
- The degradation of riparian vegetation along New South Wales water courses; and
- The installation and operation of in-stream structures and other mechanisms that alter natural stream flow regimes of rivers and streams.

The implementation of best practice stormwater management and sediment erosion control practices would be required to ensure that any development of the site would not contribute to any Key Threatening Processes, in particular the degradation of riparian vegetation. These best practice management measures are discussed further in Section 5.11.

Conclusion

It is considered highly unlikely that any of the Threatened species listed in Table 5.6 would occur on the site. As a result, rezoning and subsequent residential development of the site would not have a significant effect on

Threatened fish species, populations, ecological communities and or their habitats, pursuant to the provisions of the Fisheries Management Act (1994).

5.8.1 SEPP 14 wetland boundary

During the course of the study, it has become apparent that there is significant discrepancy between the mapped boundary of SEPP 14 wetland # 571, and the actual physical/vegetative boundary of the wetland area. In some areas, the boundary extends well beyond that of the actual wetland, on to bedrock areas with elevations above 6 m AHD, which is well above any possible tidal inundation levels. In other areas, the boundary is located well inside the physical boundary of the wetland itself (Figure 5.6).

It is understood that this situation has been brought to the attention of DIPNR's wetlands officer in Grafton, who has visited the site with the proponent's representative to examine the discrepancies. It is further noted that discussion between DIPNR's wetlands officer and the author indicate that a recommendation has been put before the Minister for a boundary adjustment, so that the mapped boundary precisely represents the physical limits of the wetland (C. Bellamy, *pers. comm.*), as indicated in Figure 5.6. Further, it has been indicated that a package of SEPP 14 wetland recommended boundary changes will be put to the Minister shortly that will include recommending change to the boundary of wetland #571 (C. Bellamy, *pers. comm.*).

It is noted that the current boundary of the 7(a) – Environmental Protection Habitat over the subject land follows the current incorrect SEPP 14 boundary (Figure 3.1). It is therefore recommended that during the course of any rezoning application for the site, that consideration be given to amending the current 7(a) boundary around the wetland to reflect the proposed changes to the SEPP 14 boundary.

DIPNR's wetlands officer has indicated that the timing of gazettal of the changes is unknown at this stage. In the interests of progressing any rezoning applications for lands affected, however, it is recommended that Council proceed with amending the 7(a) area, as indicated in Figure 6.1. In addition, a 50 m open space buffer area around the wetland is recommended, which achieves the Coastal Policy Goal 7 of *'Providing for appropriate public access and use'* of this area. Further details regarding treatment of this area are provided in Sections 6.1 and 6.4.

For the purposes of this study, we have assumed a wetland boundary that reflects the actual physical/vegetative boundary of the wetland with respect to provision of buffer areas around the wetland.

5.9 FLOODING

Council's Interim Flood Management Policy (GTCC, 1987) states that the 1% probability (100 year ARI) flood is to be applied as the standard for consideration of planning, building and development proposals. This standard defines the area of land that will be subject to flood-related building and development controls and also establishes the height of flood which will be used by Council in determining planning, building and development proposals (GTCC, 1995).

Flood levels for the area have been derived from Council's flood maps. As these are based on the approximate elevation contour, flood prone areas shown on these maps must be considered as a guide only. Prior to the development of the site, detailed land surveys should be undertaken, and all development should be excluded from land below the 1 % flood level. Modelling of Banyula Creek for stormwater management purposes has also indicated a flood level for the creek, based on a tailwater level of 2.3 m AHD. The approximate area of flooding for this event over the site is shown in Appendix D (Figure 3).

Council's policy outlines the following conditions for development of flood liable land:

Dwelling houses will not be approved on flood liable sites unless the application demonstrates to the satisfaction of the Council that the following requirements will be satisfied -

a) the dwelling house and provision for at least one vehicle shall be constructed on a certified mound [300mm above the 1% flood];

b) in high hazard areas access from the dwelling house to a flood free area of land which has ready vehicular access to a communal flood refuge shall either-

i) be flood free; or

ii) be achievable by wading through water meeting the safe wading criteria defined in Figure 6 of the NSW Government Floodplain Development Manual;

c) in addition to the above in considering applications in this category Council will take into account, inter alia, the existing and proposed usage of the site, the likelihood of the site being cut off early in a flood event, the flood warning time available, the isolation and duration of cut off of the site by flood waters and the provisions of the NSW Government Floodplain Development Manual.

It is recommended that the area of the site shown as flood prone in Appendix D, Figure 3, should be excluded from residential development.

5.10 HYDROLOGY

Full details of the site hydrological characteristics are contained in the Stormwater Management Report attached at Appendix D.

5.10.1 Surface Hydrology

The site is traversed by two creeks (Figure 1.2). Banyula Creek flows through the eastern portion of the site and is a brackish, disturbed drainage channel that is tidal for approximately half its reach within the site up to a concrete causeway. Above this, the waterway is dominated by the aquatic plant, Broad-leafed Cumbungi. Banyula Creek drains the existing urban area of Old Bar and flows under Banyula Drive through undeveloped land over the eastern portion of the site, before joining Oyster Reach within a wetland located over the lower northern portion of the site. The wetland contains primarily Salt Marsh plants.

The stream width of Banyula Creek varies between 2 – 4 m and its depth ranges between 0.2 m to approximately 1 m at bankfull discharge. The substrate of the creek is dominated by fine silts and clays. Numerous pieces of discarded building material such as bricks and concrete are evident in sections of the creek.

The Banyula Creek catchment south of Banyula Drive is almost entirely developed and comprises approximately 60 % of the catchment. The remainder of the catchment north of Banyula Drive comprises undeveloped land that is the subject of this study.

Oyster Creek drains undeveloped land to the west of Old Bar and flows across undeveloped land to the west of the site within the Precinct 2B development area, before flowing to the aforementioned wetland and Oyster Reach. The Oyster Creek catchment is currently undeveloped with only a small number of dwellings in the catchment.

A drainage line joins Oyster Reach within the wetland approximately 280 m north of the confluence with Banyula Creek, which drains land to the north east of the site. Oyster Reach then flows to Oyster Arm 500 m further north, which is a short tributary of the Manning River South Channel.

Any runoff associated with proposed residential development of the site would utilise a constructed drainage system and drain to Banyula Creek and the SEPP 14 wetland. It is imperative, therefore, that stormwater is appropriately treated to remove any potential pollutants generated from residential development on the site. Details of possible treatment methods are discussed in Section 5.11.

5.10.2 Groundwater

The assessment provided here is based on a preliminary desktop analysis and site inspection. More detailed investigations and a remediation plan may be required by Council at DA stage. There are no licence requirements under the provisions of the NSW Water Act (2000) for works that may intercept the water table (*eg.* footings, foundations, excavations).

Groundwater depths were investigated over the site during site inspections and with reference to DLWC's soil and land surveys undertaken in the local area. The site inspection identified that groundwater depth is quite shallow in the wetland areas of the site. The bedrock areas of the site are more elevated and groundwater depth is greater than 1 m. Review of the soil survey information in the local area (Eddie, *in prep.*) indicates that there are no limitations in these areas due to the presence of groundwater near the surface.

Potential impacts on groundwater quality associated with residential development include:

- Impacts from on-site wastewater management systems; and
- Reduced groundwater infiltration from stormwater due to increased impermeable surfaces (roofs, driveways, roadways.).

Reticulated sewerage is available to the majority of the site (Section 5.19.2), therefore there are no issues associated with on-site wastewater management.

Residential development results in increased areas of impervious surfaces (*eg.* roofs, driveways, roadways) covering the site, with the effect of reducing infiltration of rainfall/stormwater into the groundwater system, which may have the impact of reducing the local groundwater flows. The provision of best practice stormwater management should be implemented to ensure that this potential impact is mitigated. Measures include the provision of grassed swales and infiltration basins to promote infiltration of stormwater and pollution retention. This is discussed in more detail in Section 5.11. and Appendix D.

5.11 STORMWATER MANAGEMENT

A detailed analysis of projected stormwater flows and management measures for proposed residential development of the site is provided in Appendix D. Determination of design management measures were based on the following constraints:

- Location of the site upstream of a SEPP 14 wetland;
- Limiting of peak discharge from the proposed developed site to pre-development levels;
- Inclusion of Stormwater Quality Improvement Devices (SQIDs) where appropriate and necessary; and
- Approach the stormwater management system design from a Water Sensitive Urban Design perspective.

Key elements of the conceptual Stormwater Management Plan developed for the site are summarised below.

Short term construction related impacts

Potential impacts during the construction phase of development would be managed through the development and implementation of a soil and water management plan, prepared in accordance with the Department of Housing Guidelines (DOH, 1998) (the Blue Book). Details are provided in Appendix D. Council's requirements with respect to management of construction phase impacts are detailed in Section 5.11.1.

Long term water quality management

Potential impacts from stormwater on receiving water quality during the life of the development would be managed by implementing the following:

- Minor gross Pollutant Traps (GPTs) at all pipe outlets;
- Two constructed wetlands/retention basins; and
- A slow release configuration from the constructed wetlands and provision of sufficient storage for retarding storm flows.

In summary, any proposed residential development of the site would need to treat stormwater using constructed wetlands. These would normally be sized to cater for the 1 year ARI event, however, due to the location of SEPP 14 wetlands downstream of the development, it is recommended that the wetlands be sized to cater for the 10 year ARI storm event, achieving a hydraulic residence time (HRT) of 25 days, which would ensure that they retain their function of significant pollutant and nutrient removal for events up to this magnitude. Typical water pollution control ponds designed for urban settings provide 15 days HRT. Further details are provided in Appendix D.

5.11.1 Stormwater Management Objectives - Construction Phase

The Greater Taree Urban Stormwater Management Plan (GTCC, 2000b) lists the following objectives for the construction phase for development:

- Minimise soil erosion and discharge of sediment by the appropriate design, construction and maintenance of erosion and sediment control measures;
- Employ all practical measures to minimise soil erosion and the discharge of sediment in storm events exceeding design storms;
- All motor fuels, oils and other chemicals are stored and used on site in a manner which ensures no contamination of stormwater; and
- No litter placed in a position where it may be blown or washed off site.

Compliance with these objectives can be achieved by following "Greater Taree City Council, Aus-Spec D7 – Erosion Control and Stormwater Management" (GTCC, 2001b). Any development of the site would need, as a minimum, to follow these guidelines to ensure that only clean water leaves the site.

In addition, details are provided in Appendix D that outline a Conceptual Stormwater Management Plan, which includes the preparation of a Soil and Water Management Plan to manage potential construction-related development impacts.

5.11.2 Stormwater Management Objectives - Post Construction Phase

For large developments (generally greater than 10 ha) or developments proposed within particularly sensitive catchments, Council requires assessment of the magnitude of any change in stormwater pollutants loads caused by the development (with proposed stormwater measures), and the likely impact of any increase in pollution levels (GTCC, 2000b).

Qualitative objectives for new development include (GTCC, 2000b):

- Reuse of stormwater for non-potable purposes;
- Increased use of stormwater amelioration measures such as catch drains, tanks, on-site retention basins, detention basins;
- Stormwater infrastructure planned for ultimate development of catchment;
- Use of vegetated flow paths;
- Minimisation of impervious areas connected to the stormwater system;
- Impacts on local waterways minimised;
- All natural wetlands, watercourses, drainage channels and riparian corridors protected and maintained;
- "Natural" channel designs adopted in lieu of floodways in areas where there is no natural (or unmodified) channel;
- Minimise alterations to natural flow paths, discharge points and runoff volumes from the site;
- Areas of open space to be provided in large residential developments;
- Areas of vegetation clearance minimised where possible; and
- Vegetation corridors are maintained where possible.

In addition, details are provided in Appendix D that outline a Conceptual Stormwater Management Plan, which provides information on the proposed management of long-term stormwater water quality throughout the life of the development.

5.11.3 Stormwater Volumes and Pollutants

One of the major issues related to stormwater flows during the construction phase of development is the loss of topsoil due to runoff over exposed areas of soil. Other issues relate to fuels stored on the construction site and litter generated from construction activities (GTCC, 2000b).

Urban development can lead to significant changes in catchment hydrology due to an increase in the area of impervious surfaces and the reduction of within catchment storages, as waterways and flow paths become channelised and piped.

Stormwater pollutants from residential developments originate from a variety of sources in the catchment including construction activities, motor vehicles, erosion and surface degradation, animal droppings, fertilisers, vegetation cuttings and leaf lifter, domestic detergents, and septic tank seepage.

The design and performance of stormwater treatment measures is generally focussed on micro-pollutants in stormwater, primarily the key micro-pollutants of suspended solids (SS), Total Nitrogen (TN) and Total Phosphorus (TP). SS is a measure of the amount of suspended matter contained in water. Suspended matter in stormwater is usually associated with a range of other attached pollutants. Turbidity, the cloudiness of water, is often a function of the suspended solids content. TN and TP can be dissolved, or attached to suspended sediment or discrete particles.

Post development stormwater, therefore, needs to be treated by best practice stormwater management measures to ensure that there will be no net increase in the average annual load of key stormwater pollutants above pre-development levels.

The concepts and design measures outlined in the Stormwater Management Report in Appendix D should be used as the basis for design of the stormwater management system for any proposed development on the site. Adoption of the basic principles and concepts outlined in Appendix D will ensure that:

- Post development stormwater volumes are maintained at or below pre-development levels; and
- Pollutants generated and transported in stormwater are appropriately treated.

5.11.4 Potential Impacts of Stormwater

The following discussion highlights the potential impacts of unmanaged stormwater on waterways and riparian areas. These potential impacts can be prevented with the implementation of suitable stormwater management measures, as discussed in Sections 5.11.1 and 5.11.2. and Appendix D.

Construction Phase

The runoff of sediment into waterways can result in turbid waters which can have the effect of reducing the penetration of light through the water with the consequential impact on the feeding and respiration of aquatic biota. In addition, the public generally associates turbid waters with environmental pollution and degradation of aesthetic value.

Oils and fuels washed into waterways are unsightly and add to the chemical oxygen demand on a waterbody.

Litter is generally the most noticeable indicator of water pollution to the community. Apart from the visual impact, litter can also contribute to a reduction in the drainage capacity of stormwater conveyance systems. When deposited into the receiving waters, litter can also be a threat to aquatic ecosystems.

Post Construction Phase

As stated previously, urban development can lead to significant changes in catchment hydrology, with the most obvious effect being an increase in the magnitude of stormwater flow events in urban creeks and the consequent impact on flooding and public safety.

The effects of urbanisation on stormwater runoff includes increased peak discharges and runoff volume, increased frequency and severity of flooding, and change in characteristics of urban waterways from ephemeral to perennial streams.

Changes in catchment hydrology directly impact aquatic ecosystem in a number of ways, most notably the loss of aquatic habitats and biodiversity, due to increased frequency and severity of habitat disturbances.

Stormwater pollutants can result in progressive deterioration of the environmental values of aquatic ecosystems in residential environments. The impacts associated with stormwater pollutants can include increased turbidity and suspended solids concentrations, deposition of suspended material including litter, increased concentrations of nutrients and decreased dissolved oxygen levels.

Excess sediment can smother aquatic habitat and reduce channel capacities. Turbidity reduces light penetration in water, affecting aquatic plant growth and aquatic habitats. It can also reduce the aesthetic appeal of waterways and increase the need for filtration in water supplies.

Nutrients (mainly nitrogen and phosphorus) are essential to living organisms, but excessive loads can upset the natural balance of waterway ecosystems. Nutrients promote growth of aquatic life and, when nutrients occur in large concentrations, eutrophication or algal blooms may result. Eutrophication occurs when excessive plant growth deprives the water column of oxygen, thereby killing other forms of aquatic biota. The growth of algae is also stimulated by excessive nutrients and may result in a build up of toxins in the water column.

5.11.5 Best Management Practices for Stormwater Management

Construction Phase

Comprehensive details of the Soil and Water Management Plan (SWMP) should be prepared and implemented prior to commencement of any construction on the site, to minimise land degradation and water pollution associated with construction activities. Soil and water management plans should be prepared in accordance with Department of Housing guidelines (DOH, 1998).

A SWMP addresses the need to prevent erosion of soil material and transportation of sediment from areas disturbed during construction. Areas of disturbance for proposed residential development would be associated with construction of internal roadways, hard stand surfaces, buildings and extensions to services such as water supply, communication, power, stormwater and sewerage facilities.

Measures to prevent erosion and transportation of sediment include the use of diversion drains, catch drains, sediment fences and sediment retention basins.

Diversion drains prevent 'clean' surface runoff from undisturbed upstream areas from entering the area of disturbance by diverting it around the area following the natural gradient of the site. Flow spreading measures and sediment fences are used to prevent these diverted flows from eroding soils downstream of the discharge point. Diversion drains should be turfed or lined with erosion control matting.

Catch drains are used to protect the area on the downslope side of development, by collecting runoff from the upslope disturbed areas and directing it to sediment retention basins. The catch drains should also be turfed to assist in collection of sediment from surface flows.

Temporary sediment retention basins would prevent the transportation of sediment from the site to the drainage channels and ultimately Manning River. Sediment retention basins should be sized in accordance with relevant guidelines (DOH, 1998).

Upon completion of construction activities, any disturbed areas should be landscaped and revegetated prior to removal of the erosion control measures. The sediment retention basins can then be converted to wetland/detention basins, with suitable reconfiguration and planting to form a part of the post-construction stormwater management system.

Post Construction Phase

The post-construction or permanent stormwater management system for the subject development should be based on the objectives described in Sections 5.11.2. Accomplishment of these objectives requires implementation of stormwater management measures within the boundaries of the site. The proposed stormwater management measures should be based on contemporary practices in stormwater management, water-sensitive urban design and EPA guidelines (EPA, 1997).

Best Management Practices (BMPs) for stormwater management for the site should comprise at-source and in-line control measures.

At-source control measures have the potential to reduce stormwater flow volumes and stormwater pollutants carried to local waterways. They can also separate clean and potentially contaminated runoff, provide for potential reuse of stormwater, and promote infiltration of stormwater to compensate for the impact of impervious surfaces associated with development. Some at-source controls include:

- Capture of roofwater in rainwater tanks for reuse and/or potential outdoor irrigation;
- On-site infiltration; and
- Directing excess roofwater and stormwater to an underground tank or pond for reuse.

In-line control measures for the hard stand areas should include oil/petrol interception pits and an oil/water separator. These would be strategically located within the drainage system.

Other in-line measures involve the use of grassed or vegetated swale drains for drainage systems along the roadway and for carriage of flows to the wetlands. Swale drains are an open grassed/vegetated drain that can be used as an alternative to conventional kerb and gutter, that also provide some stormwater filtration during passage of flows.

One of the advantages of grass swales is that flow velocities are decreased, thus lessening flooding and downstream erosion impacts. The lower velocities in the swales also allow heavier fractions of the suspended particles to settle out. Grass or other vegetation in the drains act as a filtering device with removal efficiencies of suspended solids ranging from 25 % to 80 %, depending on the grading of the suspended solid loads in the flows.

End of catchment measures comprise the use of wetlands to detain flows, promote infiltration, and provide pollutant treatment via sedimentation and filtration of suspended particles and to a lesser degree, adsorption of nutrients by the sediments and epiphytes on the wetland vegetation.

Wetlands can also be a valuable water feature, with environmental and landscape amenity attributes providing considerable benefits to open space areas. The proposed wetlands/detention basins (Appendix D) would provide greater-than-best-practice treatment for stormwater runoff from the developed site. The preliminary sizing of the wetlands has been based on EPA guidelines (EPA, 1997).

Implementation of these BMP's for stormwater management would provide an overall improvement to the local waterways and enhance the amenity of open space areas associated with proposed development of the land.

5.11.6 Conceptual Stormwater Management System

The conceptual stormwater management system for proposed residential development of the site is shown in Appendix D, Figure 4. Various components of the system are discussed below.

Pipe system

The pipe system will convey stormwater from the developed area of the catchment directly to the constructed wetlands. All pipe dimensions should be in accordance with Council's specifications.

Overland flow paths

Overland flow paths have been allowed for in the proposed lot layout. The overland flow paths will convey major stormwater discharges from the catchment to the constructed wetlands.

Wetland detention system

Stormwater runoff from the developed areas of the site, as well as from overland flow paths would be directed to a wetland detention system comprising two constructed wetlands. This system would provide two functions: quantity and quality control. The conceptual design envisages a slow release configuration, with sufficient storage for a HRT of 25 days for the 1 in 10 year ARI storm event.

The required detention volume would be provided as air space above the normal operating level of the wetland system.

Preliminary sizing of constructed wetlands to treat the site stormwater runoff shows that wetland volumes of 3213 m^3 (wetland 1) and 2075 m^3 (wetland 2) will provide a hydraulic residence time (HRT) of 25 days for the 1 in 10 year ARI storm event.. A HRT of 25 days will allow for adequate pollutant removal from the stormwater prior to discharge to Banyula Creek.

5.11.7 Conceptual Stormwater Management Plan

The assessment of stormwater flows and conceptual design of major components of the stormwater infrastructure form the basis of the Conceptual Stormwater Management Plan (CSMP) for proposed residential development of the site. The CSMP should address short-term construction-related impacts and long term water quality management on the site. Construction-related impacts can be addressed through a soil and water management plan (SWMP), while long-term impacts would be addressed by designing and implementing an integrated CSMP.

The SWMP would include details on:

- Staging of development;
- Erosion and sediment control strategies;
- Progressive rehabilitation; and
- Site management and maintenance techniques.

Long term impacts would be managed through design and construction of the following:

- Minor Gross Pollutant Traps at pipe outlets;
- Two constructed wetlands/detention basins; and
- Slow release configuration of detention basins.

Full details of the proposed conceptual stormwater management system for the site is provided in Appendix D.

5.12 SOIL CONTAMINATION

A preliminary investigation into the previous land uses of the property indicates that there have been no activities which are listed as potentially contaminating activities in Councils DCP No.45 or under State Environmental Planning Policy No.55.

The majority of the site has been used for cattle grazing by the current landowner since the 1960s. No dip sites are located on or in close proximity to the site.

A completed DCP No.45 Potential for Site Contamination Checklist is contained in Appendix E. It indicates that there is little likelihood of soil contamination existing on the property.

Based on the information available at the time of the study, it is unlikely that soil contamination exists on the property and therefore there would be no need for further investigations for soil contamination prior to any development of the site.

5.13 ABORIGINAL AND EUROPEAN CULTURAL HERITAGE

5.13.1 Aboriginal Cultural Heritage

A site walk was conducted on 8 May 2003 by representatives of the Purfleet-Taree Local Aboriginal Land Council, to identify and describe any items or places on the site of Aboriginal significance.

The site walk identified six (6) items of Aboriginal archaeological significance on the site, within two (2) locations. The report provided by Purfleet-Taree LALC is provided in Appendix B.

The artefacts recorded during the site walk were determined to be 'flakes', with one identified as a 'core'. The Aboriginal Sites Officer present on the site walk indicated that the location of the artefacts is consistent with seasonal patterning movements of traditional Aboriginal persons.

Several recommendations in relation to the location of the artefacts are provided in the report. In summary, these are:

- Placement of protective buffers of 5 - 10 m^2 around each site; and
- Implementation of a Plan of Management to be developed by Purfleet-Taree LALC for the two sites.

Mr. Mick Leon of Purfleet-Taree LALC has indicated that they have been liaising with the landowner with regards to the abovementioned two recommendations.

Additional recommendations with respect to procedures and protocols to be followed should any additional material of Aboriginal significance be encountered during the construction phase of development, should be referred to and detailed in the Statement of Environmental Effects accompanying the DA for the proposed development.

5.13.2 European Cultural Heritage

In terms of European cultural history, no items of cultural significance were identified on the site. A search of the State Heritage Register, State Heritage Inventory and Register of the National Estate indicated no Statutory Listed Heritage Items in the vicinity of the site.

5.14 ACCESS AND TRAFFIC GENERATION

As the site adjoins the current residential area of Old Bar, there is currently access to the site from Banyula Drive, a local road which adjoins another local road (Molong Road) and the collector road Medowie Road, which connects to the sub-arterial Old Bar Road. These local and collector roads have speed limits of either 60 km or 50 km per hour.

Proposed development of the site would result in Banyula Drive being the access point for roads into the subdivision. There would be several internal access roads within the subdivision to distribute traffic to residential lots. The access point of the proposed subdivision with Banyula Drive would need to comply with all AUSTROADS horizontal and vertical alignment requirements (AUSTROADS, 1989). All access roads and intersection designs would need to be in accordance with Council subdivision standards under DCP No.41.

5.14.1 Traffic Volumes

The expected traffic volumes likely to be generated by the development have been calculated using the criteria outlined in the Guide to Traffic Generating Developments (RTA, 1995). These calculations have been undertaken based on the assumptions that development on the site would be urban, single household dwellings. Therefore, the actual traffic generation rates of a residential development incorporating a mix of medium density housing, would vary from these estimates.

The estimated traffic generation rates used for the study are based on the following estimations:

- Daily traffic generation for residential areas of 9.0 daily vehicle trips per dwelling;
- The lot yield for the site is estimated at 110 lots (assuming one dwelling house per lot, based on a proposed development plan submitted with rezoning applications 2002/99 and 2003/99). It should be noted, however, that the proposed design submitted with the rezoning applications was for an area larger than Precinct 2A and indicated an indicative yield of 162 lots (assuming one dwelling house per lot). Subsequent break up of Precinct 2 into 2A and 2B

has resulted in the proposed design being considered by two separate LES processes. For the purposes of assessing the capacity of the existing road network to accommodate anticipated increased traffic volumes, however, calculations assume the larger lot yield (*ie.* 162 lots).

- Traffic generation rates for dwelling houses are 0.85 peak hour vehicle trips per dwelling (RTA, 1995).

The estimated daily traffic generation rate is therefore approximately 1458 daily vehicle trips (approximately 729 trips into and 729 trips out of the site). The peak hour vehicle trips are therefore approximately 138 peak hour vehicle trips.

A summary of GTCC traffic counts for Old Bar Rd is shown in Table 5.7. Traffic counts were taken both east and west of the intersection with Warwiba Rd. The location of the traffic count east of Warwiba Rd also accounts for traffic moving to and from Manning Point and Wallabi Point. For the purposes of this study, the higher figure for the location east of Warwiba Rd is taken for traffic impact analyses.

A weekly total volume of 35699 vehicle movements (both directions) was recorded with a 7-day average of 5100 vehicle movements. Peak hour flows recorded a 7-day average of 461 (AM) and 480 (PM) movements. Data presented in Table 5.8 indicates that at present, Old Bar Rd operates at a Level of Service "B", given that 7-day average volumes of 5100 are slightly greater than the value of 4800 vehicle trips presented in Table 5.8.

TABLE 5.7
SUMMARY TRAFFIC VOLUMES - OLD BAR RD (22-28/02/01)

Summary data (both directions)	100 m east of Warwiba Rd intersection	200 m west of Warwiba Rd intersection
7-day volume	35699	35214
5-day average	5230	5174
7-day average	5100	5031
5-day AM peak hour average	574	573
7-day AM peak hour average	461	459
5-day PM peak hour average	515	513
7-day PM peak hour average	480	471

Source: Traffic data supplied by GTCC Engineering Department (2003).

TABLE 5.8 LEVEL OF SERVICE TWO-LANE TWO-WAY RURAL ROAD CAPACITY FOR LEVEL TERRAIN	
LEVEL OF SERVICE	AADT *
A	2400
B	4800
C	7900
D	13600
E	22900

Source: AUSTROADS (1999). * AADT – Average annual daily traffic

5.14.2 Site Access

As traffic generated by residential development of the site would be distributed between a number of the local and collector roads that adjoin the site and which connect to the sub-arterial road, Old Bar Rd, the traffic volumes on each of these roads would be dependant upon the road network design within the development and the location of exit points from any proposed subdivision.

This volume of traffic (1458 daily trips) would be likely to cause increases in traffic volumes on Old Bar Rd, (Table 5.7) and the collector roads within Old Bar, which may necessitate the upgrade of intersections with Old Bar Rd.

Assuming that 75 % of vehicle trips leaving the proposed residential subdivision each day on average travelled along Old Bar Rd towards the Pacific Highway, this would amount to approximately an additional 1094 daily vehicle trips on Old Bar Rd, with a total of 6194 trips per day (both directions). This volume of traffic equates to a Level of Service "B/C" (Table 5.8), which is considered acceptable for the medium term (*ie.* 5 years).

Any intersection design of the entrance to the proposed subdivision area and Banyula Drive should be based on precise lot numbers. A comprehensive traffic study would need to be undertaken following the formulation of a conceptual lot layout during the planning process for any development on the site.

Any proposed development on the site in the excess of 200 lots would also have to address SEPP No 11 - Traffic Generating Developments, with the Development Application forwarded to relevant Traffic authorities, as defined in Section 6 of SEPP 11.

5.15 EXTRACTIVE AND MINERAL RESOURCES

A search of databases held by the NSW Department of Mineral Resources indicates that the site does not contain any known or potential mineral resources.

5.16 BUSHFIRE HAZARD

The site is comprised of predominantly cleared grazing lands, with several eucalypt and turpentine trees scattered throughout the southern portion of the property. The existing urban area of Old Bar is adjacent to the eastern boundary of the site, while medium density development is located across Banyula Drive, south of the development.

Undeveloped grazing lands that form part of the Old Bar/Wallabi Point Precinct 2B development area (Figure 5.4) are located adjacent to the western boundary of the site. A Swamp Oak/Forest Red Gum community is located along the drainage line of Oyster Creek in this parcel of land. This vegetation is classified as Group 2 vegetation under Council's bushfire prone lands maps and adjoins the SEPP 14 wetland, which comprises a saltmarsh community, classified as Group 3 vegetation, in the northern portion of the site, along the property boundary (Figure 5.4). North of the SEPP 14 wetland is a Tall Open Forest community comprising Blackbutt, Tallowwood and Pink Bloodwood Eucalypt species. This vegetation is classified as Group 1 vegetation under Council's bushfire prone lands maps.

All proposed development areas on the site are located greater than 140 m from the Blackbutt forest community north of the site. This vegetation therefore has no impact on proposed development of the site with respect to bushfire planning issues. The Swamp Oak forest community to the west of the site is located greater than 140 m from the western site boundary, with a small area of forest within 100 m of the western boundary of the site, for a distance of approximately 90 m south from the wetland boundary along the western boundary.

An Asset Protection Zone(APZ) setback of 30 m would be required for the riparian vegetation of Oyster Creek that traverses through the northern portion of the site. However, as this is located within the SEPP 14 wetland boundary, this would not affect any development of the site. There is no requirement to provide a bushfire buffer from the SEPP 14 wetland, which at present is degraded and has negligible fuel load.

A 50 m buffer will be required between the wetland and any proposed development on the site. Therefore, if the wetlands were eventually revegetated and developed as a climax community, a required APZ of 20 m would be provided by and already incorporated into, the 50 m wetland buffer zone.

An APZ of 35 m is required from the Group 2 riparian vegetation along Oyster Creek. However, this setback would be contained wholly within the Development Precinct 2B area adjacent to the creek. Therefore, there is no impact from this vegetation on proposed development in Precinct 2A.

In summary, a low hazard bushfire threat could potentially occur if the SEPP 14 wetland vegetation is revegetated and eventually reaches a climax community state. In this case, an APZ of 20 m width would be required, which would be incorporated into the 50 m buffer zone around the wetland. At present, however, the degraded state of the wetland does not pose any fire risk due to the absence of any contiguous vegetation or fuel. Given the overall low fire hazard rating for the proposed development site, there are no requirements for buildings in the Precinct 2A area to conform to AS 3959- Construction of Buildings in Bushfire Prone Areas.

Maintenance of the wetland buffer area and consequently the 20 m APZ would most likely reside with Council, as the area will most likely be dedicated as public open space (Figure 6.1), incorporating grassed areas, cycleways, pathways and native garden beds.

5.17 VISUAL IMPACT ASSESSMENT

The site is visible from the adjoining streets in the existing Old Bar urban area, in particular houses located in the vicinity of Molong Road. The site is within the view catchment of urban development located along Medowie Road, east of the site. At present, the views of the site from the east and south are of slightly undulating grazing lands in the foreground, with relatively flat existing saltmarsh areas of the SEPP 14 wetland in the background towards the northern end of the site and riparian forest west of the site. At present there is no screening of the site from the existing surrounding residential areas.

Any residential development of the site would therefore not be out of character with the surrounding area, and with appropriate landscape design, would not have a significant impact on the visual amenity of the area. Several recommendations for revegetation of the site are provided in Section 6.2.

5.18 NOISE

Residential development of the site would result in an increase in noise generation in the area, above current background levels generated by the pastoral usage of the site.

The greatest amount of noise from the site would be generated during the construction phase of the development. Given the existing site layout and likely development footprint (Figure 6.1), there would be a buffer distance of between 100 - 250 m from residential development adjacent to the eastern boundary of the site opposite Banyula Creek. Existing residential development south of the site adjacent to Banyula Drive has little buffer from noise associated with construction activities. Construction times should therefore be limited to normal, Council-approved operating hours.

Noise from the residential development itself would be generated by normal urban sources such as traffic and general residential occupation of dwellings. It is considered that given the existence of residential development around the site to the east and south, that the noise generated by the occupation of residential dwellings and associated traffic movements within and outside of the proposed development site would be acceptable.

5.19 SERVICES

5.19.1 Water Supply

Reticulated water is currently available to the existing urban areas of Old Bar and Wallabi Point. MidCoast Water has a Water Supply Strategy for the area. For development of areas north of Old Bar Road, which include Precinct 2A, the Strategy plans for a line to feed off the delivery mains on Old Bar Road/Medowie Road. The service reservoir has sufficient capacity to supply development in this Precinct. Therefore, water supply is not a significant issue for residential development of Precinct 2A. The developer would be required to provide infrastructure to connect to the nominated service point in accordance with MidCoast Water's technical requirements. Water servicing concept plans would need to be developed by the proponent prior to issuing of development consent. Developer charges would also apply.

5.19.2 Sewerage management

Reticulated sewerage is also currently available to the existing urban areas of Old Bar. Identification of the upgrading needs of the existing sewerage system is articulated in MidCoast Water's Old Bar Sewerage Servicing Strategy. Figure 5.7 shows the gravity sewer catchments for Old Bar/Wallabi Point.

The majority of the Precinct 2A site is located within the gravity sewer catchment of Pump Station 3. A small area of the site (south west corner) is located within the gravity sewer catchment of future Pump Station 8. The Sewerage Servicing Strategy indicates that proposed residential development of Precinct 2A that is located within the gravity sewer catchment of Pump Station 3 could connect to the existing Pump Station 3.

The Sewerage Servicing Strategy indicates that significant upgrading of Pump Station 3 and the Old Bar Sewerage System will need to be undertaken in the next 5 years. Development of the majority of Precinct 2A is not dependant upon upgrading of this system, though sewage from any dwellings located within the south west corner of Precinct 2A will be dependant upon construction of Pump Station 8.

In turn, construction of Pump Station 8 will be dependant upon the outcomes of a LES for Precinct 2B, currently in preparation, and any future development of that Precinct. Sewer servicing concept plans would need to be developed by the proponent prior to issuing of development consent. Developer charges would also apply.

5.19.3 Electricity

Electricity is currently available to all areas of Old Bar village and surrounding rural areas. Country Energy has advised that, based on the preliminary information available, electricity is available to the site. Some upgrading of the supply infrastructure may need to be undertaken to meet the increased demand on the grid from additional residential dwellings in the area, though no detailed information was made available.

5.19.4 Telephone

Although no official correspondence was received from Telstra, it is considered that telecommunications services are available to the site, as the site adjoins an existing urban area.

5.20 COMMUNITY CHARACTERISTICS

According to Australian Bureau of Statistics census data contained within the Greater Taree City Council Demographic Profile (GTCC, 2003), the population, including overseas visitors, of the Greater Taree Local Government Area (LGA) was 42,943 in 2001. 30 % of the LGA population lived in rural areas in 2001, while the largest urban area in terms of population was Taree, with 35 % of the LGA's population.

Based on a population of 42,410 in 1996, the population of the Greater Taree City LGA grew by approximately 1.3 % between 1996 and 2001. Council projects a population of 45,904 for the LGA in 2006, constituting an increase of some 7 % over the five year period. The population is expected to further increase to approximately 53,664 by 2021 at a rate of approximately 1.2 % per annum, according to population projections (GTCC, 2003).

Table 5.9 provides additional details with respect to population projections in Greater Taree. It shows estimated resident populations (median projection) of urban centres for 1996 and 2001, as well as preliminary estimates for 2006, 2011 and 2016.

Greater Taree City Council's Facts and Figures publication (GTCC, 2000d), shows that strong increases were experienced between 1991 and 1996 in the over 70s age group, indicating that the population of the area is ageing. In contrast, the 25-34 age group experienced a slight decrease in population. When compared to the to population demographic figures for NSW, Greater Taree has a significantly lower proportion of its population in younger age groups.

TABLE 5.9: GTCC ESTIMATED RESIDENT POPULATION AND FORECASTS AS AT 30 JUNE 2001

Locality	Estimated population				Forecast population		
	Total 1996	Male 2001	Female 2001	Total 2001	Total 2006	Total 2011	Total 2016
Taree	15,575	7,129	7,926	15,055	16,093	16,698	17,292
Wingham	4,446	2,254	2,411	4,665	4,987	5,174	5,358
Old Bar	2,650	1,375	1,478	2,853	3,050	3,164	3,277
Cundletown	1,630	791	812	1,603	1,714	1,778	1,841
Harrington	1,397	701	708	1,409	1,506	1,563	1,618
Hallidays Point	1047	844	926	1,770	1,892	1,963	2,033
Tinonee	664	331	367	698	746	774	802
Lansdowne	432	206	210	416	445	461	478
Coopernook	362	186	194	380	406	421	436
Moorland	312	145	142	287	307	318	330
Manning Point	276	133	109	242	259	268	278
Wallabi Point	270	150	167	317	339	352	364
Mount George	170	69	51	120	128	133	138
Krambach	127	60	60	120	128	133	138
Johns River	128	61	60	121	129	134	139
Crowdy Head	76	64	54	118	126	131	136
Rural balance	12,538	6,480	6,288	12, 768	13,648	14,161	14,665
Greater Taree	42,410	20,979	21,964	42,943	45,904	47,629	49,324

Source: GTCC, (2003).

The Demographic Profile (GTCC, 2003) shows projected populations by age group based on the population growth rates experienced between 1991 - 2001. These projections indicate that the Greater Taree LGA population of is expected to age over the years to 2021, with a dramatic increase in the proportion of the 70 and over age group and a decrease in the proportion of those aged under 40.

In terms of income demographics, the majority of the Greater Taree population are low income earners, with 54 % of the population earning less than $499 per week. This reflects the elderly population in Taree and the number of people receiving pensions and benefits.

The most common occupations within the Greater Taree LGA in 2001 were found to be in the categories of clerical/sales/services, professional fields and trades.

According to the Greater Taree City Council Rural Residential Release Strategy (GTCC, 2000a), there is an expected demand of 58 rural residential lots per year between 2000 and 2016 within the LGA. The Strategy indicates that most existing rural residential estates can at present be considered to be almost totally developed. The strategy also outlines that new rural residential rezoning should not occur in areas adjoining existing urban development areas where these subdivisions may hinder future urban development. Hence it is likely that subdivision of lands in Precinct 2A would be for residential dwelling lots.

The number of dwellings approved in the Old Bar area between 1997/98 and 2001/02 was 148, while a total of 185 new dwellings were approved in Taree for the same period. Although the figures for dwelling approvals are high compared with other centres in Greater Taree, analysis of the demand for residential lots in Old Bar indicates a shortfall of approximately 444 residential lots up to the year 2010 (GTCC, 2001a).

5.21 SOCIAL AND ECONOMIC CONSIDERATIONS

Section 5.20 above outlines the current demographic trends in the Greater Taree LGA. Residential development on the site is not expected to result in any significant negative social impacts, particularly given that the site is located adjacent to an existing urban area. Development on the site would accommodate projected growth within the Greater Taree LGA and would not impact negatively on the structure or character of the local community, provided that Council continues to upgrade social and community services in line with population increases over time.

Adequate health, education, roads, and recreation sites are available in the local area. The site is accessible directly from Banyula Drive and Medowie Road, with health, education and recreation facilities available in Old Bar and Taree.

Response received from the Mid North Coast Area Health Service (MNCAHS) indicated several concerns with population increases in the Old Bar area. The response would presumably also relate to development Precincts 2B and 3 in the Old Bar area. Issues raised included:

- The potential for population increases to put a strain on resources and staffing of the MNCAHS Generalist Care Program, right through from the Immunisation nurses to the Aged care Resource nurses;
- A greater demand on Child and Family Health Services, including an increased demand for the Early Childhood Clinic; and
- Increased demand on Multidisciplinary Early Intervention Clinics.

It is noted that the MNCAHS would like to be informed of the timing of development commencement, so that they can be proactive in seeking additional resources to meet the anticipated increased demand for services.

There was also a suggestion detailing how the developer/s may be able to assist with provision of resources for the anticipated increase in demand for services. Details are provided in MNCAHS's correspondence in Appendix A.

In economic terms, any residential development on the site would generate employment for infrastructure construction during the subdivision period and during construction of residential dwellings. In addition to direct construction employment, there would be increased demand for services and supply in construction-related industries in the area, as well as greater demand for good and services in the village of Old Bar following occupation of dwellings.

While the direct economic benefits are difficult to quantify accurately and are beyond the scope of this study, it is reasonable to suggest that residential development of the site would have a positive economic impact on Old Bar and the GTCC area in general.

5.22 CUMULATIVE IMPACTS

Assuming that best practice construction, erosion/sediment control, stormwater and effluent disposal measures are implemented as part of the proposed development on the site, no cumulative impacts on the environment are expected to occur.

Section 6.0
Land Use Options

This section of the report outlines the suitability of the site for development having regard to the biophysical and socio-cultural opportunities and constraints of the site.

6.1 LAND SUITABILITY ASSESSMENT

The lands that comprise the site for the Old Bar Precinct 2A LES were found to be suitable for a number of land uses despite the identification of significant constraints during the study (as outlined in Section 5). It is considered that approximately 14.5 ha of the site is suitable for residential development without major limitations. Constraints to development on the site are outlined below.

6.1.1 Development Constraints

SEPP 14 wetland # 571

The greatest constraint to development was found to be the location of SEPP 14 wetland # 571 over the northern portion of the site. Despite the fact that the wetland is degraded, due to its sensitive nature and the fact that in parts it is poorly drained, contains potential acid sulfate soils and is periodically inundated by the highest tides, this area of land is not suitable for development of any type.

As indicated in Section 5.8.1, the boundary of this wetland is currently subject to an application to refine its location, so that the mapped area will more precisely reflect its physical and vegetative limits. For the purposes of this study, we have assumed the natural boundary of the wetland as a limit around which a buffer distance of 50 m has been set.

It is recommended that the degraded parts of the wetland, most notably in the immediate northern portion of the site, be rehabilitated back to the their natural state. It is noted that the landowner has been in negotiations with representatives of the Purfleet-Taree LALC to cooperate on this project, as well as on aspects related to Aboriginal Archaeological heritage on the site.

Aboriginal heritage sites

The sites that were identified during the site walk undertaken by representatives of Purfleet-Taree LALC were located adjacent to the SEPP 14 wetland and are within the 50 m buffer area determined for the wetland. These sites have been cordoned off and may form part of an interpretative display, subject to negotiations between the landowner and representatives of Purfleet-Taree LALC. A protective buffer should be placed around these sites in accordance with recommendations contained in the report by Purfleet-Taree LALC (Appendix B).

Banyula Creek

Land in the vicinity of Banyula Creek is also not suitable for development within a buffer distance of 40 m from the creek line. While not subject to flooding constraints, it is determined that an appropriate buffer of 40 m will provide for additional protection of the creek, over and above that provided by the stormwater management system outlined in Section 5.11. This land would be suited to public open space dedication, with construction of walkways/cycleways around the perimeter of the buffer area providing linkages between the existing urban areas of Old Bar and recent subdivisions to the south of the site, and the open space and visual amenity of the wetland areas in the northern portion of the site.

Bushfire APZ

As indicated in Section 5.16, there are no restrictions on development of the site as a result of bushfire threat. A 20 m APZ has been recommended should the wetland area be revegetated, however, this APZ would be incorporated into the 50 m wide buffer around the wetland.

Ecology

Results of flora and fauna studies conducted on the site (Sections 5.3 and 5.4) indicated that there are no constraints to development as a result of threatened species of plants or animals. It is recommended, however, that there is an opportunity to provide for the establishment of a habitat linkage through the site for koalas located in the forested area east of the existing subdivision adjacent to the eastern boundary of the site. This can be achieved by planting appropriate feed trees in open space areas around Banyula Creek and around the buffer areas of the wetland. Appropriate species to plant include the Forest Red Gum (*Eucalyptus tereticornis*) and Tallowwood (*E. microcorys*).

6.1.2 Proposed land use zones

Areas that are not subject to the constraints outlined above are generally suitable for residential development. Figure 6.1 shows the proposed land use zones for the site. In general, the site comprises zones suitable for residential development, open space recreation zones that act as buffers to riparian and wetland areas, and environmental protection zones. A brief description of each of the proposed zones is provided below.

Zone No. 2(a) Residential

This area occupies slightly less than half of the site (Figure 6.1). Development in this zone would be in accordance with the existing urban areas of Old Bar and would include all roads, footpaths and residential lots.

Zone No. 6(a) Open Space Recreation

This zone covers all areas that provide a buffer function to Banyula Creek and the SEPP 14 wetland (Figure 6.1). The width of the buffer around the SEPP 14 wetland is 50 m. This distance is based on the findings of a State Government inter-agency working party that provided advice to the draft Coffs Harbour City Council LEP (1998). The working party cited an extensive range of literature on the subject of riparian buffer widths to derive the recommended 50 m setback distance for wetland areas. The setback of 50 m would also incorporate an APZ width of 20 m from the saltmarsh vegetation of the wetland, which would be required if the area regenerates or is revegetated.

A buffer width of 40 m is recommended from Banyula Creek. This is based on data presented in the report cited above, and on the minimum distance prescribed in the Rivers and Foreshore Improvement Act (1948). This area would also contain the constructed wetlands for stormwater treatment, prior to discharge to Banyula creek.

It is envisaged that the buffer areas would be multi-functional, catering for passive recreational pursuits such as walking and cycling, which would achieve the goal of providing public access to coastal foreshore areas. This is especially pertinent in this instance, as the area is currently in private ownership and therefore public access to the wetland and surrounding areas is currently not available.

The buffer should also contain plantings of appropriate habitat and resource trees for Threatened species as outlined in Section 6.2. The area would thus also function as an extension and enhancement of the habitat linkage between forested vegetation of Old Bar Park to the east of the site, and Kiwarrak State Forest to the west of Old Bar, via the drainage line of Oyster Creek located west of the site. The open space zone would also contain the Aboriginal Archaeological sites identified in the site. As discussed in Section 5.13, Taree-Purfleet LALC are in consultation with the landowner regarding the provision of interpretive signage and marking and protection the sites.

Maintenance responsibility for this zone would rest with Council. It is envisaged that the area would be low maintenance, requiring periodic mowing of open lawn areas surrounding the pathways and around the tree plantings.

Zone No. 7(a) Environmental Protection Habitat

As indicated in Section 5.8.1, it is recommended that the boundary of 7(a) zoned land on the site needs to be amended to reflect more accurately the extents of wetland habitat areas. Figure 6.1 indicates the extent of the wetland area on the site, as does Figure 5.6. It should be noted that although the Minister has not gazetted the changes to this boundary, this should not preclude Council amending the zone boundary to reflect the actual wetland area. In any case, the current (incorrect) SEPP 14 wetland boundary is within the extents of the proposed 6(a) and 7(a) areas, and there would be no residential development occurring in this area as currently mapped.

6.2 DEVELOPMENT PRINCIPLES

Based on the constraints outlined above and the findings within Section 5 of this study, the following development control principles are recommended to reduce the potential for adverse impacts on the environmental, amenity or social values of the site that could arise from future residential development.

Principle 1 – Stormwater management

Proposed residential development of the site should seek to implement best practice stormwater management measures to minimise or eliminate impacts on groundwater and surface waterbodies. This should include the principle of limiting peak discharge from the developed site to pre-development levels. Section 5.11 and Appendix D outlines preliminary design details for the sizing of retention basins to achieve this objective.

Any stormwater management system implemented should also ensure that post-development pollutant loads are no greater than those currently being exported from the site. This can be achieved through appropriate sizing and design of retention basins to achieve hydraulic residence times sufficient to allow breakdown of pollutants and strip nutrients form the water column. Detention basin design can also be augmented through the enhancement (including revegetation and buffer plantings) of wetland areas to aid in water quality improvement through nutrient stripping and sediment trapping. Further detail with respect to potentially appropriate stormwater management measures is contained in Section 5.11, and Appendix D.

Principle 2 – Vegetation enhancement

Retention and enhancement of the existing vegetation on the site will enhance the protection of and reduce the potential for impacts on Threatened and significant flora and fauna species in the area posed by residential development. The enhancement of these existing vegetation areas should include a revegetation program for riparian areas around Banyula Creek and the SEPP 14 wetland, to provide linkages between the existing forest located in Old Bar Park east of the proposed development site and Kiwarrak State Forest, located west of Old Bar. In particular, planting of Forest Red Gum and Tallowwood species along these open space corridors will assist the movement of Koala's between the two areas.

Additional revegetation is recommended within the degraded SEPP 14 wetland area. A revegetation program would provide for the restoration of wading bird habitat, fisheries nursery and improve the visual amenity of the area. Buffer areas around the wetland and Banyula Creek could also be landscaped with endemic species of trees and shrubs, to encourage birds and local fauna. It is important, however, that any planting in these areas is of a density and design that does not create a bushfire risk to residential development.

Principle 3 – Visual amenity

The scenic amenity of the area would need to be considered in the conceptual planning of any future residential development and should include appropriate landscaping plans, which are sympathetic to the surroundings. In particular, landscaping should also include the use of locally endemic species to encourage additional resources for fauna species in the area. The use of endemic species will ensure maximum growth potential and survival, as well as reduce the need for the use of fertilisers to assist plant growth.

Principle 4 – Energy efficient subdivision and housing design

As with all new subdivisions, there is an opportunity for the creation of development that uses less resources and is more energy efficient than traditional urban subdivisions. The use of energy efficient designs at the subdivision planning stage to increase the number of lots with a northerly aspect, and the use of energy efficient architectural designs and recycling systems for housing should have a high priority and be encouraged by Council.

Principle 5 – Water sensitive urban design

As outlined in Principle 1, the focus of the urban stormwater system is to reduce post-development discharge and pollutant loads to pre-developed levels for the developed site. Each dwelling constructed in the proposed development area can assist to achieve this objective through the application of water sensitive urban design principles at the design and construction phase.

Examples include the use of grey-water recycling systems for watering gardens and lawns, rainwater tanks, half flush toilet cisterns and reduced areas of impervious surfaces over each lot. Further reduction in surface water runoff can be achieved by using pervious and semi-pervious paving systems, as well extensive use of landscaping to increase infiltration and reduce runoff. of as The use of energy efficient designs at the subdivision planning stage to increase the number of lots with a northerly aspect, and the use of energy efficient architectural designs for housing constructed on the site.

Principle 6 – Urban design

Any subdivision design should reference the NSW Coastal Design Guidelines (PlanningNSW, 2003). The guidelines provide a reference for appropriate urban development in the coastal zone. Comments on this LES submitted by the NSW Coastal Council (Appendix A) include reference to the Coastal Design Guidelines and a request that the principles contained therein be considered at the design stage of the development. In addition, the Coastal Council has highlighted the need for consideration of Objective 3.3 of the Coastal Policy:

'to encourage towns to reinforce or establish their particular identities in a form which enhances the natural beauty of the coastal zone'.

Therefore, the design stage of any proposed residential development should include consideration of preserving and enhancing the unique physical attributes and local character of the site. Principally, this should include the SEPP 14 wetland located in the northern portion of the site and views to the north of forested lands.

Summary

The implementation of the above development principles will reduce and possibly eliminate a range of potentially adverse impacts that may result from residential development of the site.

The proposed land use zones determined from the land suitability assessment and application of development principles are provided in Figure 6.1. These zonings have been determined with regard to the:

- Available site access from the existing road network in Old Bar;
- The restriction imposed on development of the site by the SEPP 14 wetland and riparian areas of Banyula Creek;
- The provision of services including telecommunications, electricity and water; and
- Proposed alterations to the existing 7(a) Environmental Protection Habitat adjoining the site.

6.3 GUIDING PRINCIPLES FOR ECOLOGICALLY SUSTAINABLE DEVELOPMENT

Ecologically Sustainable Development (ESD) refers to development that aims to meet the current and future needs of the community, while protecting and conserving the ecological processes and functions of ecosystems.

In determining the appropriate development for this site, the principles of Ecologically Sustainable Development as defined in the Local Government Act (1993) were applied. These principles should be adopted in the development design and implemented in the construction and post-construction phases of the development.

Under the Local Government Act (1993), *principles of ecologically sustainable development* means the following statements of principle:

Ecologically sustainable development requires the effective integration of economic and environmental considerations in decision-making processes. Ecologically sustainable development can be achieved through the implementation of the following principles and programs:

(a) ***the precautionary principle*** *— namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.*

In the application of the precautionary principle, public and private decisions should be guided by:

(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and

(ii) an assessment of the risk-weighted consequences of various options.

*(b) **inter-generational equity** — namely, that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.*

*(c) **conservation of biological diversity and ecological integrity**— namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration.*

*(d) **improved valuation, pricing and incentive mechanisms** — namely, that environmental factors should be included in the valuation of assets and services, such as:*

(i) polluter pays — that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,

(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste, and

(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

The adoption of ESD principles in any development on the site should therefore address all environmental issues associated with the site and adjoining areas potentially affected by development such as the nearby waterways of Banyula Creek, SEPP 14 wetland # 571, Oyster Reach and the Manning River South Channel.

The provision of residential development on the site would provide for an identified housing demand generated by current and immediate future generations. With appropriate planning and consideration, residential development would not compromise the ecological needs of long term future generations, as the existing biological diversity and ecological integrity of the site can be improved for Threatened species occurring in adjacent lands and waterways.

From a social perspective, the use of buffer zones to separate potential dwelling sites on the land from surrounding land uses, and the improvement of visual screens around the boundary of the property would reduce the potential for negative land use conflicts. Further, the developable portion of the site is of a sufficient area that, with careful design, its development for residential purposes can be of a style that creates an harmonious living area and hence, community prosperity.

The use of the site for residential development will potentially increase the demand for services, in particular family medical and aged care. The majority of these can be provided in Taree, approximately 15 km from the site, however, will need to be augmented to cope with the anticipated increased demand created by residential development of the site.

It is recommended that the landowner/developer liaises closely with the Mid North Coast Area Health Service regarding the timing of any development project, to ensure that MNCAHS has sufficient time to plan for an expansion of services. It should be noted that the expansion of services does not relate only to provision for proposed development associated with this development Precinct, but also those of Precinct 2B and Precinct 3.

As the site adjoins the existing Old Bar urban area, it provides residential land that is not of a ribbon development-type, or in an area which will cause further environmental damage.

With respect to the recommendations above, it is considered that development of the site could occur in a manner consistent with accepted ESD principles and provide a balance between the current residential needs of the Greater Taree LGA and the long term protection of ecological values.

6.4 MANAGEMENT MEASURES

A summary of the management measures that could be included in a future development control plan (DCP) for the site could include the following:

- Maintenance of sediment erosion and control measures should be conducted post construction until final landform and vegetation cover of these areas are stabilised;
- Regular maintenance and management of stormwater quality control measures;

- The management of buffer zones around riparian and wetland areas;
- The preparation and implementation of an Environmental Awareness Program to encourage residents to adopt environmentally responsible practices in terms of water usage, chemical usage, waste disposal, and bushfire management; and
- The involvement of Local Land care groups, the Koala preservation Society, the Purfleet-Taree Local Aboriginal Land Council and Wildlife Caring groups in the revegetation, habitat/fauna corridor enhancement programs, weed management and environmental awareness programs.

Section 7.0
Conclusion

The lands that comprise the Old Bar Precinct 2A Local Environmental Study are subject to a range of physical and socio-cultural constraints that limit the development potential of the site. In particular, development of the site is currently constrained by the presence of a SEPP 14 wetland and riparian areas around Banyula Creek.

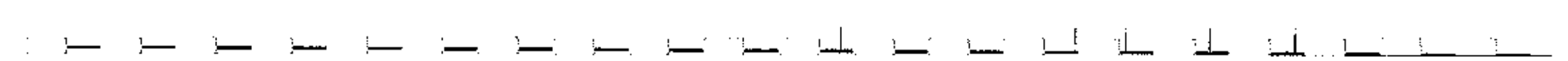
The site does not contain significant areas of vegetation and the wetland habitats present on the site are degraded and would require revegetation to return to their full ecological functionality. Revegetated wetlands, riparian corridors and fauna corridors, as recommended in this report, will provide habitat for Threatened and Protected fauna species. The site also contains items that have been deemed as potential items of Aboriginal significance.

Despite the constraints present in the site, slightly less than half of the site is suitable for residential development. The development of the site for residential purposes is consistent with strategic planning and sustainable development policies of Greater Taree City Council and the State Government. There is scope available to ensure that any development on the site complies with relevant development control standards.

It is recommended that Council proceed with the rezoning of the areas on the site deemed suitable for residential development within Section 6 of this report as 2(a) Residential to facilitate such development on the property. It is also recommended that boundary of the area on the site currently zoned 7(a) Environmental Protection Habitat be amended to reflect the limit of the wetland area, in accordance with the amended SEPP 14 boundaries currently awaiting Gazettal.

To ensure the long-term protection of significant fauna present in areas proximal to the site, areas adjoining lands zoned 7(a) Environmental Protection Habitat land should be rezoned as 6(a) Open Space Recreation, to provide the appropriate buffer distance from these habitats, for both environmental protection and bushfire threat abatement. This land could incorporate walkways/cycleways, interpretative signage near the wetlands and sites of Aboriginal significance, and revegetated areas, to provide for and enhance a fauna corridor/link from the forested areas of Old Bar Park east of the site, to Kiwarrak State Forest located west of Old Bar. The land should be dedicated to Council as parkland.

In our opinion, residential development on the site satisfies an identified and legitimate need in the Greater Taree Local Government Area.



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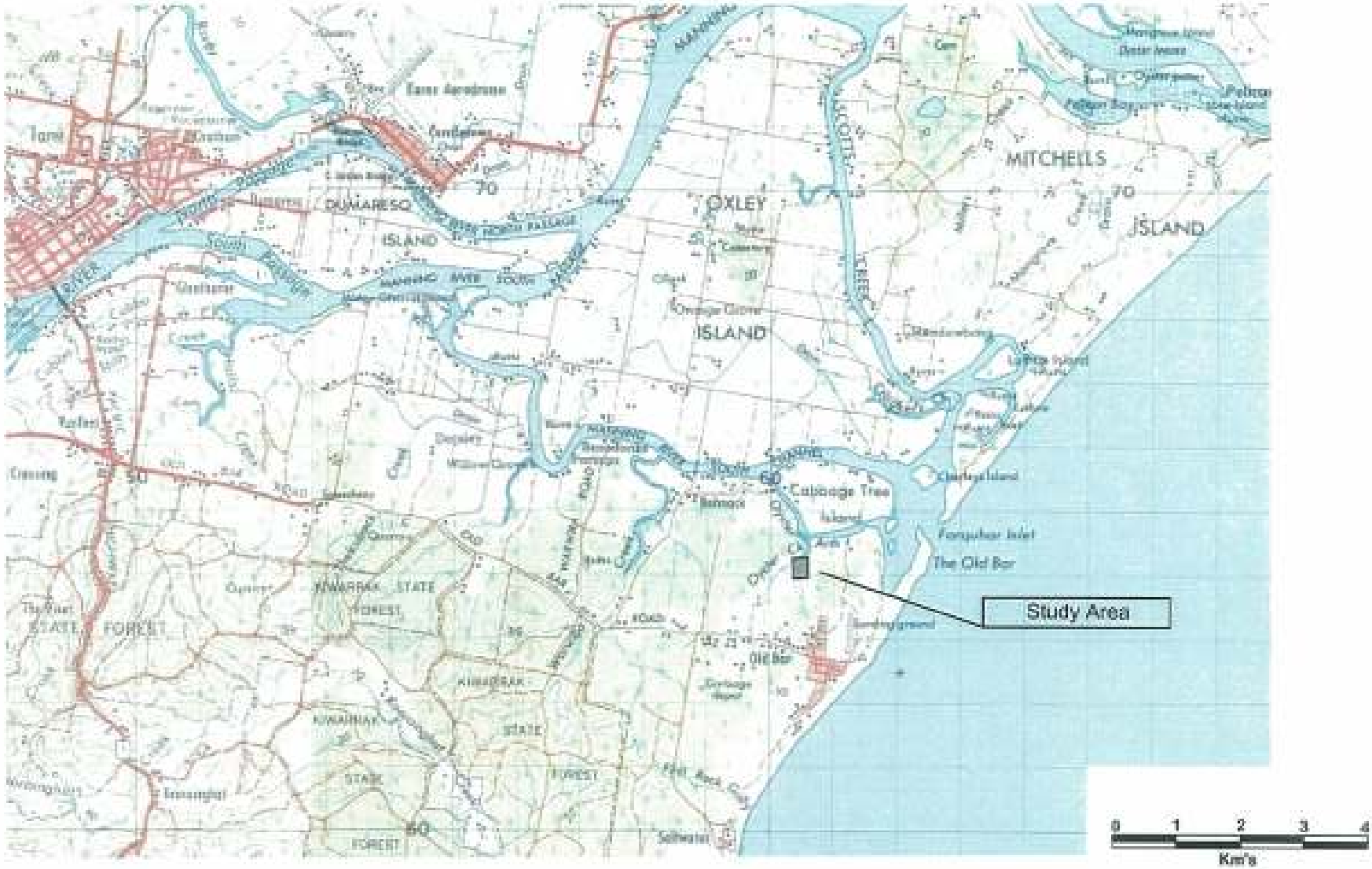
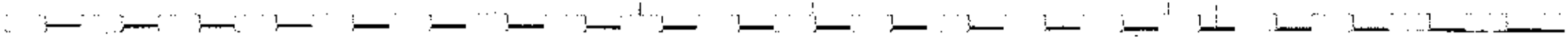


Source: Modified after 1:100 000 Camden Haven 9439 and Wingham 9334 (DNR 1976)

Terre

FIGURE 1.1
Location of Old Bar Precinct 2A Local Environmental Study



Source: Modified after 1:25 000 Cundletown 9434-3-S (CMA, 1987)

Terra

0 1 2
Km's

FIGURE 2.1
Location of site with respect to Old Bar Urban Area and Manning River South Channel

FIGURE 3.1
CURRENT ZONINGS OF THE SUBJECT SITE PERSUANT TO THE GREATER TAREE LEP (1995)

FIGURE 5.1
Soils Landscapes

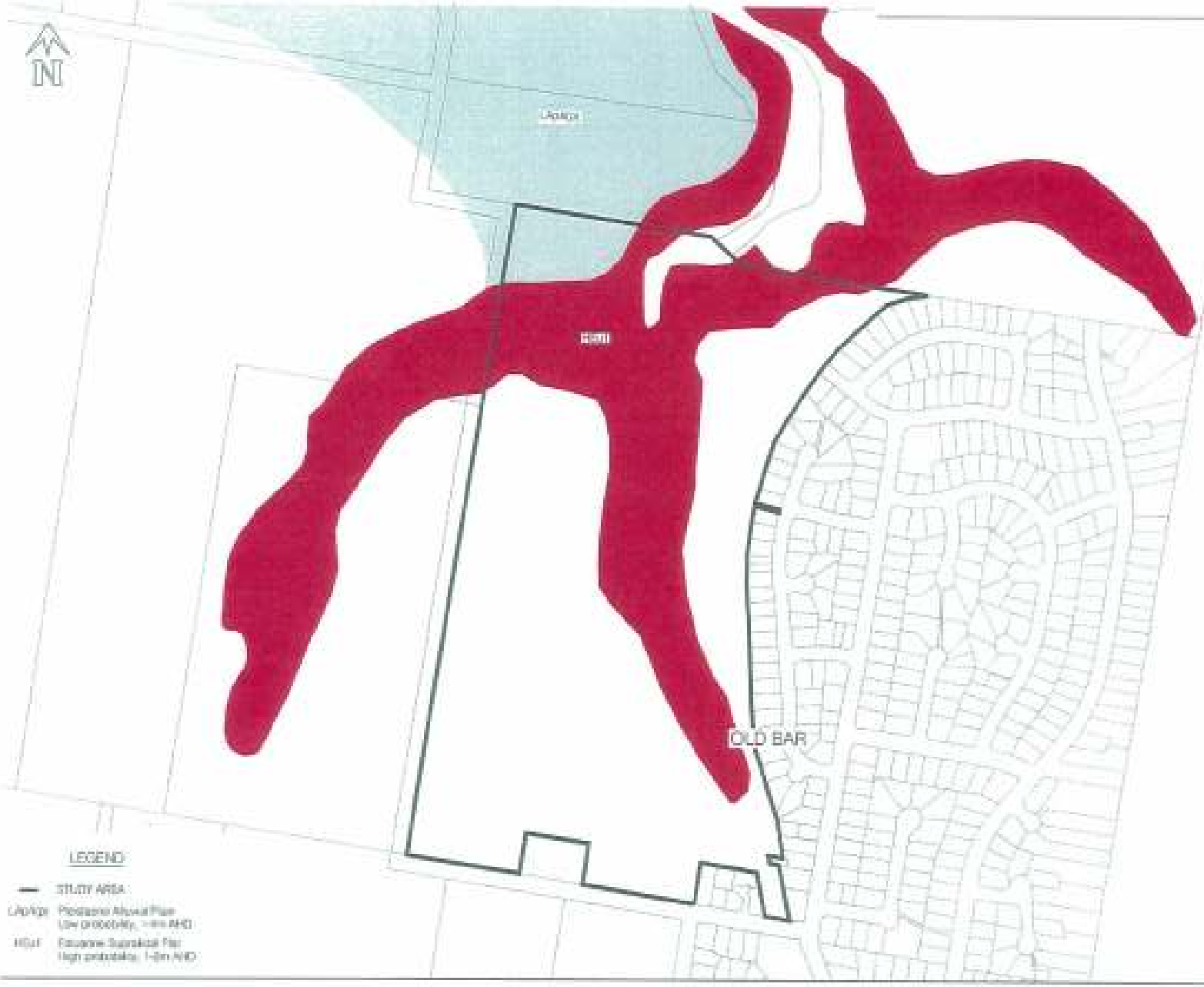
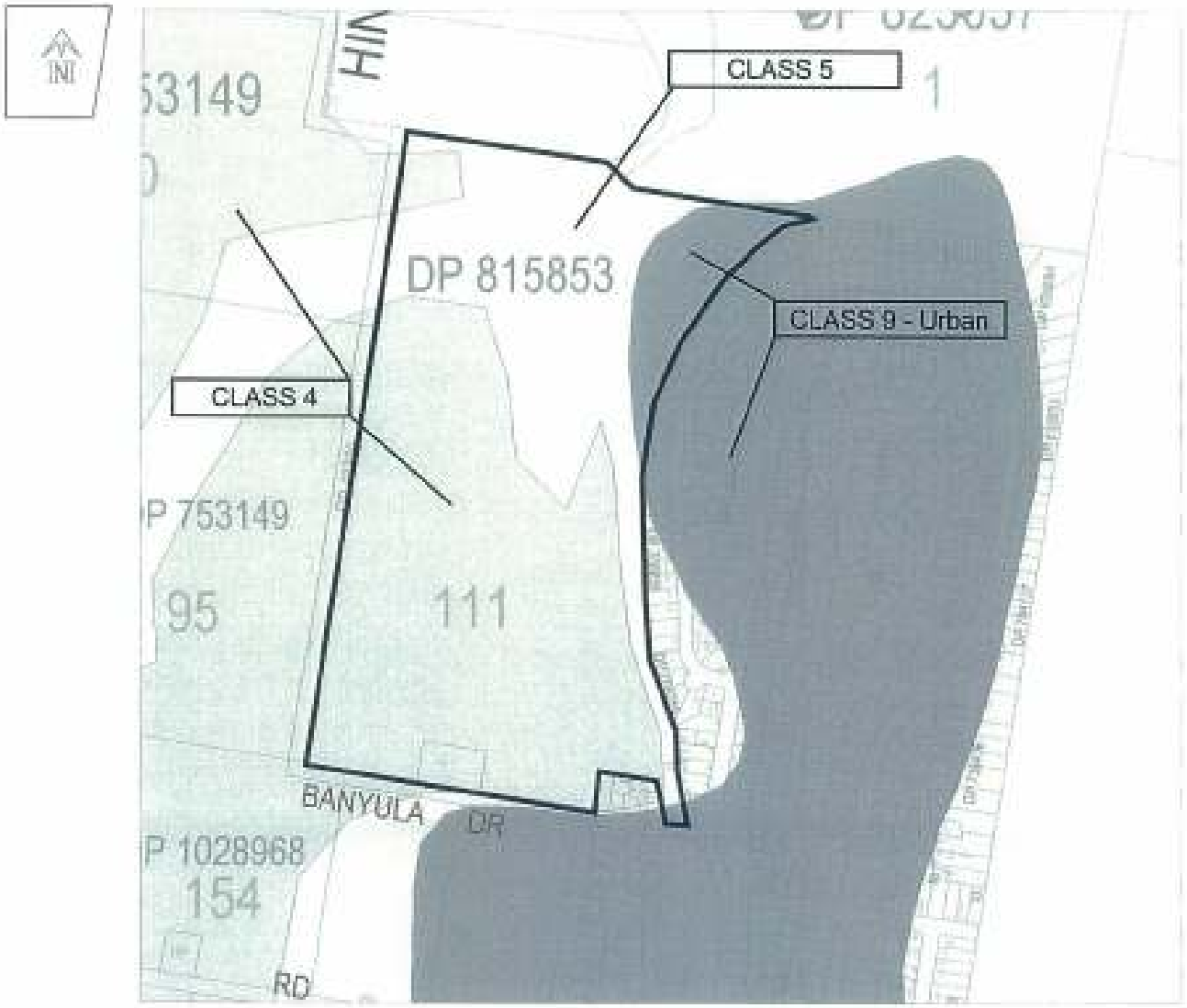


FIGURE 5.2
ACID SULFATE SOIL RISK MAP



Source: Modified after Greater Taree Council (2002)

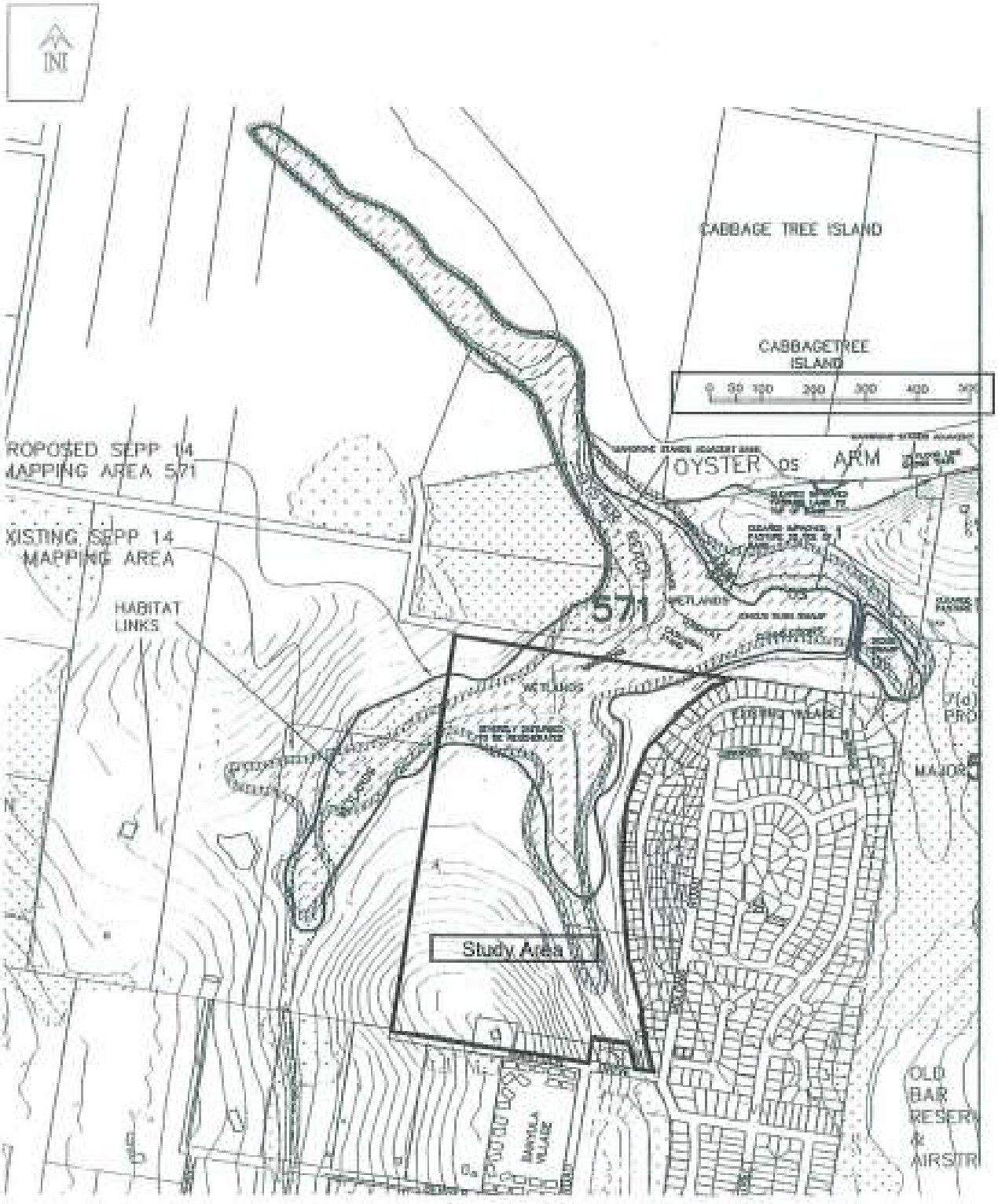
Terra

0 500
M

FIGURE 5.3
Agricultural Land Classes

FIGURE 5.4
Vegetation Communities

FIGURE 5.5
Fauna Habitat and Threatened Species recorded within the site



Source: Collins Walshe and Fitzsimmons

Terra

FIGURE 5.6
Plan showing existing and proposed SEPP 14 Mapping area

Legend

- Study Area
- Future Pump Station 8
- Pump Station 3

Source: Greater Taree City Council Draft Old Bar/Wallabi Point Development Strategy (2001)

Terra

0 0.5
Km's

FIGURE 5.7
Gravity Sewer Catchments

Legend
2(a) Residential
6(a) Open Space Recreational
7(a) Environmental Protection Habitat
Study Area

0 125 250
M

Terra

FIGURE 6.1
Proposed Landuse Zones

Appendix A

Authorities responses to LES

Coastal Council of NSW

Level 5 Henry Deane Building
20 Lee Street, Sydney
GPO Box 3927
Sydney NSW 2001

ABN 50701063808

Telephone: 02 9762 8189
Facsimile: 02 9762 8705
e-mail: thomas.williams@coastalcouncil.nsw.gov.au
www.coastalcouncil.nsw.gov.au

Our Reference: S03/00305/1
Your Reference: 402024_LEO_012
Date: 17th June 2003

Dr Justin Meleo
Environmental Manager
Terra Consulting
PO Box 280
TUNCURRY NSW 2428

Dear Dr Meleo

Identification of Issues and Comments on LES – Old Bar Precinct 2

Thank you for providing The Coastal Council with the opportunity to provide advice for this study. I apologise for the delay in responding and provide the following advice in reply to your correspondence of 17th January 2003.

Filling of Low-Lying Coastal Lands

Any placement of fill on this location is to be discouraged. Any parts of this landscape that are prone to flooding should not be developed. The Coastal Council is alarmed by the increasing trend for the filling of low-lying lands to place development along the NSW coast in areas that would otherwise be unsuitable for development due to flooding. This practice is selectively removing ecosystems restricted to these coastal low-lying lands.

Developments that require the sourcing and transport of fill material have a much larger environmental footprint than those that are placed on lands more appropriate for development. This must be taken into consideration within the context of assessing a proposal against the principles of ecologically sustainable development.

You will be aware of the wetland within the study area and its SEPP14 listing. Any land capability study should of course recognise the need for buffers around wetland areas. The presence of the wetland is an additional factor that should preclude the placement of fill on low-lying lands within this area of your study.

A Regional Approach to Development Assessment

The assessment of lands within a regional context is of course desirable. The Coastal Council recently reviewed the draft Wyong Conservation Strategy. The Strategy is an excellent approach to land use planning that will place Wyong Council in a strong position to make well informed planning decisions into the future within the context of a Shire wide approach to ecological sustainability. The Strategy utilises the GIS computer based decision making tool called 'C-Plan' developed by the NSW National Parks and Wildlife Service.

This approach ensures the choice of conservation themes and targets remain relevant and useful well into the future in planning for development across the Shire's landscapes. Such an approach facilitates planning over time as new information is gathered about local ecosystems and their conservation status and also incorporates changes in use across the Shire's landscape over time. I recommend to you an investigation of Wyong Shire's approach to their Conservation Strategy.

Integration of cultural and environmental assessment

In a paper published last year by the Travel Industry Association of America[1], Washington D.C., the term 'geotourism' is introduced. The following is an excerpt from this paper:

"The term 'geotourism' is concerned with preserving a destination's geographic character - the entire combination of natural and human attributes that make one place distinct from another. Geotourism encompasses both cultural *and* environmental concerns regarding travel, as well as the local impact tourism has upon communities and their individual economies and lifestyles."

This focus on maintenance of that which makes one place distinct from another is in concert with a primary objective of the *NSW Coastal Policy 1997*. Objective 3.3 of the Coastal Policy is 'To encourage towns to reinforce or establish their particular identities in a form which enhances the natural beauty of the coastal zone'. This maintenance of a sense of place through taking into account each settlement's unique local character when establishing the vision and planning outcomes for a place are also discussed in the Coastal Design Guidelines for NSW.

The Coastal Council is pleased to have recently finalised and released the *'Coastal Design Guidelines for NSW (2003)'*. The Guidelines were launched by the Minister for Planning, The Hon Dr Andrew Refshauge, in March this year. The Coastal Design Guidelines for NSW are on the Coastal Council Website. Hard copy and CD-ROM are available from the Department of Urban & Transport planning centre. Hard copy is $30 and CD-ROM $11. The planning centre phone number is (02) 9762 8044.

If there are any aspects of our advice you would like to discuss please contact Thomas Williams on 9762 8189.

Yours sincerely,

Bruce Thom
Chair

cc Steve Murray, Regional Planning Coordinator, Northern Region, DIPNR

[1] *See* Steuve, A.M., et.al. (2002) The Geotourism Study: Phase 1 Executive Summary. Travel Industry Association of America and National Geographic Traveler.

MINERAL RESOURCES NEW SOUTH WALES

NSW DEPARTMENT OF MINERAL RESOURCES
Minerals and Energy House, 29-57 Christie Street
St Leonards NSW 2065 Australia
PO Box 536 St Leonards NSW 1590
Phone (02) 9901 8888 · Fax (02) 9901 8777
DX 3324 St Leonards
www.minerals.nsw.gov.au
ABN: 88 040 268 347

Dr Justin Meleo
Environmental Manager
Terra Consulting (Aust) Pty Ltd
PO Box 280
TUNCURRY NSW 2428

Our ref: L03/0047
Your ref: 402024_LEO_006

Dear Sir

Identification of Issues and Comments on Local Environment Study – Old bar Precinct 2

I refer to recent letter on the above matter.

The study area contains no known mineral resources and its potential for mineral resources is low. Therefore there are no issues of concern for the Department of Mineral Resources.

It is requested that all future correspondence in this and other land use matters be addressed to;

Manager,
Land Use and Resource Assessment
Department of Mineral Resources
PO Box 536
St Leonards NSW 1590

If you have any queries concerning this matter please contact Mr Jyrki Pienmunne of the Geological Survey on (02) 9901 8369.

Yours faithfully,

G. MacRae 31/1/03.

GP MacRae
Acting Manager,
Land Use and Resource Assessment

RECEIVED
06 FEB 2003
BY:

KOALA PRESERVATION SOCIETY of NSW Inc.

POST OFFICE BOX 236, PORT MACQUARIE, 2444
KOALA HOSPITAL & STUDY CENTRE, 'ROTO HOUSE
LORD STREET, PORT MACQUARIE N.S.W.
PHONE: (02) 6584 1522 FAX: (02) 6584 2399
E-MAIL: koalahos@midcoast.com.au

MANNING AREA ADDRESS:
24 Rosewood Crescent,
TAREE. 2430

29 January 2003

Dr Justin Meleo,
Environmental Manager,
Terra Consulting (Aust) Pty Ltd,
Shop 1, 62 Manning Street,
TUNCURRY. 2428

Re: Local Environmental Study – Old Bar Precinct 2

Dear Sir,

Thank you for the opportunity to comment on Koala issues relevant to the above study area. We are aware that the site is covered to a large extent by SEPP 14 Wetlands regulations and associated buffer zone requirements, hence it is somewhat difficult to envisage what options may be available for development.

We would be keen to see, from a Koala welfare perspective, relevant issues addressed as we have rescued several Koalas from within a 2km radius of the study area and we have anecdotal evidence of Koalas being seen in the Red Gum Road environs.

Although the site appears to carry limited Koala Food Trees it is the effect that domestic dogs and cats wandering into adjacent properties that is of a concern. We therefore strongly suggest that a Section 88B Clause be written into Title Deeds to restrict owners to keep unrestrained domestic dogs and cats within their property at all times.

During your study a check for the presence of Eucalyptus piperita (Sydney Peppermint) should be made, as it is known to occur in the nearby 'Warwiba Road Reserve'.

In regard to any revegetation work that may be carried out, we strongly promote the use of only endemic species grown from locally collected seed. We currently hold a seed bank of Eucalyptus species (Koala Food Trees) collected in the Manning area.

Once again thank you for the opportunity to comment and if you require further information from us please don't hesitate to contact us on our Taree address or Phone/Fax.

Yours faithfully,

Paul & Christeen McLeod,
Manning Coordinators,
Ph/Fax: 6552 2183

Rec. 8/2/03.

NSW Heritage Office

8 Market Place
Parramatta NSW 2150
Locked Bag 5020
Parramatta NSW 2124
DX 8225 PARRAMATTA

Telephone: 61 2 9873 8500
Facsimile: 61 2 9873 8599
heritageoffice@heritage.nsw.gov.au
www.heritage.nsw.gov.au

Contact: Gary Pringle
Telephone: 02-9849 9564
pringlg@heritage.nsw.gov.au
File: H03/00306/001
Our Ref: HRL20712
Your Ref: 402024_LEO_013

Environmental Manager
Terra Consulting
PO Box 280
Tuncurry 2428

RECEIVED
14 MAR 2003
BY: Amelia

Dear Sir

LOCAL ENVIRONMENTAL STUDY – OLD BAR PRECINCT 2
Attention: Justin Meleo

I refer to your letter of 17 January 2003 requesting comments on heritage requirements for the preparation of the above Local Environmental Study (LES).

The following comments are provided for your consideration pursuant to section 63 of the EP&A Act.

- The heritage significance of the site and any impacts the development may have upon this significance should be assessed. The assessment should include natural areas and places of Aboriginal, historic or archaeological significance. It should also include a consideration of wider heritage impacts in the area surrounding the site.
- The Heritage Council maintains the State Heritage Inventory which lists some items protected under the Heritage Act 1977 and other statutory instruments. The register can be accessed through the Heritage Office home page on the internet (http:/www.heritage.nsw.gov.au), or can be searched by Heritage Office staff on request. You should consult lists maintained by the NSW National Parks and Wildlife Service, the National Trust, the Australian Heritage Commission and the local council in order to identify any items of heritage significance in the area affected by the proposal. However, you should be aware that these lists are constantly evolving and that items with potential heritage significance may not yet be listed.
- Non-Aboriginal heritage items within the area affected by the proposal should be identified by a field survey. This should include any buildings, works, relics (including relics underwater), trees or places of non-aboriginal heritage significance. A statement of significance and an assessment of the impact of the proposal on the heritage significance of these items should be undertaken. Any policies/measures to conserve their heritage significance should be identified. This assessment should be undertaken in accordance with the guidelines in the NSW Heritage Manual. The field survey and assessment must be undertaken by a qualified consultant with historic sites experience. The Heritage Office can provide a list of suitable consultants.
- The relics provisions in the Heritage Act require an excavation permit to be obtained from the Heritage Council prior to commencement of works if disturbance to a site with known or potential archaeological relics is proposed. If any

unexpected archaeological relics are uncovered during the course of work, excavation should cease and an excavation permit obtained.

- The proposal should have regard to any impacts on places, item or relics of significance to Aboriginal people. Where it is likely that the project will impact on Aboriginal heritage, adequate community consultation should take place regarding the assessment of significance, likely impacts and management/mitigation measures. For guidelines regarding the assessment of Aboriginal sites, please contact the NSW National parks and Wildlife Service on (02) 9858 6444.

The Heritage Office would be happy to review the environmental study in due course. If you have any further inquiries regarding this matter, please contact Gary Pringle on 98738564.

Yours sincerely

10/03/03

VINCENT SICARI
Principal Heritage Officer
NSW Heritage Office

File No: 426.5314;8
Telephone: (02) 4924 0684
Facsimile: (02) 4924 0659
Peta Phillips
e-mail: david_n_young@rta.nsw.gov.au

Roads and Traffic Authority
www.rta.nsw.gov.au
ABN 64 480 155 255
Hunter Client Services
59 Darby Street
Newcastle NSW 2300
Telephone (02) 4924 0240
Locked Bag 30
Newcastle NSW 2300
DX 7813 Newcastle

Terra Consulting
PO Box 280
TUNCURRY NSW 2428

Attention: Dr Justin Meleo

IDENTIFICATION OF ISSUES AND COMMENTS ON LOCAL ENVIRONMENTAL STUDY – OLD BAR PRECINCT 2

Dear Sir

I refer to your letter dated 17 January 2003, reference: 402024_LEO_011.

Although the proposed development has no direct impact on the State Road network the Roads and Traffic Authority has an involvement in proposals of this nature through SEPP 11 – Traffic Generating Developments. In conjunction with the local Council we have a responsibility to ensure that direct and indirect traffic impacts are taken into account.

As the State Road authority, we also have a responsibility with the local Council to ensure that the principles of draft SEPP 66 – Integration of Land Use and Transport are taken into account.

In this context we request that you take into account both SEPP 11 and draft SEPP 66 in preparing the Local Environmental Study (LES) for Old Bar Precinct 2, and include the traffic/transport initiatives outlined in the Old Bar/Wallabi Point Development Strategy, which was adopted by the Greater Taree City Council. This would include the incorporation of transport infrastructure (collector roads, pedestrian and cycle facilities) for all relevant transport modes as part of the LES.

As Council is responsible for Old Bar Road (Regional Road 7761), it will advise you on the requirements for this road.

The RTA is responsible for the Pacific Highway and the grade-separated interchange, which connects to Old Bar Road. All turn movements are provided for at this interchange.

In summary, the development of Old Bar Precinct 2 for urban uses has no direct impact on RTA infrastructure. However, the LES should take into account SEPP 11 and draft SEPP 66 requirements as outlined above.

A copy of this letter will be forwarded to the Greater Taree City Council for information. Please contact me on 4924 0688 if you require any further information or advice.

Yours faithfully

Dave Young
Manager, Land Use Development
Hunter Client Services
5 February 2003

cc Greater Taree City Council

Terra Consulting Pty Ltd
PO Box 280
TUNCURRY NSW 2428

LAND & WATER CONSERVATION

Your Ref: 402024_LEO_022
Our Ref: ER4220

Attention: Dr Justin Meleo

Dear Sir

Local Environmental Study - Old Bar Precinct 2

I refer to your letter of 05 February 2003 in regard to the above matter. The Department of Land and Water Conservation (DLWC) provides the following comments for your consideration.

In developing and assessing options for the site, the proponent should take into account the objectives and regulatory requirements of the following legislation if applicable:

- Crown Lands Act, 1989
- Native Vegetation Conservation Act, 1997
- Rivers and Foreshores Improvement Act, 1948
- Roads Act, 1995 (for Crown roads)
- Water Act, 1912
- Water Management Act, 2000

The proponent should also be aware of the following policies that may be relevant.

Policy	Policy Goals/Objectives	DLWC Preferred Outcomes
NSW Wetlands Management	The goal of the NSW Wetland Management Policy is the ecologically sustainable use, management and conservation of wetlands in NSW for the benefit of present and future generations.	No encroachment into any wetland and associated 40 metre wide riparian buffer areas. The rehabilitation of any degraded wetlands or riparian areas.
NSW State Rivers and Estuaries	To manage the rivers and estuaries of NSW in ways which: • Slow, halt or reverse the overall rate of degradation in the systems, • Ensure the long-term sustainability of their essential biophysical function, and • Maintain the beneficial use of these resources.	An undisturbed riparian buffer, of a minimum width of 40 metres from the top of each bank, for any creek, river or watercourse. The rehabilitation of any degraded watercourse or riparian areas. Post development flows in all watercourses should mirror pre-development flows, both in the site and downstream of the site.

Suite 6 464 King Street Newcastle West NSW 2302 PO Box 2213 Dangar NSW 2309 DX 4335 Newcastle West
Telephone (02) 4929 4346 Facsimile (02) 4929 6364 Email www.dlwc.nsw.gov.au

Policy	Policy Goals/Objectives	DLWC Preferred Outcomes
NSW State Groundwater	It is the policy of the NSW Government to encourage the ecologically sustainable management of the State's groundwater resources so as to: • slow and halt, or reverse any degradation in groundwater resources; • ensure long term sustainability of the systems biophysical characteristics; • maintain the full range of beneficial uses of these resources; and • maximise economic benefit to the Region, State and Nation.	The protection of any groundwater system.
Draft Native Vegetation Conservation Strategy	Native vegetation will be conserved, sustainably managed and improved in quality and quantity.	Protection of any regionally significant vegetation or high conservation value vegetation.

In assessing the impact of the proposal on the site, DLWC recommends the assessment of issues, incorporating any proposed mitigation action, should include the following:

- Land capability.
- Acid sulfate soils.
- Soils erosion and sedimentation.
- Effluent and waste management.
- The quality of surface water and groundwater.
- Riparian areas, of all watercourses and wetlands (including stream geomorphology and vegetation).
- Any cumulative loss of vegetation from the site through exemptions allowed under the Native Vegetation Conservation Act.
- Any regionally significant vegetation or eco-systems.
- Any Crown land.

The subject land also falls within the Lower North Coast Catchment. The Lower North Coast Catchment Management Board, with the assistance of DLWC, has developed a Catchment Blueprint that includes Old Bar area. The Blueprint includes a number of objectives and associated management targets. The objectives are:

- Water bodies are managed to balance natural ecosystem requirements with community needs.
- The physical structure and vegetation of river, lake, estuary and wetland riparian zones are protected (and rehabilitated where required) to sustain healthy ecosystems.
- Viable native plant and animal populations and communities are maintained and enhanced.
- Primary production, human settlement and other land use takes place while protecting Aboriginal cultural heritage, soil, water and ecosystem health.
- The coastal zone environment is protected whilst providing for the social and economic needs of the community.

The proposed rezoning and development of the site gives Council the opportunity to assist the Lower North Coast Catchment Management Board in meeting the objectives and targets of the draft Blueprint. Council could assist by requiring:

- The incorporation of Water Sensitive Urban Design principles at an early stage of any development of the site;
- The restoration of the riparian zone as part of the development;
- The protection of all wetlands and the rehabilitation of any of those that are degraded; and
- That any rezoning does not put any significant native vegetation at risk.

Should there be any further enquiry in this matter, please contact Ric Slatter, Senior Natural Resource Project Officer on (02) 49 299823.

Yours faithfully

Jeff Hunt
Landscape Planning Manager
Hunter Region
20/03/03

Mid North Coast
AREA HEALTH SERVICE

Primary Health & Extended Care Services

Phone: (02) 6592 9293
Fax: (02) 6551 3649

COMMUNITY HEALTH SERVICES
64 Pulteney Street, Taree 2430
PO Box 35, Taree, 2430.

6 February 2003

Dr Justin Meleo
Environmental Manager
Terra Consulting
PO Box 280
TUNCURRY NSW 2428

Dear Dr Meleo

Identification of Issues and Comments
on Local Environment Study Old Bar Precinct 2

Please find attached two (2) responses from the Program Managers for Community Health Services related to the Proposed Development of Old Bar Precinct 2.

The comments contained within those responses to me are comprehensive. Most significantly, suggestions that the Developers might wish to consider the provision of a Community Centre within the Development are noted.

Thank you for your consideration on the impact upon Community Health Services.

Your sincerely

Grant Carey-Ide
Manager, Community Health Services

Dorothy Borg
Acting Secretary to Manager Community Health Services

ENTERED
6/2/03

Received 4/2/03 BHSG

Mid North Coast
Area Health Service

Community Health Services

64 Pulteney Street
TAREE NSW 2430
Phone: 65 929 690
Fax: 65 929 607

To: Grant Carey-Ide

From: Gerlinde Sonter acting Program Manager Generalist Care Services

Date: February 4 2003

Subject: **LOCALENVIROMENT STUDY OLD BAR**

Grant

After viewing the plan for the proposed new development plans for Old Bar and Wallabi Point I have no doubt that this will have the potential to greatly effect the Generalist Care Program. There is the suggestion that there will be a population increase of approximately twelve to thirteen hundred people to the Old Bar area . This will have the potential to put a strain on our already stretched resources and staffing in the Generalist Care Program, right through from the Immunisation nurses to the Aged Care Resource nurses. I would foresee that there would need to be staff enhancement in the Old Bar area as one nurse would not be able to absorb such an increase in numbers in an already busy area.

Gerlinde Sonter
Acting Program Manager Generalist Care Services

Received 3/2/03 mday

Mid North Coast
Area Health Service

Taree Community Health Centre

64 Pulteney St
TAREE NSW 2430
Phone: 6592 9624/6555 6822
Fax: 6592 9607

To: GRANT CAREY-IDE Manager, Community Health Services

From: Pauline Wallace -- Acting Program Manager Child and Family Service

Date: February 3 2003

Subject: **IDENTIFICATION OF ISSUES AND COMMENTS ON LOCAL ENVIRONMENT STUDY - OLD BAR PRECINCT 2**

Thank you for the opportunity to comment on the proposed development from Terra Consulting with the information of the possibility of a further twelve to thirteen hundred people to swell the population at Old Bar. The type of housing being discussed is for Families in comparison to the high elderly population at such places as Forster. With a swell in population that is made up of Families one could expect a greater demand on Child and Family Health Services. It would be fair to assume that the demand for the Early Child Hood Clinic would increase. At present we have a small clinic that operates only on Tuesday Mornings 9am till 1:30 with drop ins and appointments. This service would need to be increased. At present this service is in a state of accommodation flux, with a possibility of being able to be accommodated at the local Medical Centre. With a swell in take up of services new premise may again have to be sought.

Multidisciplinary Early Intervention Clinics would also have greater demand placed on them at Taree. It is impossible to quantify such a demand but it is suffice to say that the waiting lists for these services are currently already stretched to the limit and consideration of increments to these multi-discipline positions may need to be made. The same would be true of demand for the limited 1:8 counsellor positions to support patenting, child management, and liaison with education.

It would be beneficial if when MNCAHS has dates to support the proposed development we could use these for work force planning to anticipate need rather than be reactive to over stretched services. One could ask too, what responsibility the developer has in this as the company stands to gain from the building and sales. Can they provide a community centre for housing services, a one-off grant for start up of a community development officer to quantify need etc? If they are asking for our comments they may be open to these suggestions.

Pauline Wallace
Acting Program Manager
Child and Family Service

5 February 2003

NSW
NATIONAL
PARKS AND
WILDLIFE
SERVICE

ABN 30 841 387 271

Dr J Meleo
Environmental Manager
Terra Consulting Pty Ltd
PO Box 280
TUNCURRY NSW 2428

Our Reference:
Your reference:

DOC03/00688.jdm.1440

ENTERED
14/4/03

Dear Dr Meleo

LOCAL ENVIRONMENT STUDY – OLD BAR PRECINCT 2.

I refer to your letter, dated 17 January 2003, seeking advice from the National Parks and Wildlife Service (NPWS) on issues considered relevant to the above study.

The NPWS has statutory responsibility for the care and protection of native flora and fauna, Aboriginal heritage and NPWS estate. It is recommended that the study address the following points in relation to these responsibilities:

- Impacts on areas of native vegetation, with special reference to threatened or regionally significant flora and fauna species, populations and ecological communities.
- Consistency with relevant provisions of the *Threatened Species Conservation Act* 1995, State Environmental Planning Policy (SEPP) 44 - Koala Habitat Protection and the *Native Vegetation Conservation Act* 1997.
- An appropriate level of archaeological assessment and the impact on areas of cultural significance to the Aboriginal community.
- Potential direct and indirect impacts on the NPWS estate, wilderness areas and recognised areas of high conservation value.

Please find attached some environmental assessment guidelines that detail some relevant methodology that may be of use in collecting information relating to these points.

Conservation
Programs and
Planning Division
Northern Directorate
GIO House
24 Moonee Street
Coffs Harbour NSW
2450 Australia
Locked Bag 914
Coffs Harbour NSW
2450 Australia
Tel: (02) 6651 5946
Fax: (02) 6651 6187

Head Office
43 Bridge Street
P.O. Box 1967
Hurstville NSW
2220 Australia
Tel: (02) 9585 6444
Fax: (02) 9585 6555
www.npws.nsw.gov.au

Should there be any other matters, or should Council or your company be in possession of information that suggests the interests of the NPWS may be further affected by the proposal, please contact Mr John Martindale, Conservation Planning Officer, on (02) 66 598233.

Yours faithfully

BRENDAN DIACONO
Manager Conservation Planning Unit
for **Director General**

NSW NATIONAL PARKS AND WILDLIFE SERVICE
CONSERVATION PROGRAMS & PLANNING DIVISION, NORTHERN DIRECTORATE

ENVIRONMENTAL ISSUES TO BE ADDRESSED

INTRODUCTION

The following list is provided to assist in the preparation of environmental impact assessment reports. The list details the type of information that is recommended by the New South Wales National Parks and Wildlife Service (NPWS) for inclusion in such assessments. Please note that the provision of information in accordance with this list does not negate the applicant's obligations under any legislative or planning instruments. NPWS suggests that the applicant contact the relevant local council and the Department of Urban Affairs and Planning to ascertain these obligations.

GENERAL

1. Map(s) showing the locality of the proposed development in a regional and local context. Local context maps should be based on 1:25 000 topographic plans. Photographs of the site's key attributes may provide useful documentation.

2. A description of the existing environment on the subject land and surrounding land, the proposed development and ancillary works, and the manner in which the environment will be modified by the proposal (particularly with regard to the clearing of native vegetation and impacts on fauna habitat).

3. The area subject to development should be clearly identified on an appropriately scaled plan. This includes all ancillary works such as buildings and other structures, parking areas, loading/processing/treatment areas, access roads, and material stockpiling areas.

4. The applicability or otherwise of Local Environment Plans (LEP), Regional Environment Plans (REP) and State Environmental Planning Policies (SEPP) and Regional Vegetation Management Plans (RVMPs) to the site should be determined and detailed. In particular, your attention is drawn to SEPP No. 14 - Coastal Wetlands, SEPP No. 26 - Littoral Rainforest, SEPP No. 44 - Koala Habitat Protection and the *Native Vegetation Conservation Act 1997*.

5. Your attention is also drawn to the Commonwealth *Environment Protection and Biodiversity Conservation Act 2000*. The Act specifically focuses on matters of national environmental significance (NES matters) which include listed threatened species and ecological communities, World Heritage properties, Ramsar wetlands of international importance, internationally protected migratory species and Commonwealth Marine Areas. If any NES matters under this legislation may be affected by the proposal, approval for the development may also be required from Environment Australia.

FLORA

1. A comprehensive description of the vegetation on the site. This will include an assessment of the condition of the plant communities present, including the designation of conservation significance at a local, regional and State level, and an assessment of the likely occurrence of any threatened species, populations or ecological communities listed under Schedules 1 or 2 of the *Threatened Species Conservation Act 1995* and any Rare or Threatened Australian Plant (ROTAP) species.

2. A plan showing the distribution of any threatened or ROTAP species and the vegetation communities on the site, and the extent of vegetation proposed to be cleared. This plan should be at the same scale as the plan of the area subject to development in order to assist in the assessment the impact of the proposal on the existing vegetation.

3. Where the assessment concludes that threatened species, populations or ecological communities, or their habitats, exist on or in proximity to the subject land, the effect of the proposed development should be determined in accordance with the eight point test described in Section 5A of the *Environmental Planning and Assessment Act* 1979. An assessment of the impact of the development on the plant communities and/or ROTAP species should also be provided.

4. A description of the measures proposed to mitigate and/or ameliorate the impact of the development on the plant communities, threatened and ROTAP species.

FAUNA

1. A fauna survey to identify the distribution and abundance of fauna species known or likely to utilise the site, including a description of available fauna habitats and an assessment of the conservation status of each of the faunal components at a local, regional and State level.

2. A plan showing the results of the above survey. This plan should be at the same scale as the plan of the area subject to development to assist in the assessment of the impact of the proposal on fauna.

3. An assessment of the impact of the development on the identified fauna.

4. An assessment of the existence or likely occurrence of threatened species, populations or ecological communities, or their habitats on the subject land. Where the assessment concludes that threatened species, populations or ecological communities, or their habitats exist on or in proximity to the subject land, the effect of the proposed development should be determined in accordance with the eight point test described in Section 5A of the *Environmental Planning and Assessment Act* 1979.

5. A description of the measures proposed to mitigate and/or ameliorate the impact of the development on fauna.

CULTURAL

1. The presence or absence of Aboriginal sites should be identified and the significance of the area to the local Aboriginal community must be determined. Accordingly, a search of the NPWS Aboriginal Heritage Information Management System (AHIMS) should be made and the local Aboriginal community should also be consulted with regard to any Aboriginal heritage issues associated with the proposed development. A survey may need to be undertaken by an appropriately qualified person in consultation with the relevant Aboriginal community group/s to identify and record any sites, places of cultural significance or other values that the place has to the Aboriginal community. The significance of any places or values that are recorded should be assessed and appropriate management options developed.

2. An assessment of the impact of the development on the Aboriginal heritage values of the site.

3. A description of the measures proposed to mitigate and/or ameliorate the impact of the development on the Aboriginal heritage values of the site.

4. A contingency plan that details the measures to be taken in the event that archaeological sites are discovered during the course of operations must be prepared.

NATIONAL PARKS ESTATE

1. Where the proposal may result in impacts on NPWS estate or is on land adjacent to NPWS estate, an assessment of the impact of the development on the NPWS estate. Such impacts may include pollution from stormwater discharge, dumping of rubbish and garden refuse, increased likelihood of fire, vandalism, increase in the predation of native animals by domestic pets.

2. A description of the measures proposed to mitigate and/or ameliorate the impact of the development on the NPWS estate.

NOTES

Surveys and Assessments

1. Fauna, flora and cultural surveys and assessments should be undertaken by suitably qualified persons and the qualifications and experience of the persons undertaking the work detailed.

2. Dates, site locations, design, methodology, analysis techniques, and weather conditions at the time of the assessments and surveys must be described. The limitations of surveys should be identified and the results interpreted accordingly.

3. Conclusions drawn in surveys and assessments should be substantiated by evidence resulting from those surveys and assessments. The document being supported by the surveys and assessments should reflect these conclusions and clearly state where recommendations of the survey and assessments have been incorporated in the proposal.

NPWS Databases

1. The NPWS can provide records of flora and fauna held in the Atlas of NSW Wildlife and / or Rare or Threatened Australian Plants (ROTAP) databases. In addition the NPWS has an Aboriginal Sites Register of which searches can be made. These services generally attract a fee. Enquires should be made to NPWS Hurstville office, telephone (02) 9585 6444.

2. It should be noted that the above databases are not comprehensive and should only be used as a guide. They do not negate the need for specific site investigations.

Justin Meleo
Environmental Manager
Terra Consulting
PO Box 280
Tuncurry NSW 2428

LAND & WATER CONSERVATION
Kempsey District Office
27-29 Elbow Street
P.O. Box 149
WEST KEMPSEY NSW 2440
Phone (02) 6562 0706
Fax (02) 6562 8728
Mob: 0427 817 449
E-mail: meddie@dlwc.nsw.gov.au

Ref: 402024_FAO_010

Draft soil landscape information, Old Bar area

Dear Justin,

Soil landscapes in the old Bar area are depicted in the following map, and their attributes are presented on the following pages. The soil landscape qualities and limitations presented here are indicative only, and should not preclude more detailed site assessments.

Most of the development precincts are on the Diamond Head soil landscape variant (dar) which is undulating low hills on coastal headlands and should not have major urban development constraints, but there is some land on Development Precinct 3 on the Harrington (ha) and Delicate (de) soil landscapes which are likely to have waterlogging and drainage problems.

This information is extracted from Eddie M.W. (in prep.), *Soil Landscapes of the Camden Haven 1:100 000 Sheet*, Department of Infrastructure, Planning & Natural Resources. This is a work-in-progress study, and both the polygon boundaries on the draft map and the soil landscape names may change prior to publication. The map is valid at 1:25,000 scale.

Soil profile descriptions in the area can be found via the Community Access to Natural Resources (CANRI) home page http://www.canri.nsw.gov.au/ and follow the link to SPADE – Soil Profiles under "Land".

If you require more information, please let me know.

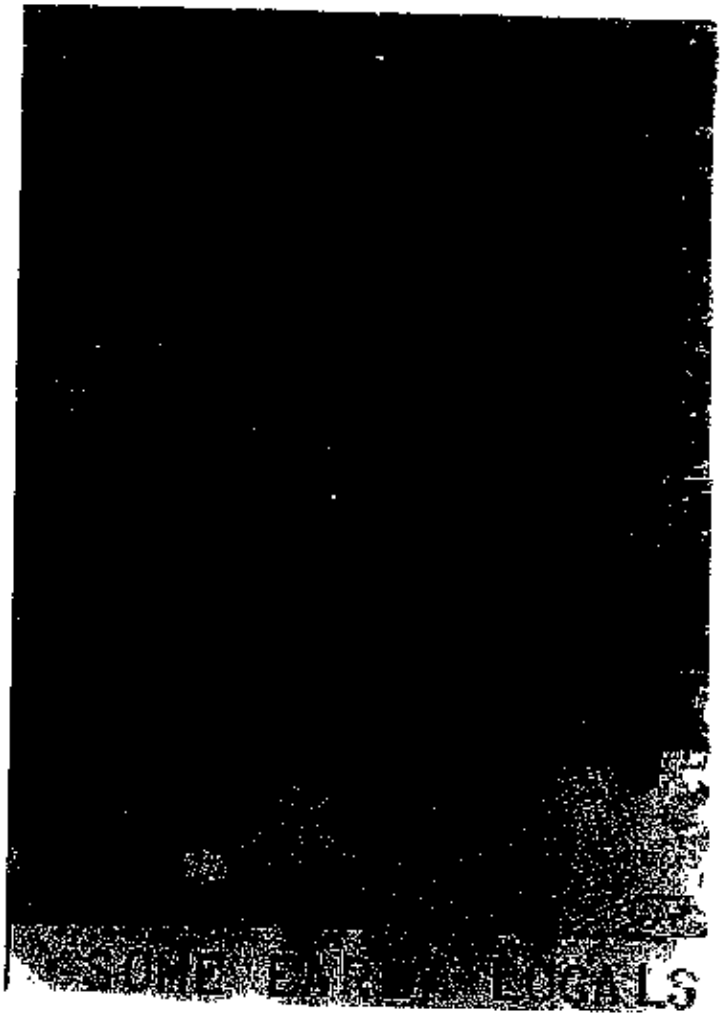
Regards,

Michael Eddie
Senior Soil Surveyor
4 September, 2003

Appendix B

Aboriginal archaeological assessment

Purfleet-Taree Local Aboriginal Land Council
Culture & Heritage Section



Aboriginal Sites Investigation
of Old Bar Precinct 2A.
8th May 2003

Report produced by Vienna Maslin and Mick Leon

Contents

Cover page,
Aboriginal Children Nabiac area circa, 1920's.

Summary

- The survey area is located approximately 1km north west of Old Bar Post Office and 12km from Taree CBD, Mid North Coast NSW.
- 6 (six) identified Aboriginal sites[1] were recorded within the study area.
- Purfleet-Taree Local Aboriginal Land Council representative Aboriginal Sites Officer Vienna Maslin, Gillian Donavon and Mick Leon, performed the field survey.
- The Aboriginal community at Taree/ Purfleet have been consulted on their prior knowledge of any Aboriginal sites existing within the subject land.

[1] Six individual artefacts were recorded during the survey and are recorded individually. 2 locations on the subject land contained these 6 artefacts.

Introduction

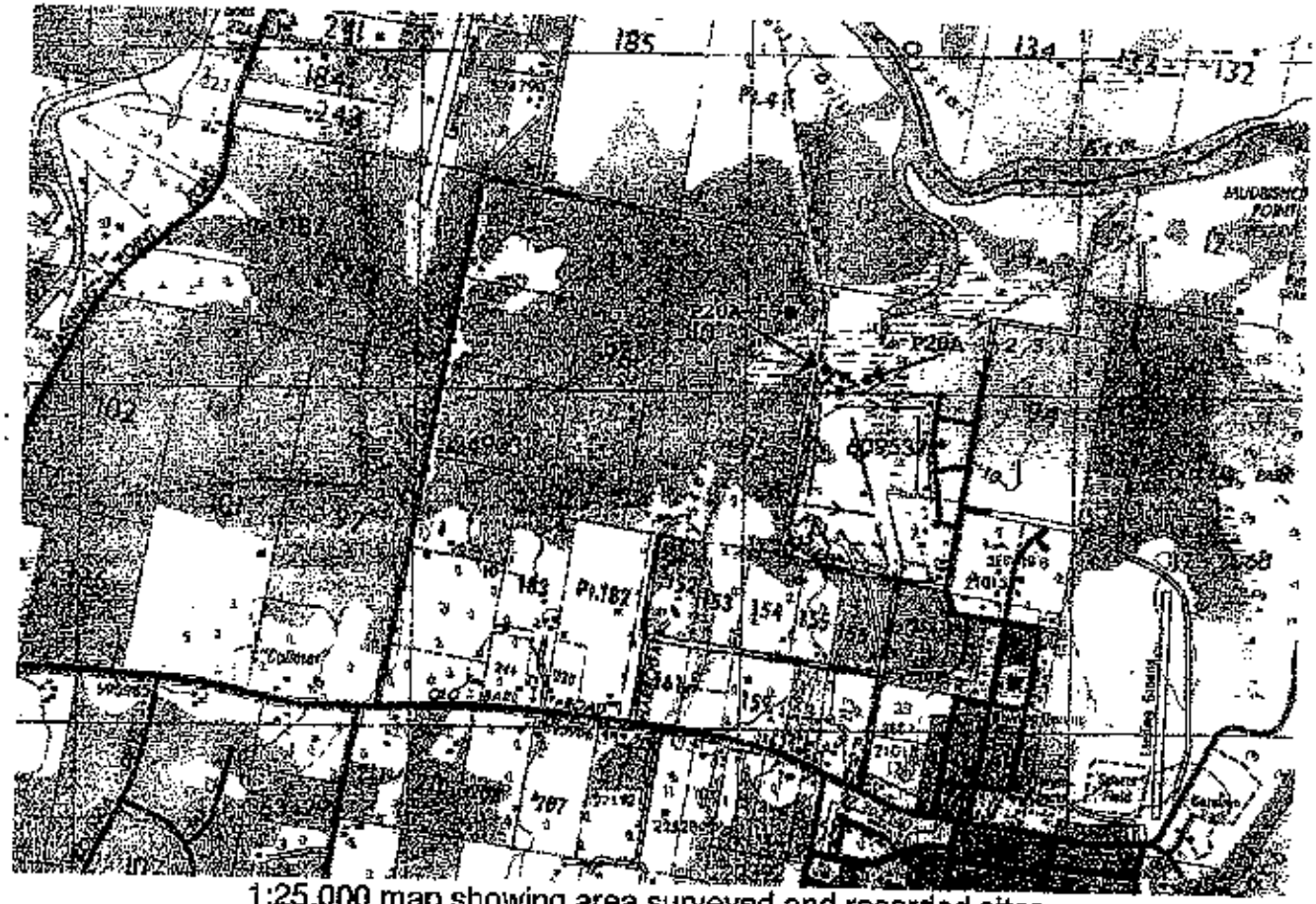
This report deals with the Aboriginal Heritage assessment of **Lot 111 DP 815853** ***Precinct 2A development at Old Bar.***

The report was commissioned by Mr Brett Campbell of Terra Consulting Environmental Consultants (Ph: 02 65553577), and is the Aboriginal Heritage component of environmental studies for the proposed subdivision.

The Assessment aims to provide identification of Aboriginal Sites and relics within the properties. It also aims to assess the significance of sites to Aboriginal people and what if any impact to these sites occurs. Recommendations can and will be sought from the Aboriginal community concerned.

- The report will contain Aboriginal community consultation and their recommendations.
- It will also have topographical description of the area(s) focused upon.
- Provide geological information.
- Describe traditional Aboriginal material located.
- Consultative work carried out with the Project Archaeologist, RTA personnel and National Parks & Wildlife staff.

Purfleet-Taree Local Aboriginal Land Council Boundary.



1:25,000 map showing area surveyed and recorded sites.

Land Use

The survey area comprises an estuarine river delta system. Alluvial sand deposits predominate.

- Old Bar township lies to the south with some residential & commercial buildings.
- Mud Bishops camping reserve and the south branch of the Manning River and old river entrance are directly to the north.
- Manning Point Road (southern end) is 2.2km to the west.

Most of the area has been extensively cleared and redeveloped with residential/ commercial subdivision. If *in-situ* traditional sites existed in these locations most would have been disturbed through changes made by developments.

Historical Reference

Tribal days on the Manning: The "Kattang speaking People" the "Biripi" were on the Manning thousands of years before European settlement began. Their traditional boundaries extended well to the north of the Manning River, west to the Gloucester River and South to Forster. Beyond the western section of their boundary lay the tribal territory of the "ngaku" which includes the modern town of Kempsey. Ngamba or Namba tribal territory lay to the north East and included Port Macquarie to the west was the "Gringhai" and "Dain-gutti" tribal territory and to the south the "worimi" people

The "biripi" way of life was ideal they used the natural foods To great advantage There was an abundance of fish along with a Summer harvest of rock and mud oysters with a available Shell food. The forests of the lower manning abounded with Koala, possum, Emu , kangaroo, pademelons and wallabies while the men hunted and spear-fished the women gathered fruit and a large variety of roots and plants

EUROPEAN SETTLEMENT AND CONFLICT

An English company called the Australian agricultural company was Allotted a land grant of 1000,000 acres which extended from port Stevens to the manning river settlement commenced during 1834 to 1827.
On the 1 January 1831 the colonial secretary informed William Wynter
A naval men that he had been granted 2560 acres of land on the Northern bank of the manning river a part of this grant is today The city of Taree, settlement advanced up the river from this point.

With settlement, clearing and fencing of large tracts of land soon led to a rapidly diminishing food supplies for the Aboriginal people. By 1840 the natural food supplies of the "Biripai" were almost totally exhausted and they were suffering starvation due to being dispossessed. Indiscriminate spearing of domesticated animals soon led to open hostility and warfare between Europeans and Aboriginals.

Warfare and diseases such as Smallpox, influenza, measles, diarrhoea, the common cold, dysentry, tuberculosis, diabetes, venereal disease, previously unknown to Aborigines decimated the local tribes.

By 1865 resistance was diminishing rapidly and only tribal remnants of several different tribes remained in the Manning, these being relegated to becoming fringe dwellers.

The first Aboriginal Reserve in New South Wales was set aside in 1884. The reserves at Karuah, Forster and Purfleet were officially gazetted on 6 July 1894, 14 September 1895 and 6 August 1900 respectively.

Development of the Manning: The coastal shipping was the development of the Manning River area because the overland journey was arduous and it was not until 1913 that the railway arrived in Taree.

Relocation of the Pacific Highway in later years, along the coast, through Taree also had a profound affect in making the area more accessible to visitors and more attractive to people wishing to re-settle.

Pre 1900:

A council of Elders enforced the rules of the Biripai Tribal people, which were handed down from generation to generation.

Boys and girls were separated from the age of ten and would not be re-united unless through marriage. The initiation process began form about 13-14 years of age for both boys and girls.

Women were forbidden to attend latter stages of mens initiation ceremony while men were forbidden to approach womens sites of initiation.

An Essay on The Manners and Customs
Of The
Australian Blacks

I must tell you I went to Australia at the age of 4 and lived there six years, on the Manning River about 150 miles from Sydney and seventy miles from any township and having lived there so long you will allow me to add I know a little about the Blacks. The first thing I remember about them is, that they used to come in and out the kitchen as they liked and sit in the chimney corner for there we have no stoves but large fir-places made of brick and it is surprising that although it is such a hot climate they are as fond of the fire as we are in a cold winter.

Now you must not suppose that the blacks are the same all over Australia, for they are different in different parts. I think if we begin with the dress of those that used to come to our farm; they used to wear a band made of skins around their waists and from this band a couple of tassels made from the skins of animals. one in front the other behind about a quarter of a yard in length and all the rest of the body is naked. That is all the clothing they wore unless anybody gave them a shirt or a pair of trousers which they considered a great prize.

They wear their hair tied up with grass in a peak in shape like the caps the ladies used to wear in the 15th. century.

They tattoo their backs and arms when they are young with red hot glass or stones. They often have a large bone sticking through the partition of the nose, about as thick as a rushlight.

In their habits they are lazy and exceedingly dirty thus to save themselves the trouble of stooping to pick up anything they will rather pick it up with their toes and seldom drop it. They sleep a good deal in the day with their toes so near the fire that they often get burnt.

They live principally on kangaroos, wallabies, paddymelons and kangaroos rats, they will also eat snakes when they will themselves try guineas, hornets when they are in the chrysalis roasted and large grubs roasted which they get out of a tree. I can tell you by experience that these grubs are not disagreeable for I have eaten them myself and when roasted taste something like marrow indeed some of the settlers have brought them on table.

Everything is half roasted and they eat their food with their fingers they never boil or bake any food.

they make bread out of the roots of a tree. This is the way they make it. First they roast it in the fire and then they pound it between two stones and so they go on for a long time for if they did not do this, it would sting their tongues and the root being of the stinging tree.

They are fond of honey which they call sugar bag, the bees are very small and have no sting. They make their nests in the hollow branch of a tree. The blacks cut nooks in the tree just large enough to place their toe all the way up and he ascends the tree when he gets to the branch that contains the honey he cuts it down and calls some of his brethren to come and have some with him. They get some skins and dip them in the honey and then they all have a suck. The honey is inferior to ours. they would sometimes bring me a pannikin full and we used to strain it but they would eat bees wax and all.

They would do anything for you, if you give them a little tobacco or flour, they will go a good many miles. They have no coin in circulation so you can never pay them in money. They do not use knives, forks or plates.

In their manners they are gentle and inoffensive seldom injuring anybody but in more unexplored parts they are salvage and warlike. They are great thieves often breaking into the Indian corn and pumpkin fields. They carry their booty off, roast and eat it. It is seldom they stop at a place more than a week at once.

They live in huts which they call camps. They are made of three sheets of bark upon a pole, one of the sides is open where they make a fire.

They seldom become sufficiently attached to stay with you the reason they give is that they like the bush better.

They speak half English and half their gibberish thus when they would say - give me some food, they would say - give me patta patta, meaning food.

The women are clothed either in a cloak made of skins or they have a blanket that some whites have given them. They generally carry their children on their backs in a knitted bag for they are good hands at knitting. They spin the bark of a tree into a kind of cord. They are the

slaves of the men for they make them perform the hardest work such as making bread and lighting the fire which they themselves are too lazy to do. The old women are called gins or mammys.

They keep balls which they call crobaries the trees are set on fire around them then they paint themselves with red and white chalk or pipeclay in stripes all down their legs and then about six of them stand in a row and shake their legs about so quick that you can see nothing but red and white they dance to the music of a shield being beat by a piece of wood the musician and one of the women make a burring noise which they call singing. The women never take a part in the dance but content themselves with looking on they begin about ten and finish at daylight and they make such a noise that it keeps you awake nearly all night. It looks queer to see the trees blazing up and the fantastic figures of the blacks in fire-light.

WEAPONS

Their weapons consist of a large club like a life preserver with a long handle and a kind of instrument they told me they used in war to cut one another's heads off the boomerang and the spear with a piece of wood they throw it with they use the spear principally in hunting and are very dexterous in using it. One part of it is made out of the grass tree is a kind of reed growing straight out of the top the other part is made out of a heavier piece of wood and is fixed in the end of the other part they make it exceedingly sharp by scraping it with a piece of glass or flint and they fix it on tighter with wax which they obtain from the honey they take.

They use the boomerang to kill birds or knock down any animal which they wish to kill out of a tree such as the flying fox a curious animal something like a bat having 4 legs and a tremendous tail it is covered with thick fur and it is very courageous defending itself to the last and when dying makes a most suffocating smell. I have often caught them I remember killing 2 large ones with the help of my dog. But to go on with my narrative they can throw the boomerang in the air to a great height and make it come back again and tell exactly the place where it will come down for I saw a black throw one day he pushed me away from where I was standing because it was coming down in that place. I could throw it very well but could never make it return.

RELIGION

I never saw them worship any image but they always wore a little bag by their side stuffed with straw but I never saw the contents of one and when ever I asked them anything about it they always turned the subject off once I found one but it only contained some rock salt and it is a curious fact worth noticing that the men only possess one never the women or boys the men keep them in their girdle by their side and sleep with it and never take any notice about it to anybody perhaps afraid of exciting their curiosity.

I fancy they believe in an evil spirit for whenever they were in the dark they used to call out debbil debbil and run away and this I can prove for one night I asked one of the blacks to help me carry my goat into a shed and it being rather dark he left the goat go and ran away calling out debbil debbil it seems to be a very hard task to teach them anything and it would take a good deal of patience for they seem to have no intellect and you may literary say they have no God what a shocking state to be in and I was told that when they think themselves dying they go away into the bush and die by themselves and then the native dogs eat their dead bodies and I certainly never saw one buried and therefore we should make greater efforts to send the Bible to them and now having tried to do my best telling you about the blacks I hope you will excuse any blunders I have had the misfortune to make but I can confidently affirm that what I have said is true having seen it with my own eyes but you of course know that they are different in different parts because where the whites have made settlements they are more civilised than those who live at a distance from any settlements for in some parts they are courageous and savage while where we lived they were effeminate and unwarlike.

Traditional people used mountain ridges to traverse either to coastal areas or to the inland. These ridges contain evidence of this activity. Also where the ridges meet estuarine systems shell middens can be located. In some places shellfish has been seen on some of these ridges. This indicates people carrying seafood with them while moving from place to place.

Many settlers whose descendants still live in these areas have in their possession artefacts which were recovered from the ground when clearing land.

Some areas can and will contain conflict places where Aboriginal people encountered confrontations with Non- Aboriginal people. These places may be massacre sites, and records show massacres were widespread in this region (if not all regions of NSW).

Site types occurring in this area include:

- Open Campsites - these sites occur where people have travelled and may be a short stop over place or a location to construct stone tools.
- Middens - these sites are deposits of shell left after consuming the mollusc. They can also serve as a signpost or boundary marker. Some other contents of middens include stone tools, animal bones and in some instances burials.
- Scarred Trees - are the result of bark being removed from trees to make a shield ; canoe or carrying container. They may also be foot holes cut for climbing trees.
- Carved Trees - These sites are specific design work carved into trees for ceremonial purposes.
- Shelters with midden material - are sites where people sheltered from the elements and also ate seafood and animals, which can be seen from the debris remaining.

Sites in area

There are 13[2] known sites in the nearby area.
All these sites are recorded with either P-TLALC or AHIMS database NSW NPWS.

[2] As at 1st January 2003 NPWS AHIMS database. *See Appendicies.

Methodology

P\T LALC Representatives were informed by Mr Brett Campbell of Terra Consulting Environmental Consultants, to attend a field survey. The field work was carried out by Purfleet-Taree Local Aboriginal Land Council Aboriginal Sites Officer Trina Ridgeway.
Areas surveyed by walking included those highlighted by Mr Campbell and any locations thought to be sensitive.

Resource Material used:

- Purfleet-Taree Local Aboriginal Land Council Aboriginal Sites Computer Database.
- NSW NPWS Aboriginal Heritage Information Management System.
- Various archive sources held by Purfleet-Taree Local Aboriginal Land Council.
- Archaeological reports.
- Local knowledge from residents.

Maps used for survey work:

- 1:25,000 Cundletown 9434-3-S
- Wingham_mosaic.sid image, courtesy NSW NPWS Hurstville Sydney.

Fieldwork:

Survey was conducted on 8th May 2003 over the subject land.

Results

The Aboriginal heritage assessment through Precinct 1 Old Bar was carried out on 8th May 2003 with Terra Consulting representative Mr Brett Campbell.

The actual fieldwork duration was 6 hours with the majority of the subject land being investigated.

The subject land was walked and in locations where it was in traversable by this method, vehicles were used. The transects covered in the property averaged 10-15meters. These transects are highlighted in ***RED arrows*** on the overview map on page 6.
Lower swampy areas that are evident in the subject area would have proven to be a more frequented location for conducting traditional Aboriginal activities.

6 individual isolated artefacts were recorded during the survey. These were recorded using NSW NPWS AHIMS site recording forms.
Artefacts were also recorded using analytical methods practiced by archaeologists.
All recorded artefacts were termed to be *flakes* with the exception of one which was determined to be a remnant *'core'*.

Aboriginal Sites Officer Gillian Donavon stated that the location of the artefacts recorded during this survey would have had to be consistent with seasonal patterning movements of traditional Aboriginal persons. The spur that extends from the south and gradually tapers down to the sites is in fact one of the traditional pathways which was used before European settlement of the area.
Sites that have been recorded have oral knowledge (still existing today) of them that allude to and support via physical evidence, the cultural links through 'old tracks'. Ridgelines in the surrounding (if not on a broader scale) area have roads and 4WD tracks on them. Early European settlers were shown these 'old routes' for easier access to sustainable resources which were abundant at the time.

Recommendations

Purfleet-Taree Local Aboriginal Land Council are satisfied with the investigation of Old Bar Precinct 1.

It is recommended that:

- **Traditional Aboriginal material was sighted during the surface investigation for the subject land.**
- **Further consultative work may be required in the area if any additional material suspected of being of traditional Aboriginal manufacture or origin is unearthed and that all work operations in that area cease.**
- **Material suspected of being constructed by traditional Aboriginal methods is confirmed through Purfleet-Taree Local Aboriginal Land Council and NSW National Parks & Wildlife Service Aboriginal Heritage Unit.**
- **Protective buffers are placed around recorded sites. That these buffers are 5-10² meters in entirety.**
- **If the Land Owner is willing, a plan of future management for the 2 (two) identified sites can be implemented.**
- **That any skeletal material unearthed is reported immediately to the NSW Police Service.**
- **Any act or legislation pertaining to Aboriginal heritage management is reviewed for future management regimes.**
- **Copies of this report be sent to:**

Brett Campbell of Terra Consulting Environmental Consultants
Mrs Jill Ruig Directorate Archaeologist - NPWS Northern Zone
Environmental Services Division Taree City Council

Bibliography

Brayshaw. H 1994,	Harrington Waters Estate Manning River, NSW. Report to Peakhurst Properties Pty Ltd.
Fitzpatrick. F. A. 1914	Peeps onto the Past: Reminiscences of the blacks – Pioneering Days on the Manning.
Dawson, Robert 1830	The Present State of Australia
Oxley, J 1817	Journal

Appendices

Photographs of property and recorded sites.

Photo 1. Vienna Maslin and Gillian Donavon investigating high points, southern sectors of property.

Photo 2. Brett Campbell (Terra Consulting) southern end of property.

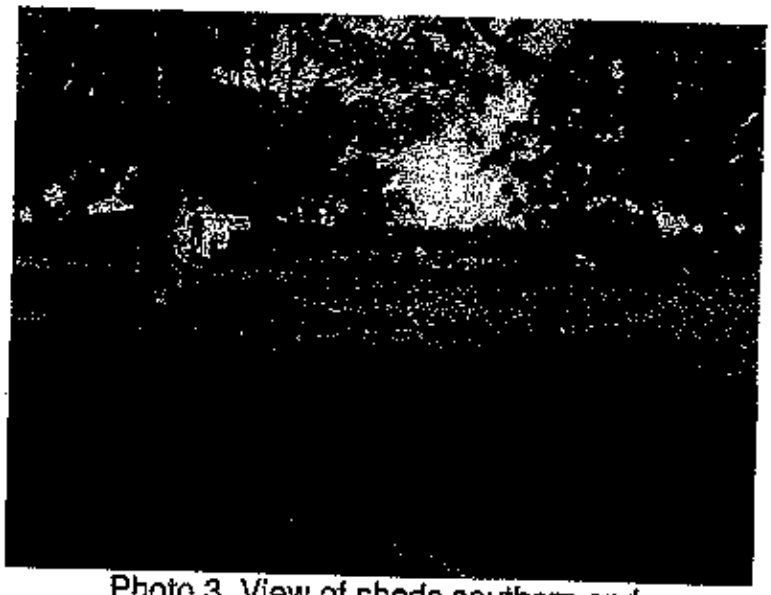


Photo 3. View of sheds southern end.

Photo 4. Oyster shell fragment,
top of rise southern end of property.

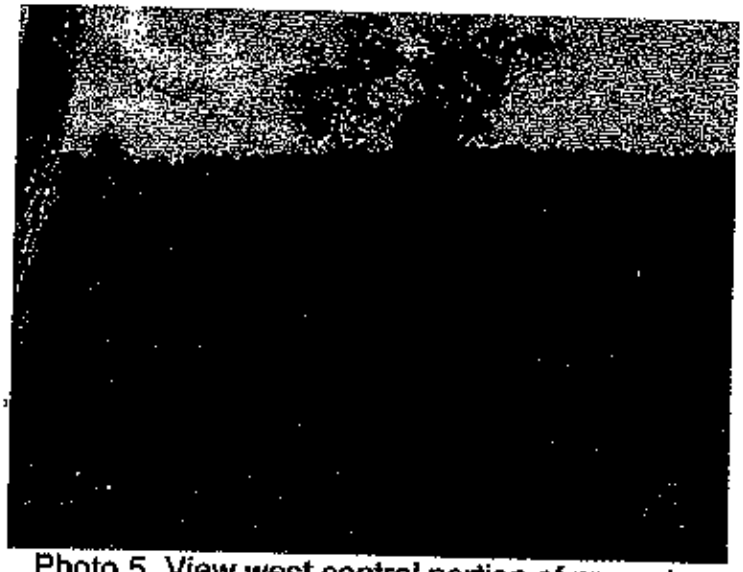


Photo 5. View west central portion of property.

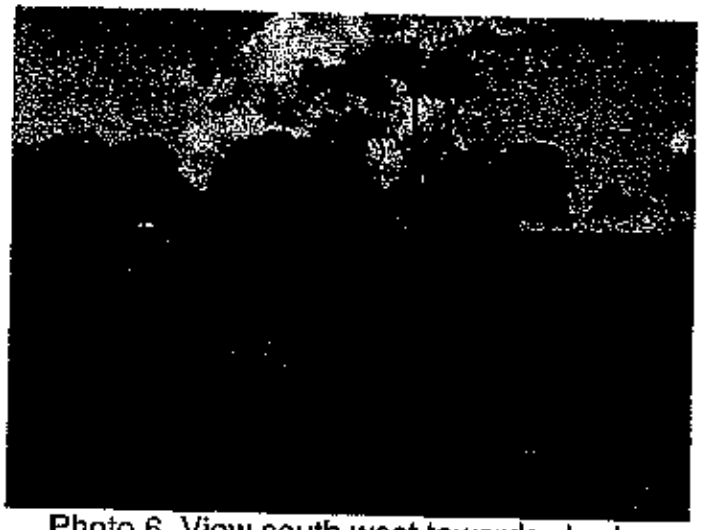


Photo 6. View south west towards sheds.

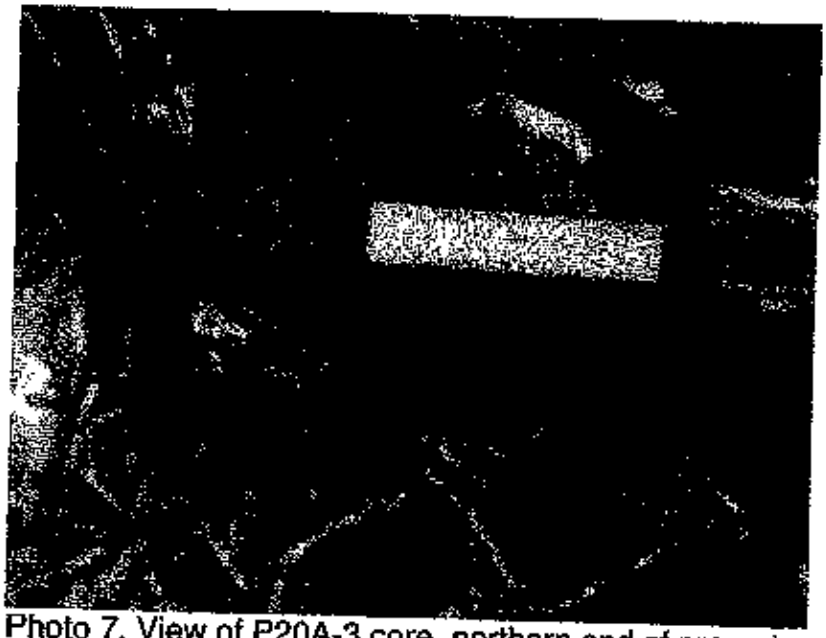


Photo 7. View of P20A-3 core, northern end of property.

Photo 8. P20A-2 flake.

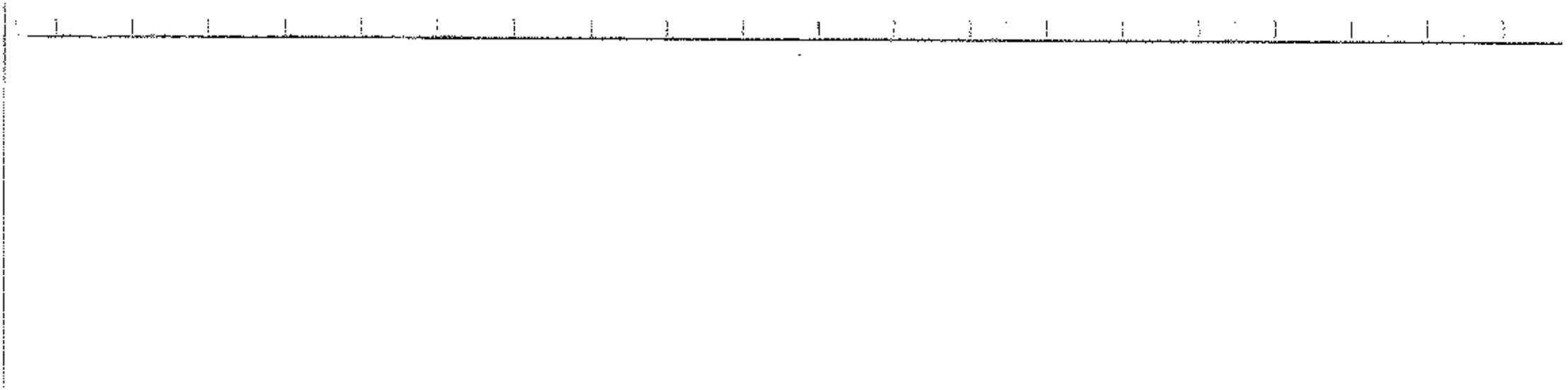
NPWS AHIMS RECORDED SITES

Approximately 5KM radius of study area.

	AHIMS Database Number	Site Type	Locality
1.	30-6-0078	SHL	Farquar
2.	30-6-0079	SHL	Farquar
3.	30-6-0043	SHL	Oxley Is
4.	30-6-0040	SHL	Bohnock
5.	30-6-0042	SHL	Bohnock
6.	30-6-0051	SHL	Old Bar
7.	30-6-0135	CER	Old Bar
8.	38-3-0222	AFT	Saltwater
9.	38-3-0031	BUR	Saltwater
10.	38-3-0228	AFT	Saltwater
11.	38-4-0107	AFT	Saltwater
12.	38-3-0229	SHL	Saltwater
13.	38-3-0259	CER	Saltwater

Appendix C

Flora survey report



Precinct 2 Old Bar – Wallabi Point
Local Environment Study

Vegetation Survey

Scope of Survey

The site is approximately 32.5 ha in size It is bounded by Banyula Drive in the south, an unformed road to the west, Oyster Creek to the north and the town of Old Bar to the east. The purpose of the survey was to assess, identify and describe the vegetation communities present on the site. Locate and identify any rare or threatened communities or taxa present within the site and identify any limitations to development which may relate to the vegetation on the site.

Site Survey

The area was surveyed over a half day period in February 2003. A flora survey of the LES site and immediately surrounding areas was carried out. The area was traversed on foot using the random meander method (Cropper, 1993) and all taxa encountered were recorded. Those not able to be positively identified in the field were sampled for later identification. Plant community descriptions were based on Walker and Hopkins (1990).

The vegetation of the area surrounding the study area has mapped in some detail by the Greater Taree City Council (GTCC). The GTCC survey identified 2 plant communities within or adjacent to the study area. The vegetation communities on site were investigated to verify the accuracy of this mapping. An amended vegetation map of the site is attached as Appendix one A cumulative species list for the site is attached as Appendix two.

General Vegetation Description

The site is dominated by extensive areas of disturbed grassland. This appears in the GTCC mapping as "cleared" land. This community is dominated by introduced grasses such as Buffalo grass (*Stenotaphrum secundatum*) and Paspalum (*Paspalum dilatatum*). Occasional remnant Eucalypt and Syncarpia are present as scattered paddock trees. The community is currently used for cattle grazing.

The other communities which are present are a small area of fringing mangrove forest which is present along Oyster Creek and an area of salt marsh. The mangrove community is dominated by Grey mangrove (*Avicennia marina var. australasica*) and River mangrove (*Aegiceras corniculatum*). The salt marsh community is dominated by Salt couch (*Sporobolus virginicus*) and Sea rush (*Juncus krausii*) . These two communities are mapped as a single community (mangroves and some salt marsh) by GTCC. This appears inappropriate given the obvious floristic and edaphic differences between the two communities.

Species of Conservation Significance

No species of conservation significance were found during the survey

Vegetation Communities

The GTCC vegetation community mapping of the area is generally accurate in its spatial extent but owing to its coarse nature does not accurately define all of the plant communities present within the study area. The GTCC mapping defines two plant communities for the area. Field inspection of the site showed that an additional plant community is present on the site. This additional community is shown in the amended mapping of the site (Appendix one).

These communities are described, for the purposes of this report as, Mangrove Forest, Salt Marsh and Disturbed Grassland.

Development constraints

From a vegetation management perspective there are no obvious limitations to development in the Disturbed Grassland Community. The Mangrove Forest area and the Salt Marsh are however protected under planning instruments associated with the NSW Fisheries Management Act.

Clearing of these vegetation communities can only be undertaken under a permit issued by NSW Fisheries.

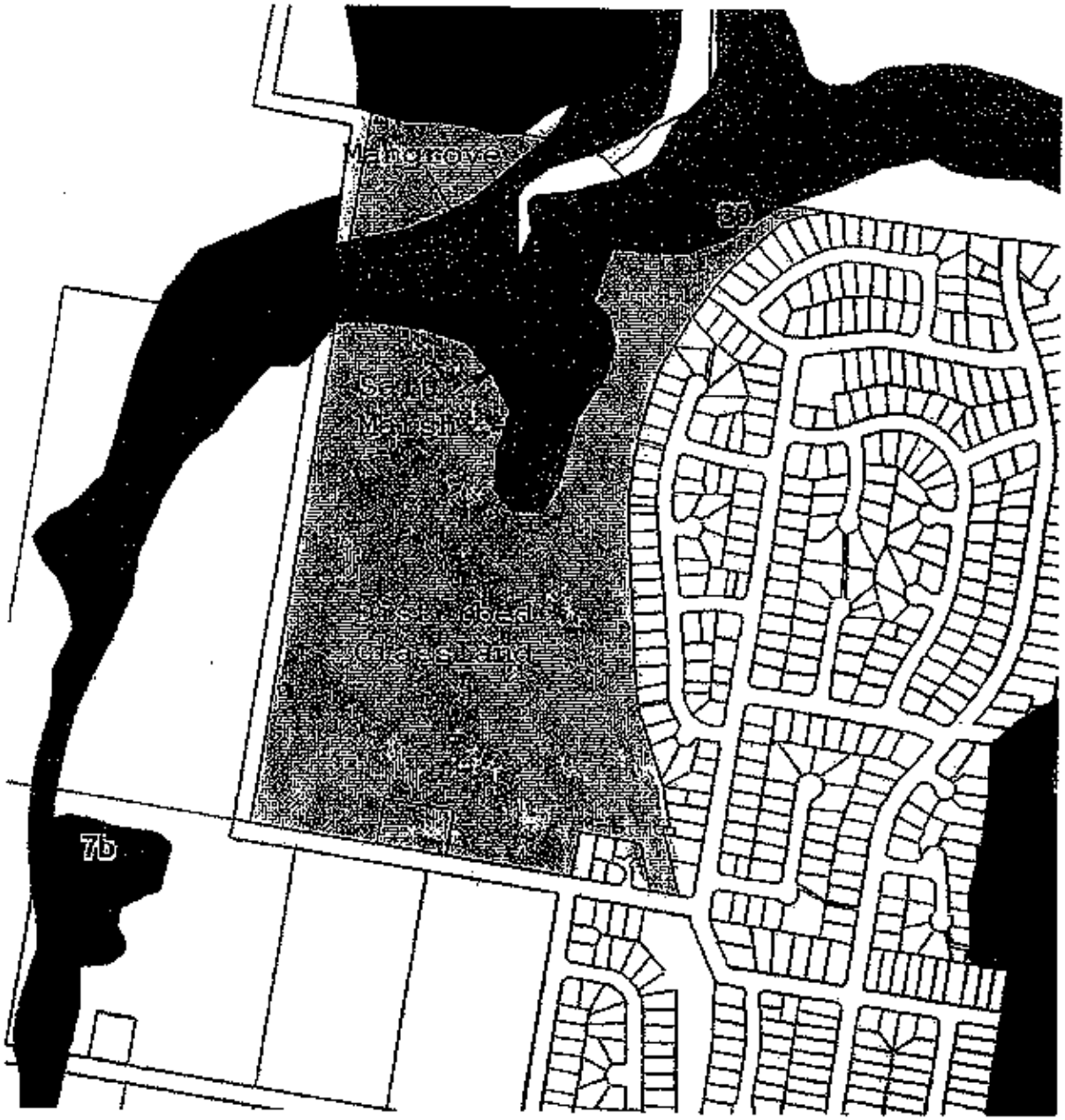
References

Cropper, S.C. (1993). *Management of Endangered Plants*, CSIRO Publications, Melbourne.

Walker, J. and Hopkins, M.S (1990), Vegetation. Pp 58-86 in *Australian Soil and Land Survey, Field Handbook* by R.C. McDonald, R.F. Isbell, J.G. Speight, J, Walker and M.S. Hopkins. Inkata Press, Melbourne.

Appendix 1.

LES Study Site Vegetation Communities

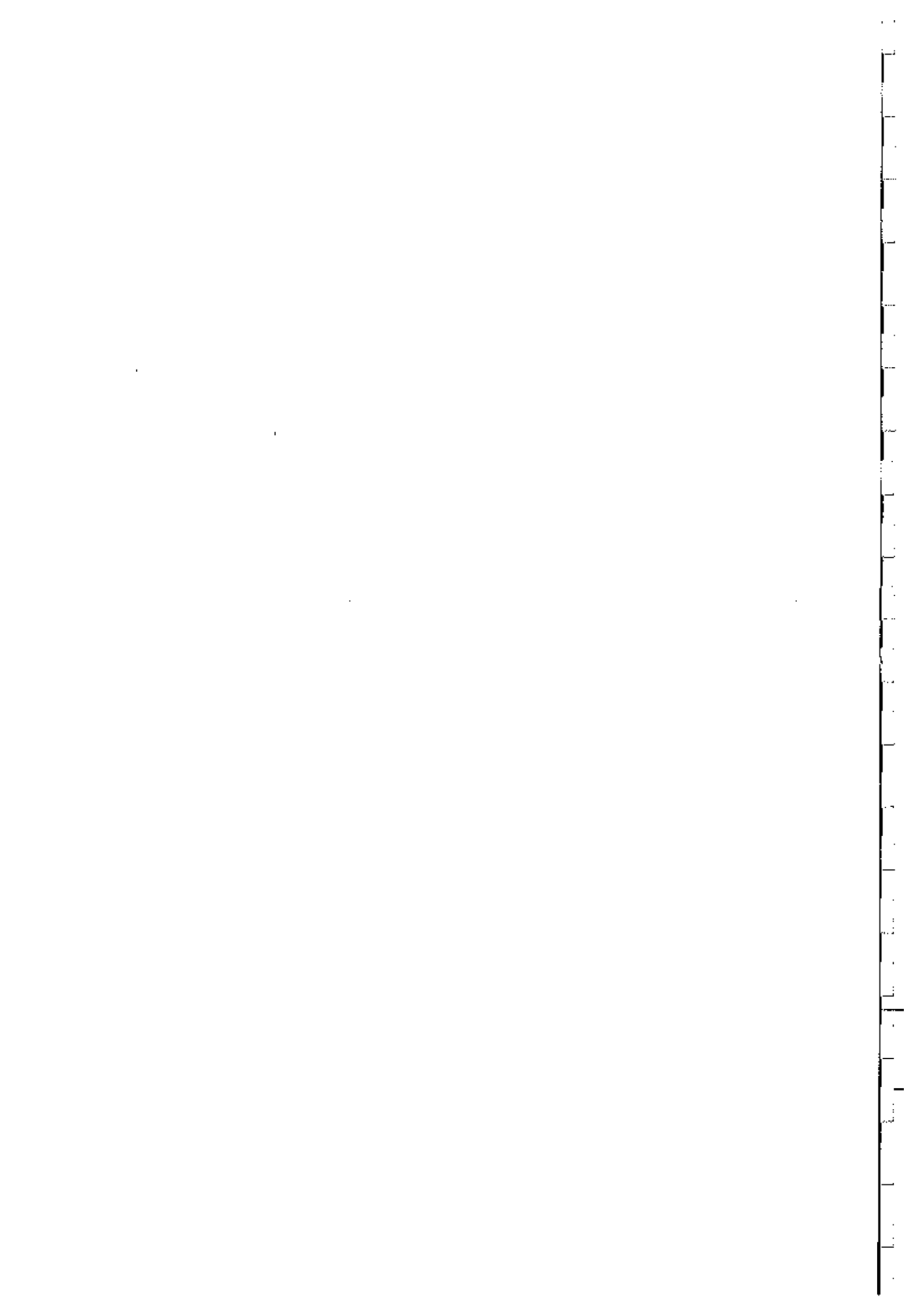


Appendix 2.

Cumulative Species List for the Old Bar Wallabi Point LES Site

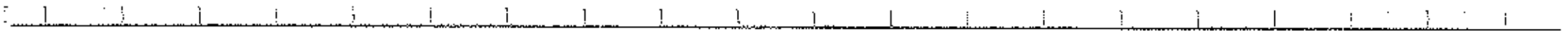
Scientific Name	Common Name
Apiaceae	
Hydrocotyle bonariensis	
Asteraceae	
Euchiton sphaericum *	Cudweed
Taraxicum officionale *	Dandelion
Avicenniaceae	
Avicennia marina var. australasica	Grey mangrove
Casuarinacaeae	
Casuarina glauca	
Chenopodaceae	
Atriplex australasica	Saltbush
Sarcocornia quinqueflora	Samphire
Cyperaceae	
Cyperus eragrostis	
Lepidosperma limicola	Razor Sword Sedge
Epacridacaeae	
Epacaris pulchella	
Juncaceae	
Juncus krausii	Sea Rush
Lobeliaceae	
Pratia purpurescens	
Myrtaceae	
Eucalyptus eugeniodes ?	White mahogany
Eucalyptus intermedia	Pink bloodwood
Eucalyptus microcorys	Tallowwood
Eucalyptus robusta	Swamp mahogany
Melalueca quinquenervia	
Syncarpia glomulifera	Turpentine
Myrsinaceae	
Aegiceras corniculatum	River mangrove

Oxalidaceae	
Oxalis perrenans	
Poaceae	
Paspalum dilatatum	Paspalum
Sporobolus virginicus	Salt Water – Couch
Stenotaphrum secundatum	Buffalo grass
Typhaceae	
Typha orientalis	Cumbungi
Violaceae	
Viola hederaceae	Native violet



Appendix D

Stormwater Management Report



OLD BAR/WALLABI POINT DEVELOPMENT PRECINCT 2A

STORMWATER MANAGEMENT REPORT

SEPTEMBER 2003

Prepared for

GREATER TAREE CITY COUNCIL

by

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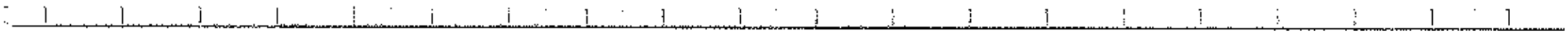

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FIGURES

Section 1.0
Introduction

1.1 BACKGROUND

The Old Bar/Wallabi Point Precinct 2 development relates to a parcel of land of approximately 180 ha adjacent to the existing urban area of Old Bar. The proposed development extends the Old Bar urban area to the north and west into currently undeveloped land.

The location of the proposed Old Bar/Wallabi Point Precinct 2 development site is shown in Figure 1.

The development site lies in a catchment that drains to the Oyster Arm of the Manning River South Channel. The area includes the entire catchment of Oyster Reach and the western side of Banyula Creek. The lower end of Oyster Reach and Banyula Creek form a natural wetland that has been classified as a SEPP 14 wetland.

The development will include retention basins and constructed wetlands. These will be a key component of the stormwater management system providing stormwater quantity and quality control. Conceptual design and assessment of these components has been undertaken and is presented in this report.

1.2 OBJECTIVES

The objectives of the stormwater management assessment were to:

- Define existing drainage characteristics for the catchment;
- Determine the impacts of the proposed development on drainage patterns;
- Outline the overall stormwater management plan for the development; and
- Provide conceptual details of major stormwater management infrastructure for the development.

1.3 REPORT STRUCTURE

This report is presented in five sections:

- **Section 1** – provides a brief background and outlines the study objectives;
- **Section 2** – provides a site description;
- **Section 3** – describes the study methodology;
- **Section 4** – presents the results of the assessment and outlines the conceptual stormwater management plan for the development; and
- **Section 5** - presents the conclusions and recommendations.

Section 2.0
Catchment Description

2.1 DEVELOPMENT LOCATION

The Old Bar/Wallabi Point Precinct 2 development site is located on the western edge of urban development in Old Bar. The site is bounded to the north by a natural wetland and the Oyster Arm of Manning River South Channel, and to the west and south by currently undeveloped areas.

The location of the subject land is shown in Figure 1.

2.2 CATCHMENT DESCRIPTION

The Old Bar/Wallabi Point Precinct 2 development site is approximately 180 ha and lies within two catchments that drain to the Manning River.

The Oyster Reach catchment flows north through currently undeveloped areas to a natural wetland before flowing into the Oyster Arm of the Manning River. The catchment boundaries are formed by natural ridge lines to the west, south and east.

The Banyula Creek catchment lies to the east of the Oyster reach catchment. Banyula Creek drains some of the existing urban area of Old Bar before flowing under Banyula Drive and into undeveloped land. Banyula Creek joins Oyster reach within the aforementioned natural wetland.

The Oyster Reach catchment is currently undeveloped with only a small number of dwellings within the catchment. The Banyula Creek catchment south of Banyula Drive is almost entirely developed and comprises approximately 60 % of the catchment. The Banyula Creek catchment below Banyula Drive is currently undeveloped to the west.

At the lower end of Oyster Reach and Banyula Creek are wetlands that becomes inundated with sea water during spring tides. The wetland has recently been classified as a SEPP 14 wetland. This classification prevents any development within the wetland boundary.

The catchment and sub-catchment boundaries are shown in Figure 2.

2.3 EXISTING DRAINAGE NETWORK

The existing developed area within the Banyula Creek catchment south of Banyula Drive is serviced by an drainage pipe system that conveys stormwater to Banyula Creek. Recent development has also incorporated vegetated swales, buffer strips and gross pollutant traps. Banyula Creek then flows under Banyula Drive through a 2 x 1500 mm reinforced concrete pipe culvert.

The Banyula Creek catchment below Banyula Drive is currently undeveloped to the west. The catchment to the west is currently used for grazing cattle and drains naturally to the creek line. The catchment to the east is fully developed as urban residential. This area drains to Banyula Creek through a network of stormwater pipes.

The Oyster Reach catchment is currently undeveloped apart from a few dwellings. There is no existing stormwater drainage infrastructure in this catchment apart from a culvert under Old Bar Road.

Banyula Creek joins Oyster Reach within the natural wetland to the north of the site. A drainage line from Old Bar reserve then joins Oyster Reach approximately 280 m further north. Oyster Reach then joins the Oyster Arm of the Manning River South Channel a further 500 m north.

2.4 PROPOSED DEVELOPMENT

2.4.1 Old Bar Precinct 2 Development

The Old Bar Precinct 2 development comprises land owners who intend to develop approximately 180ha of the Old Bar area. The development will include commercial business, residential, and public open space. Old Bar Road and the proposed collector road will form retarding basins for the development. Constructed wetlands will also be included below these two roads to provide stormwater retarding and water quality improvement.

The objectives of the stormwater management system will be to:

- limit peak discharge from the site to pre development levels for design storms up to the 100 year Average Recurrence Interval (ARI);
- safely convey stormwater discharges from the development to the wetland; and
- provide stormwater treatment.

The analyses provided in the remainder of the report relate to development of Precinct 2A, which is shown in Figure 1. This Precinct has an area of approximately 32.5 ha.

Section 3.0
Assessment Methodology

3.1 DESIGN CRITERIA

The site is located immediately above a sensitive receptor, being the SEPP14 wetland (# 571). It is therefore imperative that the stormwater discharge from the development be delivered to the wetland with minimal impact. The following constraints were therefore set for stormwater management:

- Limit peak discharge from the developed site to pre development levels;
- To include Stormwater Quality Improvement Devices (SQID's) where appropriate and necessary;
- To approach the stormwater management from a Water Sensitive Urban Design perspective; and
- Provide for greater than best-practice stormwater management of the site.

3.2 STORMWATER FLOWS

3.2.1 Hydrologic Modelling Overview

Hydrologic analysis was undertaken using the XP-RAFTS2000 rainfall runoff model. This model is able to:

- Model spatial and temporal variations in storm rainfall across the catchment;
- Model variations in catchment characteristics;
- Model storage routing effects in drainage lines and basins; and
- Calculate discharge hydrographs at any required location in the catchment.

The analytical technique used in XP-RAFTS involves the division of the catchment into a number of sub-catchments. Sub-catchment outlets may be located at the junction of tributaries, at the site of dams or retarding basins, at points corresponding to significant changes in catchment characteristics, or at any other point of interest.

Data is required on the area and connection sequence of the sub-catchments, together with average catchment slopes, the impervious percentage, and the rainfall data for the design storm being modelled. Additional data is required to model rainfall losses and channel or

pipe flow. This may be entered in several different forms depending on the data availability and the degree of refinement desired for the analysis. For this assessment the rainfall losses were modelled as initial and continuing losses.

The reservoir/retarding basin module was used to assess the performance of the stormwater management system in the development. Input data required for this analysis included stage-storage and stage-discharge relationships and outlet configurations.

3.2.2 Catchment Subdivision

This report has been prepared for Old Bar/Wallabi Point Development Precinct 2A. This area of land is a 32.5 ha parcel of land within Precinct 2 that is bounded by Banyula Drive to the south, currently undeveloped land to the west, a natural wetland to the north, and residential development to the east. The location of Precinct 2A is shown in Figure 1.

Precinct 2A includes the lower end of Banyula Creek. Land to the west of the creek line is proposed to be developed. The eastern portion of Precinct 2A falls to Banyula Creek while the remainder falls to Oyster Reach. The land that falls to Banyula Creek is included in this study.

The land that falls to Oyster Reach will be included in a future study, as the boundary of between it and Precinct 2A lies across catchment boundaries. The stormwater management of these catchments will need to be treated as a whole rather than in portions.

The area of Precinct 2A included in this study consists of three sub-catchments that drain to Banyula Creek and the lower end of Banyula creek itself. It is proposed to drain catchments A1 and A2 to a single constructed wetland (W1) and to drain catchment A3 to a second constructed wetland (W2).

The sub-catchment boundaries and location of constructed wetlands are shown on Figure 2.

Model parameter values were determined for the existing catchment conditions from available maps and field inspections. Post development values were determined from proposed design plans (CWF, 2002). A description of the input data is provided in the following sections.

Sub-catchment Details

The area of each sub-catchment and sub-catchment slope were determined from digital versions of survey plans.

Catchment Roughness

Catchment roughness values were chosen to reflect the vegetation in each sub-catchment. The following values were adopted:

- 0.07 - Open pasture land
- 0.025 - Pervious urban areas (split sub-catchment)
- 0.015 - Impervious areas (split sub-catchment)
- 0.01 - Water (ponds)
- 0.05 - Drainage Channels

Percentage Impervious

The percentage of impervious surface area adopted for rural sub-catchments under existing conditions was zero. This reflects the rural and undeveloped nature of the existing catchment. The percentage impervious for developed catchments was set at 50 %.

The split sub-catchment option was used to separately model the pervious and impervious portions of each developed sub-catchment. This enables the use of different rainfall loss and roughness values for each catchment type. This approach models the faster response time from impervious catchments.

Rainfall Loss Model

Rainfall losses were modelled using the approach of initial loss and continuing loss. The loss rates adopted for each catchment type are shown in Table 3.1.

TABLE 3 RAINFALL LOSSES

Catchment Type	Initial Loss (mm)	Continuing Loss (mm/hr)
Pervious	10	2.5
Impervious	1.6	0

Channel Routing

Channel lagging was adopted to model travel times between sub-catchments. The lag time was estimated by considering the distance travelled and adopting an average velocity of 2 m/s.

3.2.3 Design Rainfall

Design rainfall intensity/frequency/duration (IFD) data and storm temporal patterns were derived using the procedures set out in Australian Rainfall and Runoff (Institution of Engineers Australia, 1997).

A series of design storms ranging from 30 minutes to 2 hours were modelled to determine the critical duration for the 100 year ARI storm.

The critical storm duration was found to be 90 minutes.

Design rainfall data was derived for the 5 year, 10 year, 20 year, 50 year and 100 year ARI, 90 minute storms.

3.2.4 Constructed Wetlands

Two constructed wetlands (W1 and W2) are proposed within Precinct 2A. These have been sized based on catchment area, available area and achieving a hydraulic residence time (HRT) of 25 days of the design storm event. A HRT of 25 days allows for significant pollutant and nutrient removal. Standard practice is for design of a HRT of 15 days. However, due to the sensitive nature of the receiving waters, it was considered that additional treatment of stormwater through an extended residence time was warranted.

These constructed wetlands have also been designed to act as retarding basins. A variety of wetland sizes were calculated, based on their ability to act as retarding basins during large storm events. Normally, the wetlands would be sized to provide a HRT of 25 days for peak flows up to the 1 year ARI storm, which would therefore retain their function of significant pollutant and nutrient removal.

However, as the SEPP 14 wetlands are located downstream, it is desirable to retain the HRT for as large a storm as is practical. Table 3.2 shows the sizes of both basins (W1 and W2) required to achieve a HRT of 25 days for a variety of storm events.

TABLE 3.2 BASIN SIZES FOR HRT OF 25 DAYS

Storm ARI (years)	W1 available storage (m³)	W2 available storage (m³)
1	1604	936
2	2152	1257
5	2833	1877
10	3213	2075

Given that most sediment and nutrients would enter the wetlands with a first flush of the catchments, a balance needs to be achieved between the practicalities of the size of the constructed wetlands, anticipated pollutant loads, existing loads entering the SEPP 14 wetlands from Banyula Creek upstream of Precinct 2A and maximising the HRT.

Given these criteria, it is recommended that both W1 and W2 be sized for the 10 year ARI storm event. For storms greater than this magnitude, the constructed wetlands will not provide a retention function, nor significant water quality treatment (nutrient removal). Gross pollutants, however, will still be trapped in these events. In addition, the wetlands will retard peak flows downstream to pre-development levels. Smaller storms, (*ie.* < 10 year ARI) however, will be contained within the wetlands and water quality treatment will be provided.

3.2.5 Model Arrangements

Three catchment conditions were modelled as follows:

- Case 1 – pre development conditions;
- Case 2 – post development conditions with no stormwater controls; and
- Case 3 – post development conditions with stormwater management measures in place.

This approach allowed for an assessment of the effectiveness of the proposed stormwater management measures to reduce post catchment discharges to pre developed levels. Results of the modelling are provided in Section 4.1.

3.3 STORMWATER INFRASTRUCTURE

3.3.1 Pipe Drainage

Minor stormwater drainage was catered for with a conceptual pipe drainage layout. Detailed design should size the pipe systems to contain the 10 year ARI design storm.

3.3.2 Overland Flow Paths

Major stormwater drainage was catered for with a conceptual plan of overland flow paths. Detailed design of the stormwater channels should be performed to enable the flow paths to convey the 1 in 100 year peak discharges at critical locations. These flow paths should be designed with a maximum flow height of 300 mm, with 1V:6H side batters. The channels should also be designed to ensure the depth/velocity factor is below one.

3.3.3 HEC-RAS Modelling

The existing drainage lines of Banyula Creek, Oyster Reach and Old Bar Reserve were modelled using HEC-RAS. The three drainage lines were included in the one model.

The hydraulic model was established using numerous cross sections taken from an existing contour survey of the area (CWF, 2002). The sections were taken at 50 m intervals along the three drainage lines. The three drainage lines were modelled together, as they could potentially have an impact on the water surface elevations of Banyula Creek adjacent to Precinct 2A.

Manning's roughness coefficient was set at 0.05 for the channel and 0.07 for the overbank flow areas. The model was run in the subcritical mode with the downstream starting condition set as a known water surface of 2.3 m AHD. This condition was calculated by Greater Taree City Council (GTCC) as the peak 100 year ARI flood level in the Oyster Arm of the Manning River South Channel.

Section 4.0
Assessment Results

4.1 STORMWATER FLOWS

Modelled stormwater flows for catchments A1, A2, and A3 are summarised in Tables 4.1, 4.2, and 4.3 respectively.

TABLE 4.1
MODELLED PEAK DISCHARGE FOR CATCHMENT A1

ARI (years)	Case 1 (m³/s)	Case 2 (m³/s)	Case 3 (m³/s)
5	0.75	0.97	0.25*
10	0.60	0.90	0.36*
20	0.72	1.08	0.59*
50	0.82	1.21	0.87*
100	1.24	1.53	1.10*

*: Case 3 flows are discharges from constructed wetland W1.

TABLE 4.2
MODELLED PEAK DISCHARGE FOR CATCHMENT A2

ARI	Case 1 (m³/s)	Case 2 (m³/s)	Case 3 (m³/s)
5	0.59	0.76	0.25*
10	0.48	0.69	0.36*
20	0.56	0.84	0.59*
50	0.65	0.94	0.87*
100	0.99	1.22	1.10*

*: Case 3 flows are discharges from constructed wetland W1.

TABLE 4.3
MODELLED PEAK DISCHARGE FOR CATCHMENT A3

ARI	Case 1 (m³/s)	Case 2 (m³/s)	Case 3 (m³/s)
5	0.62	0.94	0.36*
10	0.57	0.84	0.44*
20	0.68	0.99	0.57*
50	0.79	1.09	0.68*
100	1.16	1.52	1.11*

*: Case 3 flows are discharges from constructed wetland W2.

Modelling of peak flows indicates the following:

- All post-development flows are reduced to below pre-development rates prior to discharge to Banyula Creek for all storms modelled; and
- The Case 2 modelling results indicate that post development, un-retarded peak discharge is above existing levels.

Based on these results, it is concluded that the proposed stormwater management system meets the objective of limiting post-development discharge to less than pre-development levels.

4.2 CONSTRUCTED WETLAND LEVELS

A summary of the peak level in each constructed wetland for the post-development case is provided in Table 4.4. Full model results are included in Appendix A. It was assumed that the floor level of the constructed wetlands was 0 m AHD and the spillway level was 0.75 m AHD. The storage volume at spill level for W1 is 3500 m^3 and for W2 is 2000 m^3. Detailed design will refine these numbers.

TABLE 4.4
MODELLED PEAK LEVELS AND STORAGE VOLUMES THROUGH CONSTRUCTED WETLANDS

ARI	W1 Peak Level (m AHD)	W1 Storage Volume (m³)	W2 Peak Level (m AHD)	W2 Storage Volume (m³)
1	0.34	1604	0.35	936
2	0.46	2152	0.47	1267
5	0.61	2833	0.62	1877
10	0.69	3213	0.70	2075
20	0.77	3575	0.78	2085
50	0.79	3679	0.82	2174
100	0.80	3744	0.83	2224

The constructed wetland outlet relationship was modelled conservatively, as the wetlands will also have a slow release outlet configuration.

The constructed wetlands will drain slowly over a period of time to enable pollutant removal and to retain an available storage capacity for storm retarding. The sizing of the wetlands has been undertaken to allow for 25 days HRT, for flows up to the 10 year ARI storm event.

The peak levels modelled through the system show 100 year ARI spill depths of around 50 mm and 53 mm in constructed wetland W1 and W2 respectively. The spillway flows would be catered for by a grassed spillway to Banyula Creek.

4.3 HEC-RAS MODELLING

The 100 year flood extents determined from the hydraulic modelling of Banyula Creek downstream of Banyula Drive are indicated in Figure 3. The extent of flooding is limited to the drainage line and will not affect any proposed development in the area.

The 100 year ARI peak flow was modelled at current development levels and at the ultimate development case. The maximum increase in water surface elevation in the fully developed model was 40 mm.

These results indicate that the existing channel has sufficient capacity to convey the 100 year ARI peak discharge.

It is also noted that the proposed development layout of Precinct 2A (CWF, 2002) places all proposed dwelling floor levels above the Flood Planning Level (FPL), where the FPL is 500 mm above the peak 100 year ARI flood level.

The northern tip of proposed land to be developed within Precinct 2A has been proposed as potential development blocks (CWF, 2002). While this land is above the 100 year peak flood level, it would require filling to ensure dwelling floor levels are above the FPL. A possible option for this area would be public open space or sporting ovals.

4.4 STORMWATER INFRASTRUCTURE

The conceptual layout of minor stormwater infrastructure is shown in Figure 4. At the detailed design phase, the stormwater pipes should be designed to contain the 10 year ARI storm. The pipe system will convey stormwater from the developed area directly to the constructed wetlands.

Three overland flow paths have been allowed for in the proposed lot layout. The overland flow paths will convey major stormwater discharges from the catchment to the constructed wetlands.

The constructed wetlands will discharge directly to Banyula Creek either by spilling or through the slow release configuration. The slow release configuration is still in the conceptual phase of design, whereas the actual design would be completed in the detailed design phase.

4.5 CONCEPTUAL STORMWATER MANAGEMENT PLAN

The stormwater assessment and conceptual design of major components has been combined to form the basis of the overall stormwater management plan for the development. Components of the stormwater management plan are discussed below. This plan would be revised as required during detailed design, however, the general principles outlined would be applied.

The conceptual stormwater management plan addresses two areas: short term construction related impacts; and long term water quality management. Construction impacts would be managed through the development and implementation of a soil and water management plan. Long term water quality would be managed by designing and implementing an integrated stormwater management plan. Each component is described in the following sections.

4.5.1 Soil and Water Management Plan

Construction related soil and water impacts would be managed through the development and strict implementation of a Soil and Water Management Plan (SWMP). The SWMP would be prepared in accordance with the Department of Housing Guidelines (DOH, 1998) (the Blue Book) and would include details of:

- Staging
- Erosion control strategies;
- Sediment control strategies;
- Progressive rehabilitation; and
- Site management and maintenance techniques.

The SWMP would be prepared in conjunction with the engineering design so that control measures can be effectively designed and located.

Strict implementation of and compliance with the SWMP would need to be monitored by Council, to ensure that the SEPP 14 wetlands are protected during the construction phase of development. Adherence to measures outlined in the SWMP would ensure protection of these wetlands.

4.5.2 Stormwater Management Plan

The stormwater management system for the development would include:

- Minor Gross Pollutant Traps (GPT's) at pipe outlets;
- Two constructed wetlands/retention basins; and
- A slow release configuration from the constructed wetlands to ensure available storage for storm retarding.

Minor GPT's would be installed at the stormwater pipe outlets prior to discharge to the constructed wetlands. The major suspended solids removal mechanism will be the constructed wetlands, therefore the gross pollutants traps need only consist of a simple trash rack configuration.

The main stormwater treatment mechanism would be sedimentation occurring in the constructed wetlands due to the designed HRT. The average hydraulic residence time provided by the ponds would be in the order of 25 days. Typical water pollution control ponds deigned for urban settings provide about 15 days hydraulic residence time. Therefore the volume available will provide extended residence time and adequate opportunity for pollutant removal.

Further treatment of the water will be provided through the proposed slow release configuration. The slow release configuration is conceptually based around a sub-surface wetland system. The water captured in the constructed wetlands will be filtered through a coarse media prior to discharge to Banyula Creek. This would provide a higher level of water quality treatment as well as preventing localised high discharge points in Banyula Creek.

Section 5.0
Conclusions

5.1 CONCLUSIONS

This report presents an assessment of the proposed stormwater management system for the planned Old Bar Precinct 2A development. The assessment has determined preliminary sizing and configuration of the required stormwater infrastructure to assist with the further assessment required for the Local Environment Study.

The main objectives of the stormwater management system are to:

- limit post development peak discharge to pre development levels; and
- provide stormwater quality control.

Modelling undertaken as part of this assessment indicates that the proposed stormwater management system meets the objective of limiting post-development discharge to less than pre-development levels.

The conceptual Stormwater Management Plan outlined in this assessment incorporates constructed wetlands. Preliminary calculations indicate that the system would provide extended residence time and opportunity for significant pollutant removal. This is important given the downstream location of two SEPP 14 wetlands. Other strategies such as the incorporation of gross pollutant traps and the implementation of a Soil and Water Management Plan during construction, that will compliment the overall Stormwater Management Plan.

Incorporation of the design criteria and concepts outlined in this assessment during the detailed design phase of the development would ensure that development of Old Bar Precinct 2A meets stormwater management objectives in accordance with Greater Taree City Council's policies and design standards.

References

Institute of Engineers Australia, (1997). *Australian Rainfall and Runoff.*

CWF, (2002). *Various data from rezoning application R2002/99, Oyster Reach Development,* Collins, Walshe & Fitzsimmons.

Department of Housing, (1998). *Managing Urban Stormwater – Soils and Construction.* 3rd Ed.

Appendix A

XP-RAFTS Results

Run started at: 15th September 2008 15:46:35

RUNTIME RESULTS

Max. no. of links allowed = 2000

Max. no. of routng increments allowed = 30000

Max. no. of rating curve points = 30000

Max. no. of storm temporal points = 30000

Max. no. of channel subreaches = 25

Max link stack level = 25

Input Version number = 600

LINK A2 1.000

ESTIMATED VOLUME (CU METRES*10**3) = 0.6124
ESTIMATED PEAK FLOW (CUMECS) = 0.43
ESTIMATED TIME TO PEAK (MINS) = 30.00

LINK A1 2.000

ESTIMATED VOLUME (CU METRES*10**3) = 0.7722
ESTIMATED PEAK FLOW (CUMECS) = 0.55
ESTIMATED TIME TO PEAK (MINS) = 30.00

LINK N1 1.001

ESTIMATED VOLUME (CU METRES*10**3) = 1.604
ESTIMATED PEAK FLOW (CUMECS) = 1.02
ESTIMATED TIME TO PEAK (MINS) = 30.00

LINK A3 3.000

ESTIMATED VOLUME (CU METRES*10**3) = 0.7931
ESTIMATED PEAK FLOW (CUMECS) = 0.50
ESTIMATED TIME TO PEAK (MINS) = 30.00

LINK N2 3.001

ESTIMATED VOLUME (CU METRES*10**3) = 0.9360
ESTIMATED PEAK FLOW (CUMECS) = 0.53
ESTIMATED TIME TO PEAK (MINS) = 30.00

LINK A1p 4.000

ESTIMATED VOLUME (CU METRES*10**3) = 0.6129
ESTIMATED PEAK FLOW (CUMECS) = 0.32
ESTIMATED TIME TO PEAK (MINS) = 34.00

LINK A2p 5.000

ESTIMATED VOLUME (CU METRES*10**3) = 0.4873
ESTIMATED PEAK FLOW (CUMECS) = 0.25
ESTIMATED TIME TO PEAK (MINS) = 34.00

LINK A3p 6.000

ESTIMATED VOLUME (CU METRES*10**3) = 0.6259
ESTIMATED PEAK FLOW (CUMECS) = 0.26
ESTIMATED TIME TO PEAK (MINS) = 40.00

LINK Dummy2 1.002

```
 ESTIMATED VOLUME (CU METRES*10**3) =          1.726
 ESTIMATED PEAK FLOW          (CUMECS) =      0.81
 ESTIMATED TIME TO PEAK         (MINS) =     35.00
```

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################################################################################
Old Bar

Results for period from  0: 0.0 15/ 2/2002
                    to  5: 0.0 15/ 2/2002
################################################################################
```

```
 ROUTING INCREMENT (MINS) =       1.00
 STORM DURATION (MINS)    =       90.
 RETURN PERIOD (YRS)      =       1.
 EX                       =  1.0000
 TOTAL OF FIRST SUB-AREAS  (km2) =      12.94
 TOTAL OF SECOND SUB-AREAS (km2) =       3.95
 TOTAL OF ALL SUB-AREAS (km2)    =      16.89
```

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Area #2	Slope #1 (%)	Slope #2	% Impervious #1	% Impervious #2	Perm #1	Perm #2	S #1	S #2	Link No.
A2	1.110	1.110	6.000	6.000	0.000	100.0	.025	.015	.0112	.0006	1.000
A1	1.400	1.400	7.000	7.000	0.000	100.0	.025	.015	.0117	.0007	2.000
W1	0.6600	0.000	.0010	0.000	100.0	0.000	.010	0.00	.0301	0.000	1.001
A3	1.440	1.440	4.000	4.000	0.000	100.0	.025	.015	.0157	.0009	3.000
W2	0.4300	0.000	.0010	0.000	100.0	0.000	.010	0.00	.0241	0.000	3.001
A1p	2.793	0.000	7.000	0.000	0.000	0.000	.030	0.00	.0190	0.000	4.000
A2p	2.220	0.000	6.000	0.000	0.000	0.000	.030	0.00	.0182	0.000	5.000
A3p	2.880	0.000	4.000	0.000	0.000	0.000	.030	0.00	.0256	0.000	6.000
Dummy2	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0021	0.000	1.002

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Init. Loss #2	Cont. Loss #1 (mm/h)	Cont. Loss #2	Excess Rain #1 (mm)	Excess Rain #2	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
A2	23.200	10.00	1.500	2.500	0.000	21.800	33.300	0.4326	30.00	0.000
A1	23.200	10.00	1.500	2.500	0.000	21.800	33.300	0.5451	30.00	0.000
W1	23.200	1.500	0.000	0.000	0.000	33.300	0.000	1.017	30.00	0.000
A3	23.200	10.00	1.500	2.500	0.000	21.800	33.300	0.5010	30.00	0.000
W2	23.200	1.500	0.000	0.000	0.000	33.300	0.000	0.5303	30.00	0.000
A1p	23.200	10.00	0.000	2.500	0.000	21.800	0.000	0.3194	34.00	0.000
A2p	23.200	10.00	0.000	2.500	0.000	21.800	0.000	0.2516	34.00	0.000
A3p	23.200	10.00	0.000	2.500	0.000	21.800	0.000	0.2558	40.00	0.000
Dummy2	23.200	1.500	0.000	0.000	0.000	33.300	0.000	0.8062	35.00	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak Inflow (m^3/s)	Time to Peak	Peak Outflow (m^3/s)	Total Inflow (m^3)	Basin Vol. Avail	Basin Vol. Used	Basin Stage Used
W1	30.00	1.016	30.00	0.000	1604.2	0.0000	1604.2	0.3438
W2	30.00	.5303	30.00	0.000	935.96	0.0000	935.95	0.3510

SUMMARY OF BASIN OUTLET RESULTS

Link Label	No. of	S/D Factor (m)	Dia (m)	Width (m)	Pipe Length (m)	Pipe Slope (%)
W1	1.0	1.000		0.000	0.5000	0.2000
W2	1.0	1.000		0.000	0.5000	0.2000

```
 LINK A2                  1.000

 ESTIMATED VOLUME (CU METRES*10**3) =          0.8257
 ESTIMATED PEAK FLOW          (CUMECS) =      0.58
 ESTIMATED TIME TO PEAK         (MINS) =     30.00

 LINK A1                  2.000

 ESTIMATED VOLUME (CU METRES*10**3) =          1.042
 ESTIMATED PEAK FLOW          (CUMECS) =      0.74
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ESTIMATED TIME TO PEAK          (MINS) =      30.00

LINK W1                    1.001

ESTIMATED VOLUME (CU METRES*10**3) =          2.152
ESTIMATED PEAK FLOW           (CUMECS) =     1.38
ESTIMATED TIME TO PEAK          (MINS) =     30.00

LINK A3                    3.000

ESTIMATED VOLUME (CU METRES*10**3) =          1.071
ESTIMATED PEAK FLOW           (CUMECS) =     0.69
ESTIMATED TIME TO PEAK          (MINS) =     30.00

LINK W2                    3.001

ESTIMATED VOLUME (CU METRES*10**3) =          1.257
ESTIMATED PEAK FLOW           (CUMECS) =     0.74
ESTIMATED TIME TO PEAK          (MINS) =     30.00

LINK A1p                   4.000

ESTIMATED VOLUME (CU METRES*10**3) =          0.9731
ESTIMATED PEAK FLOW           (CUMECS) =     0.53
ESTIMATED TIME TO PEAK          (MINS) =     31.00

LINK A2p                   5.000

ESTIMATED VOLUME (CU METRES*10**3) =          0.6984
ESTIMATED PEAK FLOW           (CUMECS) =     0.40
ESTIMATED TIME TO PEAK          (MINS) =     31.00

LINK A3p                   6.000

ESTIMATED VOLUME (CU METRES*10**3) =          0.9084
ESTIMATED PEAK FLOW           (CUMECS) =     0.40
ESTIMATED TIME TO PEAK          (MINS) =     34.00

LINK Dummy2                1.002

ESTIMATED VOLUME (CU METRES*10**3) =          2.486
ESTIMATED PEAK FLOW           (CUMECS) =     1.31
ESTIMATED TIME TO PEAK          (MINS) =     31.00


##################################################################################################
Old Bar

Results for period from  0: 0.0 15/ 2/2002
                     to  5: 0.0 15/ 2/2002
##################################################################################################

                              ROUTING INCREMENT (MINS) =          1.00
                              STORM DURATION (MINS)    =          30.
                              RETURN PERIOD (YRS)      =           2.
                              BX                       =      1.0000
                              TOTAL OF FIRST SUB-AREAS  (km2) =         12.94
                              TOTAL OF SECOND SUB-AREAS (km2) =          3.95
                              TOTAL OF ALL SUB-AREAS (km2)    =         16.89
```

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Catch. Area #2	Slope #1 (%)	Slope #2	% Impervious #1 (%)	% Impervious #2	Pern #1	Pern #2	B #1	B #2	Link No.
A2	1.110	1.110	6.000	6.000	0.000	100.0	.025	.015	.0112	.0006	1.000
A1	1.400	1.400	7.000	7.000	0.000	100.0	.025	.016	.0117	.0007	2.000
W1	0.6600	0.000	.0010	0.000	100.0	0.000	.010	0.00	.0301	0.000	1.001
A3	1.440	1.440	4.000	4.000	0.000	100.0	.025	.015	.0257	.0009	3.000
W2	0.4300	0.000	.0010	0.000	100.0	0.000	.010	0.00	.0241	0.000	3.001
A1p	2.793	0.000	7.000	0.000	0.000	0.000	.030	0.00	.0190	0.000	4.000
A2p	2.220	0.000	6.000	0.000	0.000	0.000	.030	0.00	.0182	0.000	5.000
A3p	2.890	0.000	4.000	0.000	0.000	0.000	.030	0.00	.0256	0.000	6.000
Dummy2	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0021	0.000	1.002

```
Link    Average   Init. Loss   Cont. Loss    Excess Rain    Peak    Time    Link
```

Label	Intensity (mm/h)	#1 (mm)	#2	#1 (mm/h)	#2	#1 (mm)	#2	Inflow (m^3/s)	to Peak	Lag mins
A2	29.700	10.00	1.500	2.500	0.000	31.383	43.050	0.5835	30.00	0.000
A1	29.700	10.00	1.500	2.500	0.000	31.383	43.050	0.7352	30.00	0.000
W1	29.700	1.500	0.000	0.000	0.000	43.050	0.000	1.376	30.00	0.000
A3	29.700	10.00	1.500	2.500	0.000	31.383	43.050	0.6949	30.00	0.000
W2	29.700	1.500	0.000	0.000	0.000	43.050	0.000	0.7369	30.00	0.000
A1p	29.700	10.00	0.000	2.500	0.000	31.383	0.000	0.5327	31.00	0.000
A2p	29.700	10.00	0.000	2.500	0.000	31.383	0.000	0.3962	31.00	0.000
A3p	29.700	10.00	0.000	2.500	0.000	31.383	0.000	0.4008	34.00	0.000
Dummy2	29.700	1.500	0.000	0.000	0.000	43.050	0.000	1.314	31.00	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak Inflow (m^3/s)	Time to Peak	Peak Outflow (m^3/s)	Total Inflow (m^3)	Basin Vol. Avail	Basin Vol. Used	Basin Stage Used
W1	30.00	1.376	30.00	0.000	2151.8	0.0000	2151.8	0.4611
W2	30.00	.7369	30.00	0.000	1256.6	0.0000	1256.6	0.4712

SUMMARY OF BASIN OUTLET RESULTS

Link Label	No. of	S/D Factor (m)	Dia (m)	Width (m)	Pipe Length (m)	Pipe Slope (%)
W1	1.0	1.000		0.000	0.5000	0.2000
W2	1.0	1.000		0.000	0.5000	0.2000

LINK A2 1.000

ESTIMATED VOLUME (CU METRES*10**3) = 1.092
ESTIMATED PEAK FLOW (CUMECS) = 0.76
ESTIMATED TIME TO PEAK (MINS) = 30.00

LINK A1 2.000

ESTIMATED VOLUME (CU METRES*10**3) = 1.378
ESTIMATED PEAK FLOW (CUMECS) = 0.97
ESTIMATED TIME TO PEAK (MINS) = 30.00

LINK W1 1.001

ESTIMATED VOLUME (CU METRES*10**3) = 2.833
ESTIMATED PEAK FLOW (CUMECS) = 1.82
ESTIMATED TIME TO PEAK (MINS) = 30.00

LINK A3 3.000

ESTIMATED VOLUME (CU METRES*10**3) = 1.419
ESTIMATED PEAK FLOW (CUMECS) = 0.94
ESTIMATED TIME TO PEAK (MINS) = 30.00

LINK W2 3.001

ESTIMATED VOLUME (CU METRES*10**3) = 1.656
ESTIMATED PEAK FLOW (CUMECS) = 1.00
ESTIMATED TIME TO PEAK (MINS) = 30.00

LINK A1p 4.000

ESTIMATED VOLUME (CU METRES*10**3) = 1.212
ESTIMATED PEAK FLOW (CUMECS) = 0.75
ESTIMATED TIME TO PEAK (MINS) = 31.00

LINK A2p 5.000

ESTIMATED VOLUME (CU METRES*10**3) = 0.9639
ESTIMATED PEAK FLOW (CUMECS) = 0.59
ESTIMATED TIME TO PEAK (MINS) = 31.00

LINK A3p 6.000

ESTIMATED VOLUME (CU METRES*10**3) = 1.251
ESTIMATED PEAK FLOW (CUMECS) = 0.62
ESTIMATED TIME TO PEAK (MINS) = 31.00

LINK Dummy2 1.002

ESTIMATED VOLUME (CU METRES*10**3) = 3.427
ESTIMATED PEAK FLOW (CUMECS) = 1.96
ESTIMATED TIME TO PEAK (MINS) = 31.00

##########
Old Bar

Results for period from 0: 0.0 15/ 2/2002
to 5: 0.0 15/ 2/2002
##########

ROUTING INCREMENT (MINS) = 1.00
STORM DURATION (MINS) = 90.
RETURN PERIOD (YRS) = 5.
BX = 1.0000
TOTAL OF FIRST SUB-AREAS (km2) = 12.94
TOTAL OF SECOND SUB-AREAS (km2) = 3.95
TOTAL OF ALL SUB-AREAS (km2) = 16.89

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Catch. Area #2 (ha)	Slope #1 (%)	Slope #2 (%)	% Impervious #1 (%)	% Impervious #2 (%)	Perm #1	Perm #2	B #1	B #2	Link No.
A2	1.110	1.110	6.000	6.000	0.000	100.0	.025	.015	.0112	.0006	1.000
A1	1.400	1.400	7.000	7.000	0.000	100.0	.025	.015	.0117	.0007	2.000
W1	0.6600	0.000	.0010	0.000	100.0	0.000	.010	0.00	.0301	0.000	1.001
A3	1.440	1.440	4.000	4.000	0.000	100.0	.025	.015	.0187	.0009	3.000
W2	0.4300	0.000	.0010	0.000	100.0	0.000	.010	0.00	.0241	0.000	3.001
A1p	2.793	0.000	7.000	0.000	0.000	0.000	.030	0.00	.0190	0.000	4.000
A2p	2.220	0.000	6.000	0.000	0.000	0.000	.030	0.00	.0182	0.000	5.000
A3p	2.890	0.000	4.000	0.000	0.000	0.000	.030	0.00	.0256	0.000	6.000
Dummy2	.00081	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0021	0.000	1.002

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Init. Loss #2 (mm)	Cont. Loss #1 (mm/h)	Cont. Loss #2 (mm/h)	Excess Rain #1 (mm)	Excess Rain #2 (mm)	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
A2	37.720	10.00	1.500	2.500	0.000	43.330	55.080	0.7563	30.00	0.000
A1	37.720	10.00	1.500	2.500	0.000	43.330	55.080	0.9699	30.00	0.000
W1	37.720	1.500	0.000	0.000	0.000	55.080	0.000	1.825	30.00	0.000
A3	37.720	10.00	1.500	2.500	0.000	43.330	55.080	0.9378	30.00	0.000
W2	37.720	1.500	0.000	0.000	0.000	55.080	0.000	0.9990	30.00	0.000
A1p	37.720	10.00	0.000	2.500	0.000	43.330	0.000	0.7454	31.00	0.000
A2p	37.720	10.00	0.000	2.500	0.000	43.330	0.000	0.5871	31.00	0.000
A3p	37.720	10.00	0.000	2.500	0.000	43.330	0.000	0.6234	31.00	0.000
Dummy2	37.720	1.500	0.000	0.000	0.000	55.080	0.000	1.956	31.00	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak Inflow (m^3/s)	Time to Peak	Peak Outflow (m^3/s)	Total Inflow (m^3)	Basin Vol. Avail	Basin Vol. Used	Basin Stage Used
W1	30.00	1.824	30.00	0.000	2933.0	0.0000	2933.0	0.6071
W2	30.00	.9990	30.00	0.000	1655.8	0.0000	1655.8	0.6209

SUMMARY OF BASIN OUTLET RESULTS

Link Label	No. of	S/D Factor (m)	Dia (m)	Width (m)	Pipe Length (m)	Pipe Slope (%)
W1	1.0	1.000		0.000	0.5000	0.2000
W2	1.0	1.000		0.000	0.5000	0.2000

LINK A2 1.000

ESTIMATED VOLUME (CU METRES*10**3) = 1.239
ESTIMATED PEAK FLOW (CUMECS) = 0.69
ESTIMATED TIME TO PEAK (MINS) = 15.00

LINK A1 2.000

ESTIMATED VOLUME (CU METRES*10**3) = 1.567
ESTIMATED PEAK FLOW (CUMECS) = 0.90

```
ESTIMATED TIME TO PEAK          (MINS) =     15.00

LINK W1                 1.001

ESTIMATED VOLUME (CU METRES*10**3) =          3.212
ESTIMATED PEAK FLOW          (CUMECS) =     1.63
ESTIMATED TIME TO PEAK          (MINS) =     15.00

LINK A3                 3.000

ESTIMATED VOLUME (CU METRES*10**3) =          1.611
ESTIMATED PEAK FLOW          (CUMECS) =     0.84
ESTIMATED TIME TO PEAK          (MINS) =     15.00

LINK W2                 3.001

ESTIMATED VOLUME (CU METRES*10**3) =          1.877
ESTIMATED PEAK FLOW          (CUMECS) =     0.87
ESTIMATED TIME TO PEAK          (MINS) =     15.00

LINK A1p                4.000

ESTIMATED VOLUME (CU METRES*10**3) =          1.294
ESTIMATED PEAK FLOW          (CUMECS) =     0.60
ESTIMATED TIME TO PEAK          (MINS) =     24.00

LINK A2p                5.000

ESTIMATED VOLUME (CU METRES*10**3) =          1.114
ESTIMATED PEAK FLOW          (CUMECS) =     0.48
ESTIMATED TIME TO PEAK          (MINS) =     24.00

LINK A3p                6.000

ESTIMATED VOLUME (CU METRES*10**3) =          1.451
ESTIMATED PEAK FLOW          (CUMECS) =     0.57
ESTIMATED TIME TO PEAK          (MINS) =     26.00

LINK Dummy2             1.002

ESTIMATED VOLUME (CU METRES*10**3) =          3.959
ESTIMATED PEAK FLOW          (CUMECS) =     1.66
ESTIMATED TIME TO PEAK          (MINS) =     25.00
```

Old Bar

Results for period from 0: 0.0 15/ 2/2002
                    to 5: 0.0 15/ 2/2002

```
ROUTING INCREMENT (MINS) =        1.00
STORM DURATION (MINS)    =       90.
RETURN PERIOD (YRS)      =       10.
BK                       =   1.0000
TOTAL OF FIRST SUB-AREAS  (km2) =      12.94
TOTAL OF SECOND SUB-AREAS (km2) =       3.95
TOTAL OF ALL SUB-AREAS (km2)    =      16.89
```

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Catch. Area #2 (ha)	Slope #1 (%)	Slope #2 (%)	% Impervious #1	% Impervious #2	Perm #1	Perm #2	B #1	B #2	Link No.
A2	1.110	1.110	6.000	6.000	0.000	100.0	.025	.015	.0112	.0006	1.000
A1	1.400	1.400	7.000	7.000	0.000	100.0	.025	.015	.0117	.0007	2.000
W1	0.6500	0.000	.0010	0.000	100.0	0.000	.010	0.00	.0301	0.000	1.001
A3	1.440	1.440	4.000	4.000	0.000	100.0	.025	.015	.0157	.0009	3.000
W2	0.4300	0.000	.0010	0.000	100.0	0.000	.010	0.00	.0241	0.000	3.001
A1p	2.793	0.000	7.000	0.000	0.000	0.000	.030	0.00	.0190	0.000	4.000
A2p	2.220	0.000	6.000	0.000	0.000	0.000	.030	0.00	.0182	0.000	5.000
A3p	2.890	0.000	4.000	0.000	0.000	0.000	.030	0.00	.0256	0.000	6.000
Dummy2	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0021	0.000	1.002

Link	Average	Init. Loss	Cont. Loss	Excess Rain	Peak	Time	Link

Label	Intensity (mm/h)	#1 (mm)	#2	#1 (mm/h)	#2	#1 (mm)	#2	Inflow (m^3/s)	to Peak	Lag mins
A2	42.200	10.00	1.500	2.500	0.000	49.925	61.800	0.6932	15.00	0.000
A1	42.200	10.00	1.500	2.500	0.000	49.925	61.800	0.8975	15.00	0.000
W1	42.200	1.500	0.000	0.000	0.000	61.800	0.000	1.634	15.00	0.000
A3	42.200	10.00	1.500	2.500	0.000	49.925	61.800	0.8382	15.00	0.000
W2	42.200	1.500	0.000	0.000	0.000	61.800	0.000	0.8724	15.00	0.000
A1p	42.200	10.00	0.000	2.500	0.000	49.925	0.000	0.6035	24.00	0.000
A2p	42.200	10.00	0.000	2.500	0.000	49.925	0.000	0.4847	24.00	0.000
A3p	42.200	10.00	0.000	2.500	0.000	49.925	0.000	0.5744	26.00	0.000
Dummy2	42.200	1.500	0.000	0.000	0.000	61.800	0.000	1.656	25.00	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak Inflow (m^3/s)	Time to Peak	Peak Outflow (m^3/s)	Total Inflow (m^3)	Basin Vol. Avail	Basin Vol. Used	Basin Stage Used
W1	15.00	1.633	15.00	0.000	3212.5	0.0000	3212.5	0.6884
W2	15.00	.8714	15.00	0.000	1877.4	0.0000	1877.4	0.7048

SUMMARY OF BASIN OUTLET RESULTS

Link Label	No. of	S/D Factor (m)	Dia (m)	Width (m)	Pipe Length (m)	Pipe Slope (%)
W1	1.0	1.000		0.000	0.5000	0.2000
W2	1.0	1.000		0.000	0.5000	0.2000

LINK A2 1.000

ESTIMATED VOLUME (CU METRES*10**3) = 1.440
ESTIMATED PEAK FLOW (CUMECS) = 0.84
ESTIMATED TIME TO PEAK (MINS) = 15.00

LINK A1 2.000

ESTIMATED VOLUME (CU METRES*10**3) = 1.815
ESTIMATED PEAK FLOW (CUMECS) = 1.08
ESTIMATED TIME TO PEAK (MINS) = 15.00

LINK W1 1.001

ESTIMATED VOLUME (CU METRES*10**3) = 3.722
ESTIMATED PEAK FLOW (CUMECS) = 2.97
ESTIMATED TIME TO PEAK (MINS) = 15.00

LINK A3 3.000

ESTIMATED VOLUME (CU METRES*10**3) = 1.870
ESTIMATED PEAK FLOW (CUMECS) = 0.99
ESTIMATED TIME TO PEAK (MINS) = 15.00

LINK W2 3.001

ESTIMATED VOLUME (CU METRES*10**3) = 2.174
ESTIMATED PEAK FLOW (CUMECS) = 1.03
ESTIMATED TIME TO PEAK (MINS) = 15.00

LINK A1p 4.000

ESTIMATED VOLUME (CU METRES*10**3) = 1.651
ESTIMATED PEAK FLOW (CUMECS) = 0.72
ESTIMATED TIME TO PEAK (MINS) = 22.00

LINK A2p 5.000

ESTIMATED VOLUME (CU METRES*10**3) = 1.308
ESTIMATED PEAK FLOW (CUMECS) = 0.56
ESTIMATED TIME TO PEAK (MINS) = 23.00

LINK A3p 6.000

ESTIMATED VOLUME (CU METRES*10**3) = 1.689
ESTIMATED PEAK FLOW (CUMECS) = 0.68
ESTIMATED TIME TO PEAK (MINS) = 26.00

LINK Dummy2 1.002

ESTIMATED VOLUME (CU METRES*10**3) = 5.006
ESTIMATED PEAK FLOW (CUMECS) = 1.93
ESTIMATED TIME TO PEAK (MINS) = 25.00

##
Old Bar

Results for period from 0: 0.0 15/ 2/2002
to 5: 0.0 15/ 2/2002
##

ROUTING INCREMENT (MINS) = 1.00
STORM DURATION (MINS) = 90.
RETURN PERIOD (YRS) = 20.
MX = 1.0000
TOTAL OF FIRST SUB-AREAS (km2) = 12.94
TOTAL OF SECOND SUB-AREAS (km2) = 3.95
TOTAL OF ALL SUB-AREAS (km2) = 16.89

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	#2	Slope #1 (%)	#2	% Impervious #1	#2	Perm #1	#2	B #1	#2	Link No.
A2	1.110	1.110	6.000	6.000	0.000	100.0	.025	.015	.0112	.0006	1.000
A1	1.400	1.400	7.000	7.000	0.000	100.0	.025	.015	.0117	.0007	2.000
W1	0.6600	0.000	.0010	0.000	100.0	0.000	.010	0.00	.0301	0.000	1.001
A3	1.440	1.440	4.000	4.000	0.000	100.0	.025	.015	.0157	.0009	3.000
W2	0.4300	0.000	.0010	0.000	100.0	0.000	.010	0.00	.0241	0.000	3.001
A1p	2.793	0.000	7.000	0.000	0.000	0.000	.030	0.00	.0190	0.000	4.000
A2p	2.220	0.000	6.000	0.000	0.000	0.000	.030	0.00	.0182	0.000	5.000
A3p	2.690	0.000	4.000	0.000	0.000	0.000	.030	0.00	.0256	0.000	6.000
Dummy2	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0021	0.000	1.002

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	#2	Cont. Loss #1 (mm/h)	#2	Excess Rain #1 (mm)	#2	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
A2	48.200	10.00	1.500	2.500	0.000	58.883	70.800	0.9425	15.00	0.000
A1	48.200	10.00	1.500	2.500	0.000	58.883	70.800	1.078	15.00	0.000
W1	48.200	1.500	0.000	0.000	0.000	70.800	0.000	1.973	15.00	0.000
A3	48.200	10.00	1.500	2.500	0.000	58.883	70.800	0.9943	15.00	0.000
W2	48.200	1.500	0.000	0.000	0.000	70.800	0.000	1.033	15.00	0.000
A1p	48.200	10.00	0.000	2.500	0.000	58.883	0.000	0.7241	22.00	0.000
A2p	48.200	10.00	0.000	2.500	0.000	58.883	0.000	0.5621	23.00	0.000
A3p	48.200	10.00	0.000	2.500	0.000	58.803	0.000	0.6773	26.00	0.000
Dummy2	48.200	1.500	0.000	0.000	0.000	70.800	0.000	1.932	25.00	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak Inflow (m^3/s)	Time to Peak	Peak Outflow (m^3/s)	Total Inflow (m^3)	Basin Vol. Avail	Basin Vol. Used	Basin Stage Used
W1	15.00	1.973	93.00	.1036	3722.3	0.0000	3574.8	0.7660
W2	15.00	1.033	95.00	.0565	2173.9	0.0000	2075.3	0.7762

SUMMARY OF BASIN OUTLET RESULTS

Link Label	No. of	S/D Factor (m)	Dia (m)	Width (m)	Pipe Length (m)	Pipe Slope (%)
W1	1.0	1.000		0.000	0.5000	0.2000
W2	1.0	1.000		0.000	0.5000	0.2000

LINK A2 1.000

ESTIMATED VOLUME (CU METRES*10**3) = 1.702
ESTIMATED PEAK FLOW (CUMECS) = 0.94
ESTIMATED TIME TO PEAK (MINS) = 15.00

LINK A1 2.000

ESTIMATED VOLUME (CU METRES*10**3) = 2.145
ESTIMATED PEAK FLOW (CUMECS) = 1.21

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ESTIMATED TIME TO PEAK          (MINS) =     15.00

LINK N1                 1.001

ESTIMATED VOLUME (CU METRES*10**3) =          4.392
ESTIMATED PEAK FLOW          (CUMECS) =     2.21
ESTIMATED TIME TO PEAK          (MINS) =    15.00

LINK A3                 3.000

ESTIMATED VOLUME (CU METRES*10**3) =          2.208
ESTIMATED PEAK FLOW          (CUMECS) =     1.09
ESTIMATED TIME TO PEAK          (MINS) =    15.00

LINK N2                 3.001

ESTIMATED VOLUME (CU METRES*10**3) =          2.563
ESTIMATED PEAK FLOW          (CUMECS) =     1.13
ESTIMATED TIME TO PEAK          (MINS) =    15.00

LINK A1p                4.000

ESTIMATED VOLUME (CU METRES*10**3) =          1.970
ESTIMATED PEAK FLOW          (CUMECS) =     0.82
ESTIMATED TIME TO PEAK          (MINS) =    20.00

LINK A2p                5.000

ESTIMATED VOLUME (CU METRES*10**3) =          1.569
ESTIMATED PEAK FLOW          (CUMECS) =     0.65
ESTIMATED TIME TO PEAK          (MINS) =    20.00

LINK A3p                6.000

ESTIMATED VOLUME (CU METRES*10**3) =          2.047
ESTIMATED PEAK FLOW          (CUMECS) =     0.79
ESTIMATED TIME TO PEAK          (MINS) =    25.00

LINK Dummy2             1.002

ESTIMATED VOLUME (CU METRES*10**3) =          7.003
ESTIMATED PEAK FLOW          (CUMECS) =     2.20
ESTIMATED TIME TO PEAK          (MINS) =    23.00
```

Old Bar

Results for period from 0: 0.0 15/ 2/2002
to 5: 0.0 15/ 2/2002

```
ROUTING INCREMENT (MINS) =        1.00
STORM DURATION (MINS)    =       90.
RETURN PERIOD (YRS)      =       50.
EX                       =   1.0000
TOTAL OF FIRST SUB-AREAS  (km2) =      12.94
TOTAL OF SECOND SUB-AREAS (km2) =       3.95
TOTAL OF ALL SUB-AREAS (km2)    =      16.89
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SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Catch. Area #2 (ha)	Slope #1 (%)	Slope #2 (%)	% Impervious #1 (%)	% Impervious #2 (%)	Perm #1	Perm #2	B #1	B #2	Link No.
A2	1.110	1.110	6.000	6.000	0.000	100.0	.025	.015	.0112	.0006	1.000
A1	1.400	1.400	7.000	7.000	0.000	100.0	.025	.015	.0117	.0007	2.000
N1	0.6600	0.000	.0010	0.000	100.0	0.000	.010	0.00	.0301	0.000	1.001
A3	1.440	1.440	4.000	4.000	0.000	100.0	.025	.015	.0157	.0009	3.000
N2	0.4300	0.000	.0010	0.000	100.0	0.000	.010	0.00	.0241	0.000	3.001
A1p	2.793	0.000	7.000	0.000	0.000	0.000	.030	0.00	.0190	0.000	4.000
A2p	2.220	0.000	6.000	0.000	0.000	0.000	.030	0.00	.0182	0.000	5.000
A3p	2.890	0.000	4.000	0.000	0.000	0.000	.030	0.00	.0256	0.000	6.000
Dummy2	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0021	0.000	1.002

Link	Average	Init. Loss	Cont. Loss	Excess Rain	Peak	Time	Link

Label	Intensity (mm/h)	#1	#2	#1	#2	#1	#2	Inflow (m^3/s)	to Peak	Lag mins
		(ms)		(mm/h)		(mm)				
A2	56.000	10.00	1.500	2.500	0.000	70.583	82.500	0.9380	15.00	0.000
A1	56.000	10.00	1.500	2.500	0.000	70.583	82.500	1.207	18.00	0.000
W1	56.000	1.500	0.000	0.000	0.000	82.500	0.000	2.208	15.00	0.000
A3	56.000	10.00	1.500	2.500	0.000	70.583	82.500	1.086	15.00	0.000
W2	56.000	1.500	0.000	0.000	0.000	82.500	0.000	1.131	15.00	0.000
A1p	56.000	10.00	0.000	2.500	0.000	70.583	0.000	0.8225	20.00	0.000
A2p	56.000	10.00	0.000	2.500	0.000	70.583	0.000	0.5474	20.00	0.000
A3p	56.000	10.00	0.000	2.500	0.000	70.583	0.000	0.7865	25.00	0.000
Dummy2	56.000	1.500	0.000	0.000	0.000	82.500	0.000	2.200	23.00	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak Inflow (m^3/s)	Time to Peak	Peak Outflow (m^3/s)	Total Inflow (m^3)	Basin Vol. Avail	Basin Vol. Used	Basin Stage Used
W1	15.00	2.207	72.00	.3837	4391.6	0.0000	3679.2	0.7894
W2	15.00	1.130	80.00	.1989	2563.1	0.0000	2174.3	0.8154

SUMMARY OF BASIN OUTLET RESULTS

Link Label	No. of	S/D Factor (m)	Dia (m)	Width (m)	Pipe Length (m)	Pipe Slope (%)
W1	1.0	1.000		0.000	0.5000	0.2000
W2	1.0	1.000		0.000	0.5000	0.2000

LINK A2 1.000

ESTIMATED VOLUME (CU METRES*10**3) = 1.898
ESTIMATED PEAK FLOW (CUMECS) = 1.22
ESTIMATED TIME TO PEAK (MINS) = 30.00

LINK A1 2.000

ESTIMATED VOLUME (CU METRES*10**3) = 2.394
ESTIMATED PEAK FLOW (CUMECS) = 1.53
ESTIMATED TIME TO PEAK (MINS) = 30.00

LINK W1 1.001

ESTIMATED VOLUME (CU METRES*10**3) = 4.894
ESTIMATED PEAK FLOW (CUMECS) = 2.92
ESTIMATED TIME TO PEAK (MINS) = 30.00

LINK A3 3.000

ESTIMATED VOLUME (CU METRES*10**3) = 2.461
ESTIMATED PEAK FLOW (CUMECS) = 1.52
ESTIMATED TIME TO PEAK (MINS) = 30.00

LINK W2 3.001

ESTIMATED VOLUME (CU METRES*10**3) = 2.854
ESTIMATED PEAK FLOW (CUMECS) = 1.65
ESTIMATED TIME TO PEAK (MINS) = 30.00

LINK A1p 4.000

ESTIMATED VOLUME (CU METRES*10**3) = 2.215
ESTIMATED PEAK FLOW (CUMECS) = 1.25
ESTIMATED TIME TO PEAK (MINS) = 31.00

LINK A2p 5.000

ESTIMATED VOLUME (CU METRES*10**3) = 1.770
ESTIMATED PEAK FLOW (CUMECS) = 0.99
ESTIMATED TIME TO PEAK (MINS) = 31.00

LINK A3p 6.000

ESTIMATED VOLUME (CU METRES*10**3) = 2.306
ESTIMATED PEAK FLOW (CUMECS) = 1.16
ESTIMATED TIME TO PEAK (MINS) = 31.00

LINK Dummy2 2.002

ESTIMATED VOLUME (CU METRES*10**3) = 8.498
ESTIMATED PEAK FLOW (CUMECS) = 3.39
ESTIMATED TIME TO PEAK (MINS) = 31.00

##########
Old Bar

Results for period from 0: 0.0 15/ 2/2002
to 5: 0.0 18/ 2/2002
##########

ROUTING INCREMENT (MINS) = 1.00
STORM DURATION (MINS) = 90.
RETURN PERIOD (YRS) = 100.
BX = 1.0000
TOTAL OF FIRST SUB-AREAS (km2) = 12.94
TOTAL OF SECOND SUB-AREAS (km2) = 3.95
TOTAL OF ALL SUB-AREAS (km2) = 16.89

SUMMARY OF CATCHMENT AND RAINFALL DATA

Link Label	Catch. Area #1 (ha)	Catch. Area #2 (ha)	Slope #1 (%)	Slope #2 (%)	% Impervious #1 (%)	% Impervious #2 (%)	Perm #1	Perm #2	B #1	B #2	Link No.
A2	1.110	1.110	6.000	6.000	0.000	100.0	.025	.015	.0112	.0006	1.000
A1	1.400	1.400	7.000	7.000	0.000	100.0	.025	.015	.0117	.0007	2.000
W1	0.6600	0.000	.0010	0.000	100.0	0.000	.010	0.00	.0301	0.000	1.001
A3	1.440	1.440	4.000	4.000	0.000	100.0	.025	.015	.0157	.0009	3.000
W2	0.4300	0.000	.0010	0.000	100.0	0.000	.010	0.00	.0241	0.000	3.001
A1p	2.793	0.000	7.000	0.000	0.000	0.000	.030	0.00	.0190	0.000	4.000
A2p	2.220	0.000	6.000	0.000	0.000	0.000	.030	0.00	.0182	0.000	5.000
A3p	2.880	0.000	4.000	0.000	0.000	0.000	.030	0.00	.0256	0.000	6.000
Dummy2	.00001	0.000	.0010	0.000	0.000	0.000	.025	0.00	.0021	0.000	1.002

Link Label	Average Intensity (mm/h)	Init. Loss #1 (mm)	Init. Loss #2 (mm)	Cont. Loss #1 (mm/h)	Cont. Loss #2 (mm/h)	Excess Rain #1 (mm)	Excess Rain #2 (mm)	Peak Inflow (m^3/s)	Time to Peak	Link Lag mins
A2	61.900	10.00	1.500	2.500	0.000	79.517	91.350	1.215	30.00	0.000
A1	61.900	10.00	1.500	2.500	0.000	79.517	91.350	1.533	30.00	0.000
W1	61.900	1.500	0.000	0.000	0.000	91.350	0.000	2.924	30.00	0.000
A3	61.900	10.00	1.500	2.500	0.000	79.517	91.350	1.517	30.00	0.000
W2	61.900	1.500	0.000	0.000	0.000	91.350	0.000	1.651	30.00	0.000
A1p	61.900	10.00	0.000	2.500	0.000	79.517	0.000	1.246	31.00	0.000
A2p	61.900	10.00	0.000	2.500	0.000	79.517	0.000	0.9862	31.00	0.000
A3p	61.900	10.00	0.000	2.500	0.000	79.517	0.000	1.156	31.00	0.000
Dummy2	61.900	1.500	0.000	0.000	0.000	91.350	0.000	3.388	31.00	0.000

SUMMARY OF BASIN RESULTS

Link Label	Time to Peak	Peak Inflow (m^3/s)	Time to Peak	Peak Outflow (m^3/s)	Total Inflow (m^3)	Basin Vol. Avail	Basin Vol. Used	Basin Stage Used
W1	30.00	2.923	61.00	.6088	4893.7	0.0000	3743.7	0.8022
W2	30.00	1.650	69.00	.2905	2954.0	0.0000	2224.4	0.8342

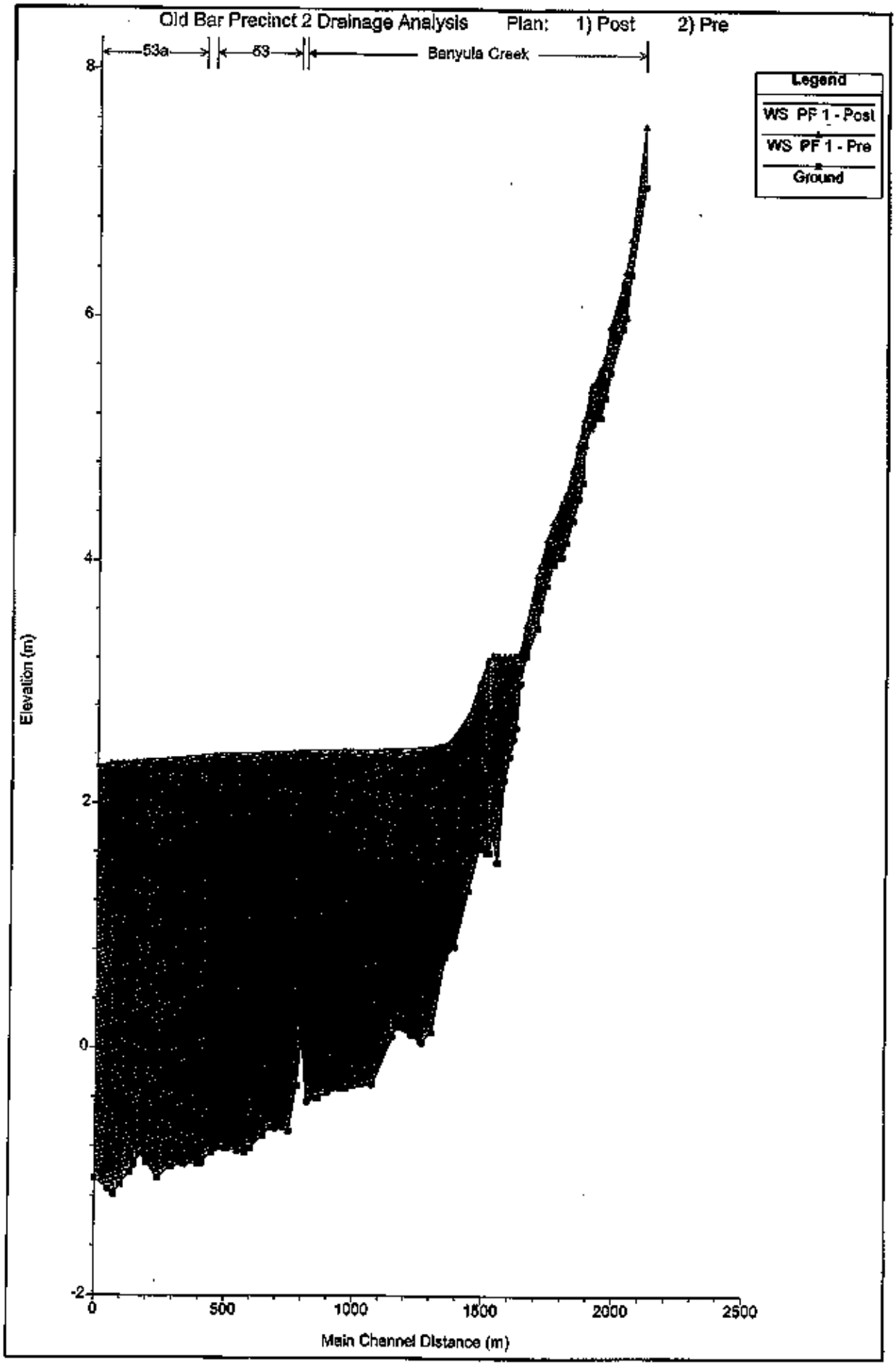
SUMMARY OF BASIN OUTLET RESULTS

Link Label	No. of	S/D Factor	Dia (m)	Width (m)	Pipe Length (m)	Pipe Slope (%)
W1	1.0	1.000		0.000	0.5000	0.2000
W2	1.0	1.000		0.000	0.5000	0.2000

Run completed at: 15th September 2003 15:46:37

Appendix B

HEC-RAS Output


Old Bar Precinct 2 Drainage Analysis
Plan: 1) Post 2) Pre
53a
53
Banyula Creek
Legend
WS PF 1 - Post
WS PF 1 - Pre
Ground
Elevation (m)
8
6
4
2
0
-2
0
500
1000
1500
2000
2500
Main Channel Distance (m)

Appendix E

Site contamination checklist

TABLE E1 POTENTIAL FOR SITE CONTAMINATION - CHECKLIST	
1. Please specify all land uses and activities to which the site has been put, including the current use.	The majority of the site has been previously used for low intensity cattle grazing, although no dip sites have been located on the site. The site is currently used for low intensity cattle grazing.
2. Are you, as proponent, aware of uses to which properties adjoining the site have been put? If so, please specify.	Adjoining properties to the east and south of the site are used for residential purposes. Property adjoining the western boundary has been and is currently used for low intensity cattle grazing. Property to the north of the site contains wetlands and forested areas.
3. Do any of the uses in the answers to questions 1 and 2 correlate with the potentially contaminating activities set out in Appendix 1 of DCP 45.	Yes. Agricultural activities are listed in Table 1 of DCP 45 Appendix 1 as a potentially contaminating activity.
4. If the answer to question 3 is yes has there been any testing or assessment of the site and, if so, what are the results?	A desktop assessment has been undertaken as part of this LES (Section 5.12). To the best of the authors' knowledge, no testing for contamination has been undertaken on the site.
5. Are you aware of any contamination on the site?	As no testing for contamination of the site has been undertaken, it is unknown whether contamination exists on the site. However, it is unlikely that there is any contamination of the site, given the results of the desktop examination (Section 5.12).
6. What remediation work, if any (carried out voluntarily or ordered by government agency) has been taken in respect to contamination, which is or may have been present on the site?	It is unlikely that any remediation works have been carried out on the site, given that no contamination of the site has been previously reported and that the site is unlikely to contain any contamination.