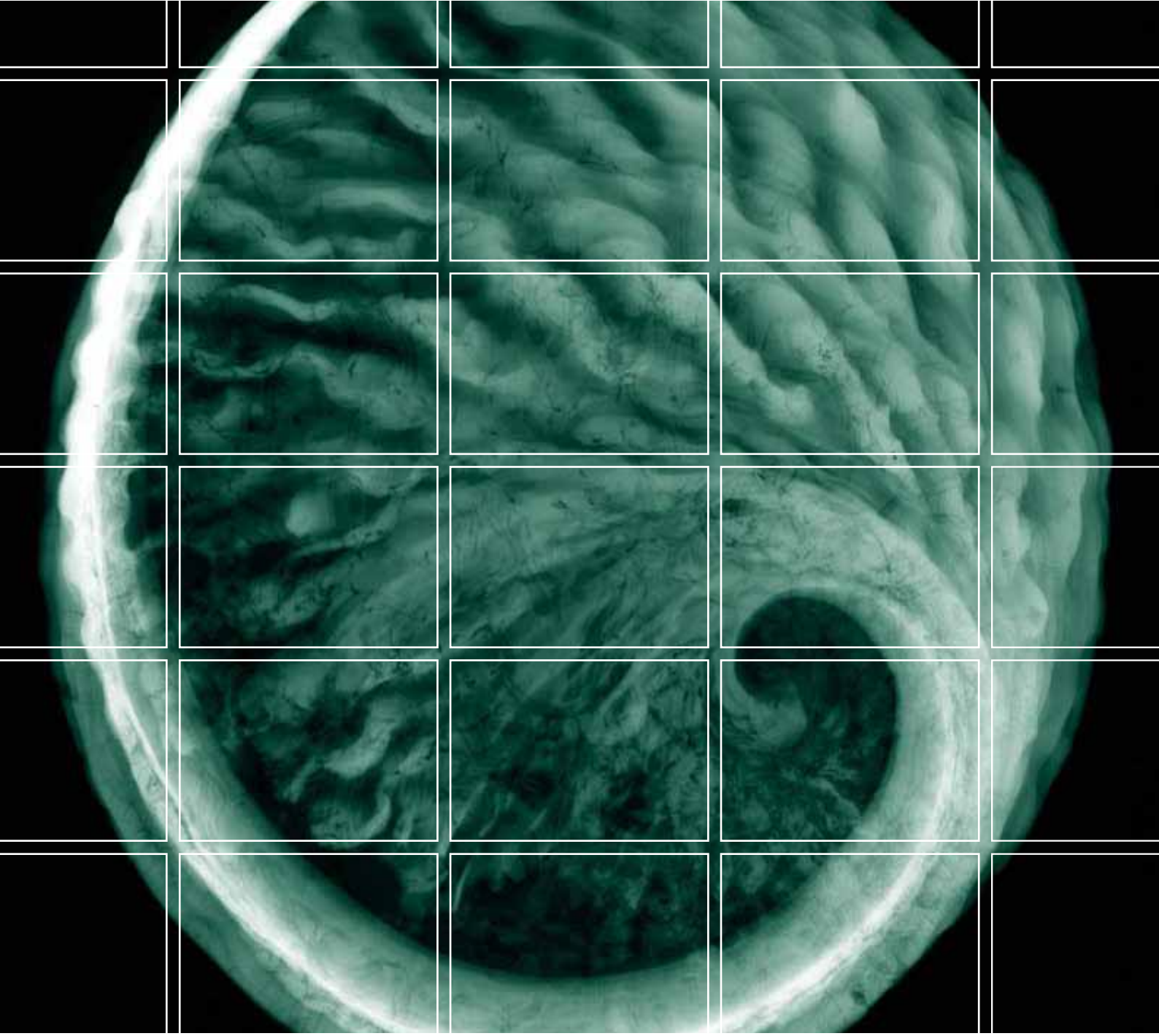

South West Rocks

Stormwater Management

MVPG

January 2007

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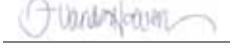
Approved by:	*Fiona van der Hoeven*
Position:	Project Director
Signed:	
Date:	*9 January, 2007*

Environmental Resources Management Australia Pty Ltd Quality System

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FINAL REPORT

MVPG

South West Rocks

Stormwater Management

January 2007

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1 INTRODUCTION

Environmental Resources Management Australia (ERM) has been commissioned by Macleay Valley Property Group Pty Ltd (MVPG) to prepare an environmental assessment for a proposed residential subdivision of Lot 2 in DP 581117, commonly known as 334 – 356 Gregory Street, South West Rocks (the study area). This assessment includes stormwater management, flooding and water cycle issues to address advice from the Director-General of the Department of Planning (DoP).

In correspondence dated 21 November 2005, DoP confirmed that it has determined that the proposed subdivision is a 'major project' to which Part 3A of the EP&A Act applies.

This report presents the assessment of stormwater management, flooding, water quality and related issues.

1.1 ASSESSMENT AIM AND OBJECTIVES

The main aim of this assessment is to ascertain whether there are any constraints to the proposed development relating to stormwater management, water sensitive urban design and water quality impacts on nearby SEPP14 wetlands and other downstream environs. To achieve these aims the following objectives were established:

- to assess expected flood levels and impacts of proposed works;
- to confirm suitability of proposed drainage system to convey stormwater to Spencers Creek;
- to establish water quality criteria and assess the ability of the drainage system to meet these criteria;
- to assess the suitability of proposed works in meeting Council's Water Cycle Management Plan and Water Sensitive Urban Design (WSUD) principles;
- to assess the overall impact of the proposed development on water resources; and
- to prepare recommendations on the management of stormwater.

1.2 STUDY AREA

The site comprises Lot 2 DP 581117, which is located on the north east intersection of Gregory Street and Arakoon Road, approximately 3 km south of the town centre of South West Rocks on the mid-north coast of New South Wales (refer to *Figure 1.1*). In addition to the site itself, assessment of stormwater impacts in this report extend to Spencers Creek – approximately 120 m from the southwestern corner of the site; and to a SEPP14 wetland in an adjacent catchment to the southeast of the site. Should any impacts on Spencers Creek be identified they could be conveyed to the Macleay River and the study area would be extended if required.

1.3 PROJECT BACKGROUND

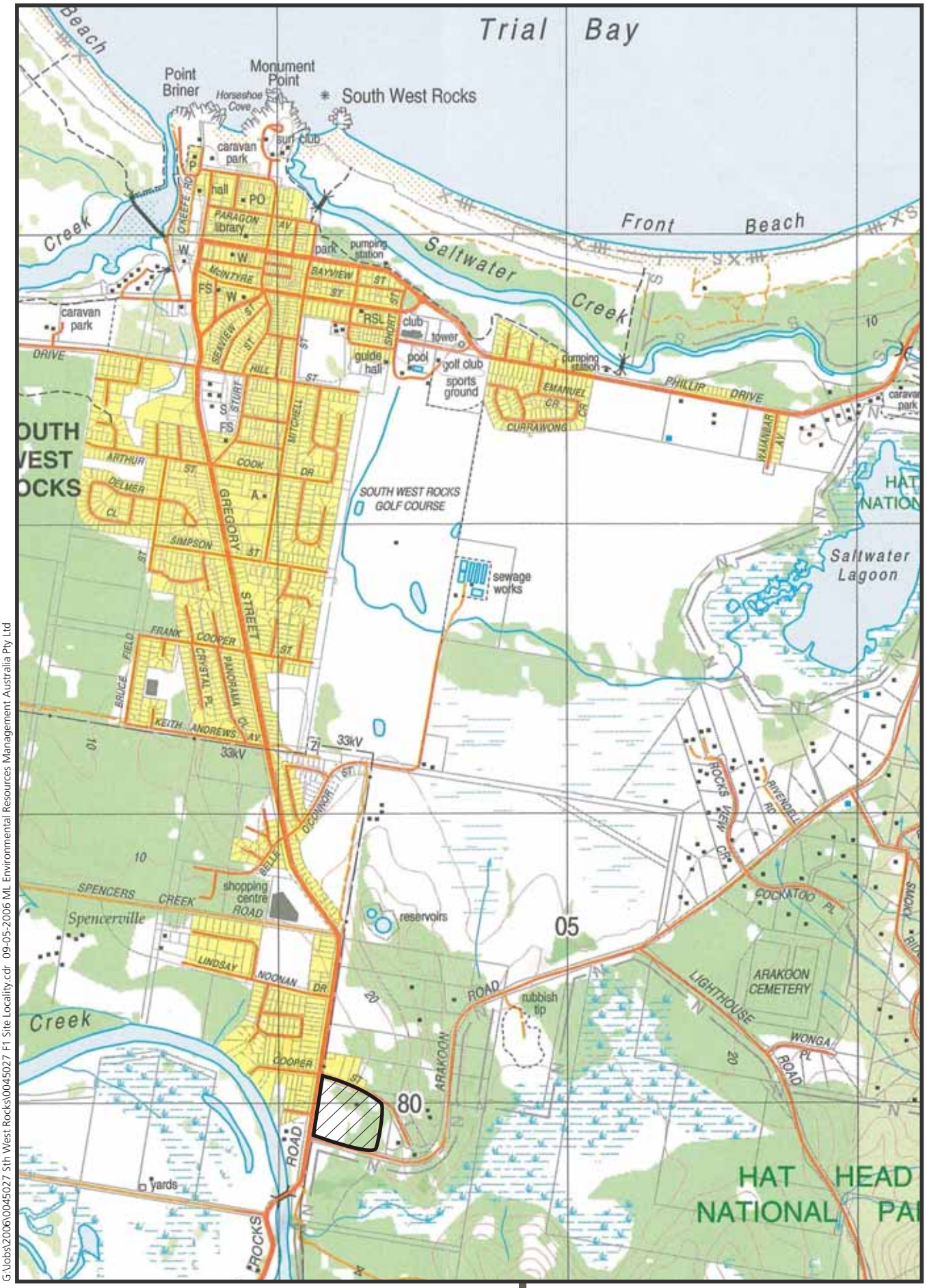
The project will include construction of a high quality residential development at the entrance to South West Rocks, along Gregory Street (*Figure 1.2*).

Project approval is sought for a staged subdivision of 46 lots including a lot for the sewage pump station (SPS) and a divided lot to accommodate the existing house. It will include three internal roads and new residential lots will range in size from approximately 500 m^2 to 1815 m^2.

The existing house will be accommodated on a lot with an area of approximately 8055 m^2, which includes 1171 m^2 on the north side of Cooper Street and 6344 m^2 on the south side of Cooper Street. The development does not include any physical works on the portion of the site on the north side of Cooper Street and it was therefore not assessed as part of this study.

The existing sewage pump station will be accommodated on a lot with an area of approximately 257 m^2. It is to be acquired by Kempsey Shire Council.

The existing electricity transmission easement will be included in a lot frontage to Arakoon Road, Gregory Street and Cooper Street.



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ERM

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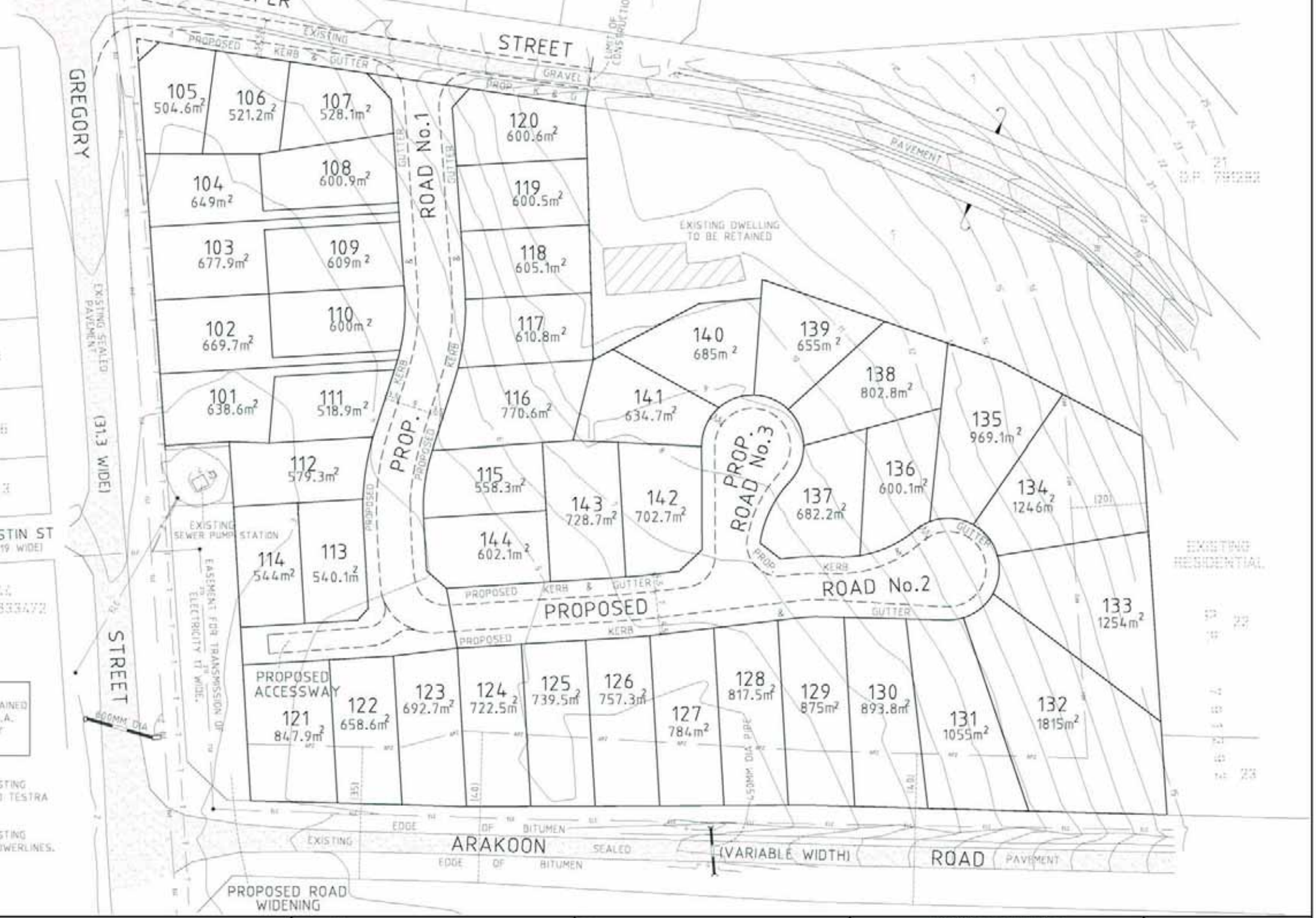
Figure 1.1 **Location of the study area**



ROSE ATKINS
consulting surveyors

PROPOSED SUBDIVISION
ARAKOON ROAD, GREGORY STREET
COOPER STREET, SOUTH WEST ROCKS

AMENDMENTS

2 EXISTING CONDITIONS

2.1 TOPOGRAPHY

The study area is located in mid-north coast New South Wales, specifically the Macleay Coast. There is a complex pattern of ridges and valleys in this area, and coastal beach, dune and lagoon barrier systems reach their maximum development at Myall Lakes (Morgan 2001). The site itself is moderately sloping, with a fall of 16 m over 270 m from the northeastern corner to the southwestern corner.

2.2 GEOLOGY

The Macleay Coast has extremely complex faulted terrain where the New England Fold belt over-thrusts the Sydney Basin. The main rocks present are Silurian and Devonian slates, quartzites and acid volcanics, Carboniferous mudstones and lithic sandstones, and less deformed Permian shales and sandstones, as well as Quaternary coastal sands (Morgan 2001). The site itself has a number of stone outcrops which appear to be quartz based conglomerate.

The soils on the Macleay Coast include red brown structured loams on basalt, deep siliceous sands and very well developed podsols in dunes (particularly the older high dunes), and organic sands in estuaries (Morgan 2001). The site itself is covered mainly by brown and grey sandy/silty soils.

2.3 DRAINAGE

Cooper Street and its shoulder drains intercept runoff from areas above the site to the north and northeast and convey flows to Gregory Street. Gregory Street and Arakoon Road form effective barriers to flow to or from the site to the west and south.

Runoff from the site itself and from a small area to the east flows overland to a depression near the corner of Gregory Street and Arakoon Road, from which it is conveyed via a 600 mm diameter pipe under Gregory Street to a short channel leading to Spencers Creek. Spencers Creek runs within 120 m of the study area, at which point it is a major creek approximately 50 m in width. The 100-year Average Recurrence Interval (ARI) flood in Spencers Creek is reported to reach RL 3.6 in the vicinity of the site, which will cause backwater flooding of the southwestern corner of the site.

Spencers Creek is effectively an anabranch of the Macleay River as well as draining the dune and wetland areas adjacent to Hat Head National Park to the south of the site. It rejoins the River about 4 km downstream, to the northwest of the site. The study area beyond the site is thus in an estuarine environment, in the tidal context of Spencers Creek. There is an unnamed first-order creek, a tributary of Spencers Creek, approximately 150 m south of the study area, and a wetland beginning at the eastern end of this tributary which extends further to the east and north east.

2.4 SURFACE CONDITIONS AND LAND USE

The site is lightly covered by scattered trees over a slashed understorey with open grassed areas (see *Photograph 2.1*). Some native shrubs exist around the bases of large trees, around the existing residence and scattered in the northeast of the site. Exotic weeds also exist in some areas (see *Photograph 2.2*). There are no fences surrounding most of the site and people, dogs and vehicles can move freely across it. Some bare patches exist where soil has the potential to be eroded but significant erosion is not evident.

Cooper Street, Gregory Street and Arakoon Road are sealed roads that serve the site and surrounding rural properties. The existing residential subdivision in the South West Rocks township is located on the western side of Gregory Street. Rural and residential properties are located to the north and north-east, and Hat Head National Park is located to the south of Arakoon Road There is no rural zoned land adjacent to the site.

Past land use on the site itself has been predominantly pastoral. The site currently comprises mostly cleared land, a house and a horse paddock.

2.5 IMPLICATIONS FOR STORMWATER DRAINAGE

The environmental context outlined above has a number of implications for stormwater drainage and water quality. Firstly, the soil types and vegetation cover will tend to reduce the coefficient of runoff and increase losses to infiltration and evapo-transpiration – this will require any increased discharge from the proposed development to be restricted to low predevelopment flow conditions. Secondly, the pastoral usages of the site and its potential for unauthorised rubbish dumping have potential to adversely affect runoff water quality – this means that while the proposed development may improve water quality for some pollutants, others such as oils and greases will need to be otherwise controlled. Thirdly, flood impacts will influence existing and proposed stormwater drainage as well as some finished ground levels in the southwestern corner of the site – this will require new works to have no adverse impacts on existing flood levels and behaviour.

Photograph 2.1 Site surface conditions – cleared areas

Photograph 2.2 Lantana near existing house on Lot 2

3 METHODOLOGY

A desktop assessment has been carried out for this report. Items assessed included topographic maps, available flood information, proposed development plans, preliminary drainage designs, relevant design guidelines and standards and Council policies.

4 IMPACTS ASSESSMENT

4.1 SITE RUNOFF

Subdivision works including the construction of roads and pavements and subsequent works including the construction of houses will result in an increase in impermeable surfaces on the site and a consequential increase in the peak stormwater flows from the site for all storm events. A piped drainage system is proposed, which will need to convey flows to meet design standards. A detention system may also be required to limit post-development flows to pre-development conditions.

The proposed roads will act as overland flow paths for flows that exceed the capacity of the piped drainage system. There will be a requirement to design gutters and road geometry to convey such flows in a safe manner. There will be a requirement for interallotment drainage to convey runoff from the lot containing the existing dwelling to proposed road No.3 and there may be a requirement for infiltration drainage at the rear of Lots 121 to 132 to prevent flows to Arakoon Road.

4.2 FLOODING

Filling in the flood prone south western corner will result in a loss of flood storage volume during a 100-year ARI flood in Spencers Creek of approximately 400 m^3. This is expected to have negligible impacts on flood levels in Spencers Creek – estimated to be in the order of 8 mm near the site reducing to 0 mm within 500 m upstream of the site. Any detention basin or pollution control elements proposed will need to be protected from inundation or be located above the 100-year ARI flood level. Proposed building floor levels should also be at least 300 mm above the 100-year ARI flood level.

4.3 WATER QUALITY

The quality of stormwater runoff will improve insofar as animal waste and uncontrolled rubbish will no longer contribute to pollutants being washed from the site. However, runoff from new roads can be expected to contain additional oils and greases and runoff from lawns and landscape areas may contain other contaminants such as fertiliser, sediment and other materials.

During the construction phase, exposed earthworks and stockpiles have the potential to cause sediment laden runoff if erosion and sediment control measures are not properly implemented.

There may be some potential for gross pollutants/litter to enter the stormwater system from the completed development but this is unlikely to occur in a high quality residential development.

4.4 RECEIVING WATERS

Given the distance (approximately 200 m) and the level difference (approximately +1 m) between the discharge point from the site to Spencers Creek and the SEPP14 wetland to the south and southeast of the site, it is not possible for any pollutant leaving the site to impact on this wetland. However, it is unacceptable for any discharge from the site to exceed acceptable quality standards (refer ANZECC, 2000 Guidelines for Fresh and Marine Water Quality in Annex A).

4.5 WATER SUPPLY

The increase in population will result in increased demand from existing potable water supplies. Similarly, there will be an increase in demand for water that may not need to be of potable water quality (e.g. toilet flushing, washing, irrigation).

Rainwater tanks are proposed for each dwelling so that impacts on total water demand will be reduced and site discharge may also be reduced depending on the proportion of tank storage volume that is available for detention. Rainwater tanks will not eliminate the overall increase in water demand and the overall increase in stormwater runoff due to the development of the site.

4.6 WASTE WATER

Sewage will be disposed of to the existing trunk sewerage system via a conventional gravity system to the existing SPS near the south western corner of the site. The development will result in increased load on the existing sewerage system.

No separate grey water collection system is proposed.

5 PROPOSED WORKS AND MITIGATION MEASURES

5.1 STORMWATER DRAINAGE SYSTEM

Conventional piped drainage systems and road geometry is proposed in accordance with Council's design requirements. Roads will be kerbed and guttered and will provide a suitably graded overland flow path to the proposed detention basin and sediment pond in the electricity easement in the southwestern corner of the site. All site drainage will flow to this basin with the possible exception of some infiltration devices at the rear of properties backing onto Arakoon Road. The detention basin will be sized to ensure post-development peak flows do not exceed pre-development flows.

Pipes will be sized to convey the 10-year ARI runoff without surcharge and roads and other overland flow paths will be designed to convey the 100-year ARI runoff safely (i.e. minimum freeboard of 300 mm to habitable areas and velocity.depth factor <0.4). No adverse cumulative stormwater drainage or water quality impacts are anticipated as a result of the proposed development. There may be a very small improvement in the quality of flows to receiving waters.

5.2 FLOOD MITIGATION

Filling within flood prone areas will be limited to ensuring that habitable areas have at least 300 mm freeboard above flood level and there will be safe access during floods. Because impacts on flood levels in Spencers Creek are negligible, no flood mitigation measures are proposed.

5.3 WATER SENSITIVE URBAN DESIGN

To address WSUD principles, the development should seek to reduce urban impacts using a variety of strategies. These strategies usually include reduced demand for potable water, reduced runoff rate, reduced runoff volumes and reduced contaminant loads to assist in the collection and management of stormwater runoff in an efficient, cost effective and environmentally friendly way. The goal of WSUD is to reduce the quantity, while improving the quality of stormwater runoff to our waterways, thus improving environmental outcomes for surrounding rivers and streams.

WSUD technologies can include:

- Rainwater Tanks
- Streets with swales instead of concrete guttering
- Vegetation buffers or filters within swales
- Water saving fittings in dwellings
- Sediment and retention basins
- Wetlands and ponds.

For the proposed development, rainwater tanks will be installed on each dwelling, water efficient fittings will be prescribed in dwellings and a sediment/detention basin with infiltration capability will be constructed. In addition a gross pollutant trap with capacity to trap oils and greases will be installed at the entry to the basin.

There is insufficient space to accommodate bio-swales, wetlands and ponds within the development; however, the proposed system is expected to meet water quality requirements for discharges from the site.

Water quality monitoring should be undertaken to confirm the performance of the drainage system and to detect any adverse impacts on receiving waters. If discharges do not meet quality guidelines an additional filter type pollution control device may need to be installed.

5.4 INTEGRATED WATER CYCLE MANAGEMENT

A separate non-potable water supply pipe network will be installed to reduce demand on potable water when it is connected to Macleay Water's proposed dual reticulation system. The rainwater tanks and water saving fittings mentioned above will also reduce demand on potable water.

It is not economically viable to develop a grey water treatment and recycling system for the site.

Disposal of sewage and other wastewater will be through connection to the existing sewage collection and treatment system. It is expected that the existing sewage collection and treatment system will have sufficient capacity to accommodate the additional load.

5.5 EROSION AND SEDIMENT CONTROL

Stormwater controls will be implemented to prevent pollutant discharges during construction of the development. The controls will be detailed in an Erosion and Sediment Control and Stormwater Management Plan to be prepared by the contractor(s) as part of an on-site Environmental Management Plan prior to the commencement of site works. The Plan will be prepared in accordance with *Managing Urban Stormwater – Soils and Construction* (Landcom, 2004).

6 RELEVANT LEGISLATION

6.1 ACTS

Environmental Planning and Assessment Act 1979 (NSW)

The *Environmental Planning and Assessment Act 1979* (EP&A Act) requires that environmental impacts are considered in land-use planning, including impacts on waterways. Various planning instruments prepared under the Act identify permissible land use and development constraints.

National Environmental Protection Council Act 1994 (Commonwealth)

This Act provides for the establishment of the National Environment Protection Council (NEPC) as a statutory body with law making powers. The corresponding legislation in New South Wales is the *National Environment Protection Council (NSW) Act 1995.* The NEPC Act provides NEPC with the statutory powers to make National Environment Protection Measures (NEPMs). The Department of Environment and Conservation (NSW) is one agency that administers the implementation of national environment protection measures in New South Wales. NEPMs are broad framework-setting statutory instruments made by NEPC. They may be a combination of:

- *goals* - desired essential outcomes to guide management strategies;
- *guidelines* on means of meeting desired outcomes;
- *standards* - quantifiable characteristics against which environmental quality is assessed; and
- *protocols* - processes for measuring environmental characteristics to determine whether desired outcomes are being achieved.

Groundwater contamination is not likely to be present and is not expected to be adversely affected by the development. Should groundwater testing be required, analytical results will be compared to the NEPM guidelines in order to assess potential contamination impacts.

Water Management Act (NSW) 2000

The Act is based on the concept of ecologically sustainable development – development today that will not threaten the ability of future generations to meet their needs. The Act recognises that:

- the fundamental health of our rivers and groundwater systems and associated wetlands, floodplains, estuaries has to be protected;
- the management of water must be integrated with other natural resources such as vegetation, soils and land;

- to be properly effective, water management must be a shared responsibility between the government and the community;

- water management decisions will involve consideration of environmental, social, economic, cultural and heritage aspects; and

- social and economic benefits to the State will result from the sustainable and efficient use of water.

The potential for release of contaminants to surface water and groundwater systems is low. The proposed stormwater management systems will satisfactorily manage the potential migration of contaminants to prevent impact to off-site water resources.

Protection of the Environment Operations Act (1997) & Clean Waters Regulation (1972)

The Act regulates pollution in New South Wales, and categorises certain activities and work that require licenses. This Act also creates a scheme for the making of policy instruments, which set environmental standards, goals, guidelines and protocols. Under this Act, and of relevance to water quality protection:

- A person must not willfully or negligently cause any substance to leak, spill or otherwise escape in a manner that harms or is likely to harm the environment.

- A person who pollutes any waters is guilty of an offence, unless the pollution was authorised by an environment protection license.

- A person who is a polluter or occupier must notify the EPA of any pollution event that causes or threatens "material harm" to the environment as soon as practicable.

This Act will be particularly relevant to the construction phase of the development.

The *Clean Waters Regulation (1972),* which falls under the *Protection of the Environment Operations Act 1997*:

- classifies waters and prescribe certain standards in relation to each class of waters; and

- prescribes the testing procedures to be used to determine the concentration of any matter in waters or in wastes for the purposes of these Regulations.

Discharge to classified waters cannot exceed the concentration limits outlined in the Clean Waters Regulation 1972.

6.2 GUIDELINES

National Water Quality Management Strategy Australian And New Zealand Guidelines For Fresh And Marine Water Quality (ANZECC Guidelines) – October 2000

The ANZECC Guidelines have been prepared as part of Australia's national water quality management strategy to provide an authoritative guide for setting water quality objectives required to sustain current or likely future, environmental values for natural and semi-natural water resources in Australia and New Zealand. The guidelines provide recommendations for different ecosystem types and for different levels of protection in the absence of specific regional guidelines. These are the guidelines that would form the principle basis for the assessment of on-site and off-site status of surface waters.

The guideline criteria for the assessment of surface water data include the default trigger levels for toxicants for freshwater aquatic ecosystems.

7 *RECOMMENDATIONS*

The following recommendations are made in light of the stormwater management components of the proposed development and the relevant legislation in NSW, taking into account the Part 3A nature of the proposed development.

The works should be designed in accordance with Council's LEP and relevant design standards. The proposed dual water supply system is the most effective option for meeting WSUD objectives. Augmentation of this system with rainwater tanks will minimise demand on potable water supplies.

Integration of the detention basin/settling pond with infiltration capacity and with gross pollutant and oil/grease traps is expected to meet requirements for stormwater discharge for both quantity and quality. Initial monitoring of discharge quality is recommended to confirm the performance of the system.

The construction contractor(s) must provide a soil and water management plan prior to commencement of works and must comply with relevant legislation, including obtaining licences if required.

REFERENCES

Morgan, G. (2001) **Delineation and description of the eastern environmental subregions (provinces) in New South Wales study.** NSW NPWS: Hurstville.

Annex A

Water Quality Guidelines

Table A.1 Water Quality Guidelines

	ANZECC Guidelines [1]		DEC Objectives[2]	
Aquatic Ecosystems				
pH	6.5 – 8.0		6.5 – 9.0	
Turbidity (NTU)	2-25		< 10% change	
DO (% saturation)	90-110		80-90	
Temp (^{0}C)	NG		< 2 ^{0}C increase	
EC (µS/cm)	NG		280 - 800	
Total nitrogen (mg/L)	0.25		0.10 – 0.75	
Total phosphorus (mg/L)	0.02		0.01 – 0.10	
Phosphates (mg/L)	0.015		NG	
Chemical contaminants	Note [3]		Use ANZECC Guidelines	
Visual Amenity				
Visual clarity	< 20% reduction		< 20% reduction	
Surface films/debris	Non visible / no odour		None visible / no odour	
Nuisance organisms	Not in excessive amounts		Not in unsightly amounts	
Recreation	***Primary Contact***	***Secondary Contact***	***Primary Contact***	***Secondary Contact***
Turbidity	< 6 NTU		< 6 NTU	NG
Algae (cells/mL)	< 20,000		< 15,000	
Faecal coliforms (CFU/100mL)	< 150 [4]	< 1000 [5]	< 150 [4]	< 1000 [5]
Enterococci (per 100mL)			Median over bathing season < 35 [6]	Median < 230 [7]
Protozoans			No Pathogenic free-living protozoans	NG
pH	5.0 – 9.0		5.0 – 9.0	NG
Temperature (°C)	15 -35		15 – 35	NG
Chemical contaminants	Note [8]		Use guidelines for raw drinking water	

1. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000) – Ecosystem protection guidelines for upland rivers in South-Eastern Australia*
2. *DEC (EPA) Water quality and River Flow Interim Environmental Objectives (1999)*
3. *See ANZECC (2000) Guidelines - Table 3.4.1*
4. *4 out of 5 samples < 600/100mL*
5. *4 out of 5 samples < 4000/100mL*
6. *maximum number in any one sample: 60-100 organisms/100mL*
7. *maximum number in any one sample: 450-700 organisms/100mL*
8. *See ANZECC (2000) Guidelines - Table 5.2.3*
9. *< 10% samples to be > 43 MPN/100mL*
10. *NG – no guideline*

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