

**VINCENTIA COASTAL VILLAGE &  
DISTRICT CENTRE**

**WATER SENSITIVE URBAN  
DESIGN STUDY  
FINAL REPORT**

**FOR  
STOCKLAND DEVELOPMENTS PTY LTD**



**JANUARY 2006**

Forbes Rigby Pty Ltd Ref: 104016-3 Report 002 Rev 4



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## EXECUTIVE SUMMARY

This report outlines proposed WSUD (Water Sensitive Urban Design) measures for the Vincentia Coastal Village and District Centre and includes description of flooding and water quality issues.

The report was issued in draft form to the government authorities (in June 2004 and September 2004). Comments on the draft report were subsequently received from the authorities. Responses to these comments have been incorporated into this Final Report.

This report has also been updated to reflect changes to the development footprint in the western part of the site adjoining the Jervis Bay National Park to meet DEC requirements, and the application is being re-submitted to the state government under the Major Projects SEPP (Part 3A of the Environmental Planning & Assessment Act).

### **Flooding**

1% AEP flood inundation extents are generally contained within the proposed riparian corridors which have been defined on the basis of ecological constraints.

Backwater modelling indicates that an increase in Manning's *n* from 0.1 (for existing forested conditions) to 0.2 (representing an upper limit of possible vegetation density) has minimal impact on the inundation limits.

The 1% AEP flood inundation limits are therefore a secondary constraint to the ecological requirements, which often necessitate larger areas to be preserved (in the form of riparian corridors and heathland) than are inundated by flooding.

### **Water Quality Objectives**

The principal water quality objective often applied to recent urban release areas has been *"the maintenance of water quality within receiving water bodies at pre-development levels"*. This is also the approach advocated by Appendix H1 of the EPA's *Managing Urban Stormwater – Council Handbook (Draft, 1997)*.

This is in accord with the Jervis Bay Settlement Strategy (DIPNR, 2003) objectives and is considered an appropriate water quality objective for the Vincentia Coastal Village and District Centre.

Given that almost the whole site is forested or heathland and only small portions of the headwaters of each of the 3 subcatchments covering the site are subject to a rural land

use, meeting an objective of *no net increase in pollutant loadings* will be a demanding requirement. A configuration of WSUD measures is proposed to meet this requirement.

### **Water Quality Monitoring**

Surface water quality monitoring has been conducted as part of this study in response to agency requests for more extensive predevelopment baseline data, particularly in regard to nutrients (ie, various forms of nitrogen and phosphorus).

Four surface water quality sampling campaigns were carried out between October 2004 and January 2005, each involving collection of samples at 5 locations within or near Stockland's site. The water quality results are analogous to mildly polluted stormwater runoff when compared to published data for mixed rural and urban catchments.

Stormwater quality from areas upstream of Naval College Road is relatively poor. This suggests that treatment measures should target (where possible) stormwater running on the site from above Naval College Road.

More recently (in September 2005), Stockland instructed Forbes Rigby to conduct further surface water quality monitoring, as a continuation of the baseline monitoring program. This includes sampling at the 5 previous locations, and additionally involves testing for faecal coliforms as well as nutrient parameters, suspended solids and grease & oils. The scope of monitoring work has also been expanded to include additional water quality monitoring points within the Moona Moona Creek wetlands.

To date, one further campaign has been carried out to this extended scope (in late November 2005), indicating similar water quality observed in previous campaigns. One trend observed however with the most recent data is that 'natural' treatment of Nitrogen and Phosphorus appears to be occurring within the Eastern Moona Moona Creek wetland, with higher concentrations recorded in the sites near the Collingwood Beach development, and significantly lower concentrations at the downstream site in this wetland (at the access road to the sewage treatment plant).

In addition to the monitoring of surface water runoff quality (pre- and post-construction) within the Coastal Village and District Centre, it is recommended that more extensive biophysical monitoring also be conducted in the Moona Moona Creek wetlands. An appropriate program needs to be developed in conjunction with the project ecological consultants and the relevant authorities, together with a management response framework.

### **Proposed WSUD Measures**

WSUD measures considered most appropriate to the Vincentia Coastal Village & District Centre are in the areas of water supply management, stormwater quality control and groundwater management.

For water supply management, the following measures are proposed (with further detail provided in the Cundall Johnston & Partners ESD Opportunities report):

- Demand management (including use of AAA-rated fittings and native landscaping/gardens to reduce garden watering usage); and
- Rainwater tanks for each house to collect roof runoff (to be used for garden watering and toilet flushing). Proposed tank sizes are between 3 and 5 kL depending on lot size and roof area.

For stormwater quality management a combination of proprietary litter/sediment traps, bio-retention swales and water quality control ponds/ artificial wetlands is proposed, located in ways sympathetic to the other environmental constraints of the site.

The opportunity presented by APZ's and advice from the then-named DIPNR (now DNR) that ponds could be placed in the riparian buffer zones was recognised as a key driver in siting the ponds/wetlands.

Bio-swales are proposed along the riparian corridor buffer strips to filter out pollutants from urban stormwater runoff. Bioswales comprise an open swale with a trench filled with a filter media in its base. The swale also incorporates native vegetation where possible to assist with the take up of nutrients. Bioswales also reduce the potential for migration of weed propagules into the riparian zone in addition to improving water quality.

The proposed wetland system consists of a combination of permanent and intermittently inundated ponds and wetlands, mostly positioned so that they lie within the APZs.

The shape of the wetlands and interlinking bio-swales will be varied to retain mature trees where possible. Aesthetic considerations have also influenced the preferred wetland location. The wetlands have been placed to maximise viewing from the development site, and shaped to create visual interest for residents.

Preliminary concept designs have been developed for the stormwater quality treatment system. The proposed stormwater quality control measures for the Village Central and Village West are presented in **Figure 7**. The water quality software package MUSIC was used to optimise the configuration of the proposed stormwater quality treatment measures and to ensure water quality objectives are met. The modelling shows that average pollutant concentrations in post-development conditions match the water quality expected from a natural forest

In regard to the District Centre, discussions were held with the then named DIPNR (now DNR) and Council in the evolution of an alternative development theme that better accommodated the environmental sensitivity of the site, arising from an increased knowledge of ecological issues from ERM's studies. The former DIPNR agreed in principle to an alternative location for the District Centre, in the south-western corner of the commercial precinct. This however was subject to finer detail on footprints of the District Centre and proposed treatment pond, bearing in mind that the pond's principal function was water quality and quantity control.

DEC suggested in correspondence dated 15 November 2004 that 'run-on water' from the catchment upstream of the District Centre be diverted around (or under) the Centre to separate clean and dirty water. This is generally a good design principle, however in this particular instance there is no water quality benefit in diverting run-on water from the upstream catchment around the commercial area given its poor quality. It is preferable to direct it into the treatment chain rather than bypassing the District Centre treatment ponds.

The WSUD measures for the District Centre and Village East are presented in **Figures 9 and 10**.

For groundwater management, the following measures are proposed:

- General use of bioswales and unlined intermittent wetlands.
- Provision of a bioswale within the reserve of the (slightly relocated) Moona Creek Road, to help increase soil moisture levels

and groundwater recharge on the north-western side of the leek orchid area.

- Leaving the lower part of the proposed District Centre pond system unlined, again to assist maintenance of soil moisture levels and groundwater recharge upstream of the leek orchid area.
- Ensuring that flows from the piped creek underneath the District Centre are not concentrated, but are spread out as sheet flow as occurs under natural conditions.
- Again, to assist in maintaining soil moisture levels and groundwater recharge on the south-eastern side of the heathlands/leek orchid area, the provision of a bio-swale within the reserve of the Village East perimeter road.

The bioswales also serve to filter out pollutants in urban stormwater and hence further protect the heathlands.

#### **Other Issues**

Statutory approval aspects in relation to artificial water bodies and justification for change to 9(a) Zoning are discussed in Section 7.4.

Operational issues including staging, soil and water management during construction, maintenance and post-construction monitoring are discussed in **Section 8** of the report.

Other water-related issues are discussed in **Section 9**. These include:

- ⇒ Possible changes to the hydrologic regime applying to the Moona Moona Creek Wetlands - It was found that increases in peak discharges would result in negligible increases in flood levels. Increases in annual runoff volumes post-development were also found to be relatively small, compared to the natural year to year variability of inflows. Some of the proposed WSUD measures serve to reduce the volume of runoff that would otherwise occur post-development, including:
  - § The use of rainwater tanks on residential lots to provide water for toilet flushing/garden watering use
  - § Re-use of water from large roof areas in the commercial area to provide top-up water from ornamental ponds and for toilet flushing
  - § Use of buffer swales and small wetlands with pervious substrates
  - § Provision of large ornamental ponds that will result in evaporative losses.

Modelled increases in annual flow volumes from the proposed District Centre & Coastal Village were found as being only one-half of the increase in flows already experienced as a result of the Collingwood Beach development. Biological monitoring indicates the eastern Moona Moona Creek wetland is a robust system that has been resilient in the face of increased flow and other impacts over time, including the Collingwood Beach development. The ecosystem is relatively intact with generally weed-free wetlands despite immediately adjoining development with no water quality controls. Given this observed resilience to flow variations, the relatively small increased flows from the proposed development are considered unlikely to have an adverse environmental outcome.

- ⇒ Creek crossings – the development has been planned to minimise creek crossings. Refer to **Figures 12 and 13** for locations and conceptual crossing arrangements.
- ⇒ Longevity of open water in the larger ponds during dry periods (given that these ponds also serve an ornamental function) - water balance modelling indicated that the large ponds on the Central Creek and the ornamental component of the District Centre pond remain substantially full for the average year, but may dry out for a month or two in the driest year in ten.



## **1. INTRODUCTION**

### **1.1. BACKGROUND**

The proposed Vincentia Coastal Village and District Centre is sited a short distance to the west on the existing township of Vincentia at the intersection of Naval College Road and The Wool Road.

Forbes Rigby (FR) has been commissioned to undertake studies of hydrology, flooding and 'water sensitive urban design' (WSUD) for the proposed development.

This (WSUD Study) report was issued in draft form to the government authorities (in June 2004 and September 2004). Comments on the draft report were subsequently received from the authorities. Responses to these comments have been incorporated into this Final Report.

This report has also been updated to reflect changes to the development footprint in the western part of the site adjoining the Jervis Bay National Park to meet DEC requirements, and the application is being re-submitted to the state government under the Major Projects SEPP (Part 3A of the Environmental Planning & Assessment Act).

### **1.2. PROJECT SETTING**

The development site comprises some 126.6 ha and is located immediately upstream of the National Park to the north of the site. It is bounded by Naval College Road (also known as Jervis Bay Road) to the south, the Wool Road and Basin and Bay Leisure Centre to the east, and National Park to the west (see **Figure 1**). The legal description of the site is Lots 801 and 802 in DP 1022286 and Lots 72 – 75 in DP 874040 (and all public roads within these lots).

There are three broad valleys draining the site separated by two ridges, running in a north-easterly direction. These valleys drain to the Moona Moona Creek wetlands downstream of the site. Creek morphology is generally not well defined except in the lower reaches, as the streams are ephemeral, valley slopes relatively gentle and the catchments limited in size.

Threatened species have been identified on the site of the Vincentia Coastal Village and District Centre, and include the Eastern Bristle Bird, Glossy Black Cockatoo, Giant Dragonfly and the Jervis Bay Leek Orchid.

### **1.3. PROPOSED DEVELOPMENT**

Stockland is seeking project approval for a residential subdivision and concept approval for a district town centre in the south east corner of the site and an adaptable housing area adjacent to the existing Bay and Basin Leisure centre.

The residential subdivision includes:

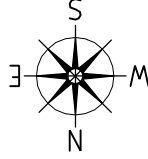
- a total of 604 lots
- approximately 60 hectares (47 percent of the site) of open space area, which would be comprised of environmental conservation areas, asset protection zones and urban parks
- an internal road network with three access points to Naval College Road



REV	DATE	BY	APP.	DETAILS	DRAWING STATUS
P2	13/01/06	AP	AW	UPDATED FOR DEC 2005 DEVELOPMENT FOOTPRINT	DESIGN BY AP 05/05/04
				DRAFTING CHECK PJS 10/02/05	DESIGN CHECK AW 14/12/04
				FINAL APPROVAL	PSN 10/02/05

DRAWING STATUS	
DESIGN BY	AW
DRAWN BY	AP
DRAFTING CHECK	PJS
DESIGN CHECK	AW
FINAL APPROVAL	PSN
	1/02/05
	14/12/04
	10/02/05
	05/05/04
	05/05/04

**DRAWING STATUS**

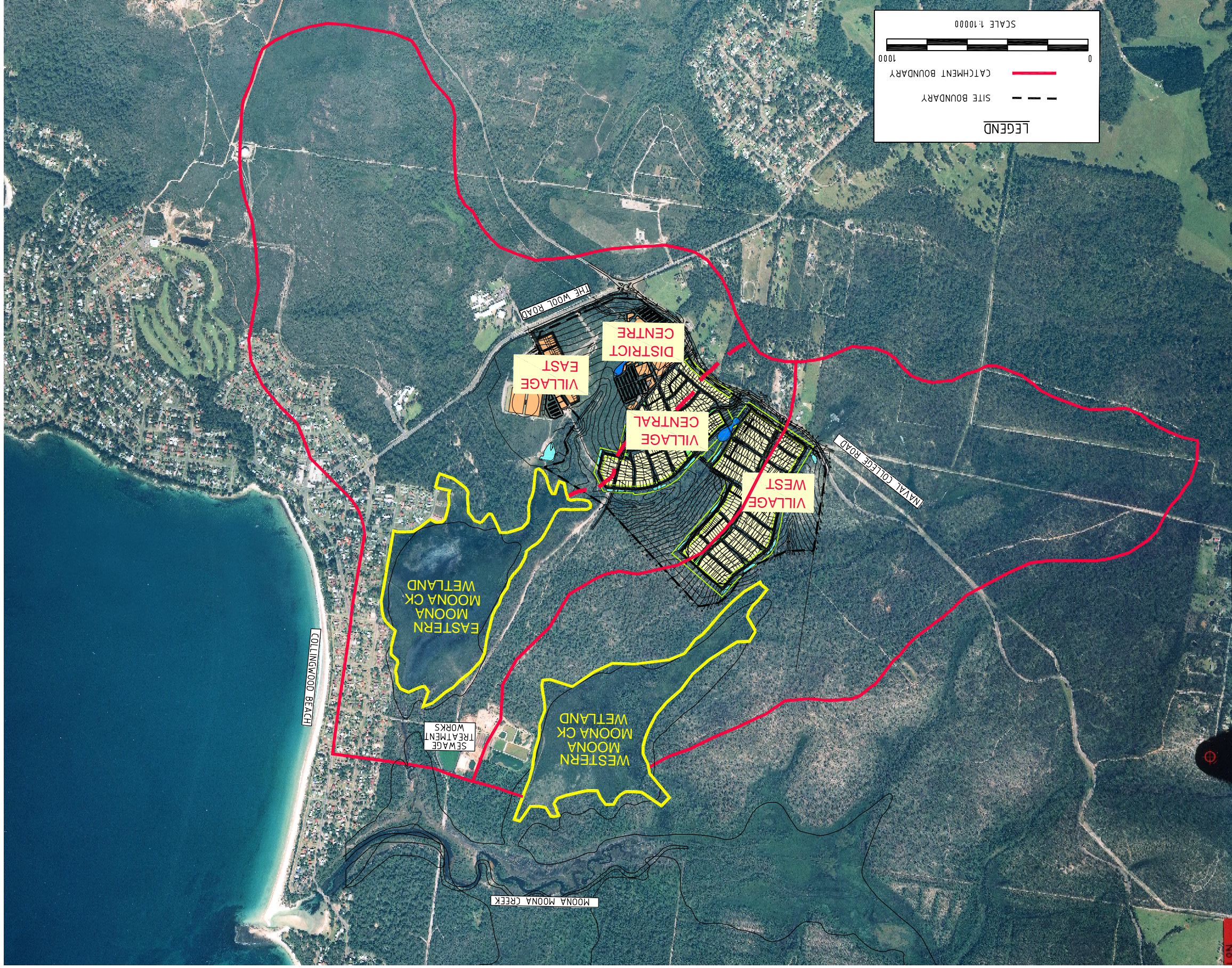


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**PROJECT TITLE**  
VINCENTIA COASTAL VILLAGE  
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DRAWING TITLE		OVERALL CATCHMENT		PLAN	
Project No.	104016	Com No.	3	Drawing No.	FIG 1
				REV	P2



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