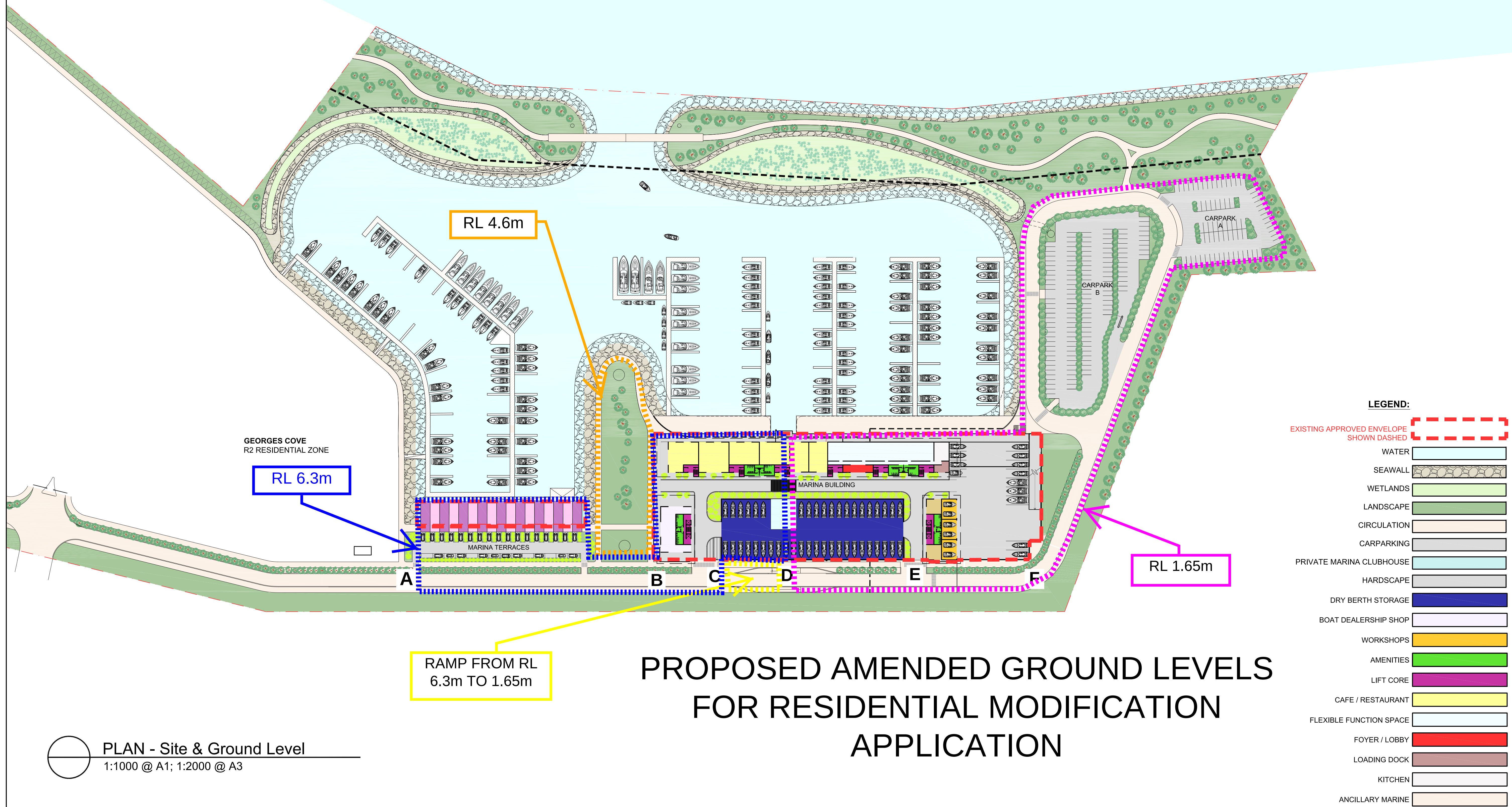
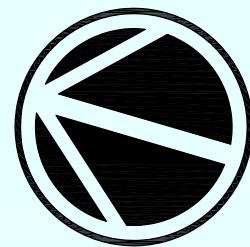


FIGURE 3



PROPOSED AMENDED GROUND LEVELS
FOR RESIDENTIAL MODIFICATION
APPLICATION

PLAN - Site & Ground Level
1:1000 @ A1; 1:2000 @ A3

ISSUE	REV	AMENDMENTS	DATE
E		ISSUED FOR REVIEW	20/10/14
F		ISSUED FOR REVIEW	09/12/14
G		ISSUED FOR REVIEW	19/12/14

ISSUE	REV	AMENDMENTS	DATE

DRAFT

Benedict Industries Pty. Ltd.

Georges Cove Marina
Newbridge Road
Moorebank NSW 2170

PLAN
Site & Ground Level

DRAWN
DS
SCALE 1:1000 @ A1
1:2000 @ A3
DATE 19/12/14
DRAFTING NO. 0914
SK-002
ISSUE G

Appendix E

Bushfire risk assessment

Georges Cove Marina

Bushfire Assessment

Prepared for Benedict Industries Pty Limited | 26 October 2015



Georges Cove Marina

Bushfire Assessment

Prepared for Benedict Industries Pty Limited | 26 October 2015

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Georges Cove Marina

Final

Report J14149RP10 | Prepared for Benedict Industries Pty Limited | 26 October 2015

Prepared by **Mark Roberts**

Approved by **Dr Philip Towler**

Position Senior Environmental Consultant

Position Associate Director

Signature



Signature



Date 26 October 2015

Date 26 October 2015

This report has been prepared in accordance with the brief provided by the client and has relied upon the information collected at the time and under the conditions specified in the report. All findings, conclusions or recommendations contained in the report are based on the aforementioned circumstances. The report is for the use of the client and no responsibility will be taken for its use by other parties. The client may, at its discretion, use the report to inform regulators and the public.

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Document Control

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Acronyms

APZ	Asset protection zone
DA	Development application
EMM	EMM Consulting Pty Limited
FDI	Fire danger index
IPA	Inner protection area
LEP	Local environmental plan
LGA	Local government area
OPA	Outer protection area
PBP	Planning for bushfire protection
RFS	NSW Rural Fire Service
SEARs	Secretary's Environmental Assessment Requirements

1 Introduction

This bushfire assessment has been prepared by EMM Consulting Pty Limited (EMM) for the proposed Georges Cove Marina (the project), as sections of the lot are shown in the Liverpool Bushfire Prone Land maps as being bushfire prone (Figure 1.1). This bushfire assessment has been prepared in accordance with the NSW Rural Fire Service's *Planning for Bush Fire Protection Guideline* (RFS 2006) (PBP). It considers the bushfire hazard associated with the project and describes mitigation measures, in accordance with Appendix 4 of the PBP (Submission requirements for DAs on bushfire prone land).

1.1 Project description

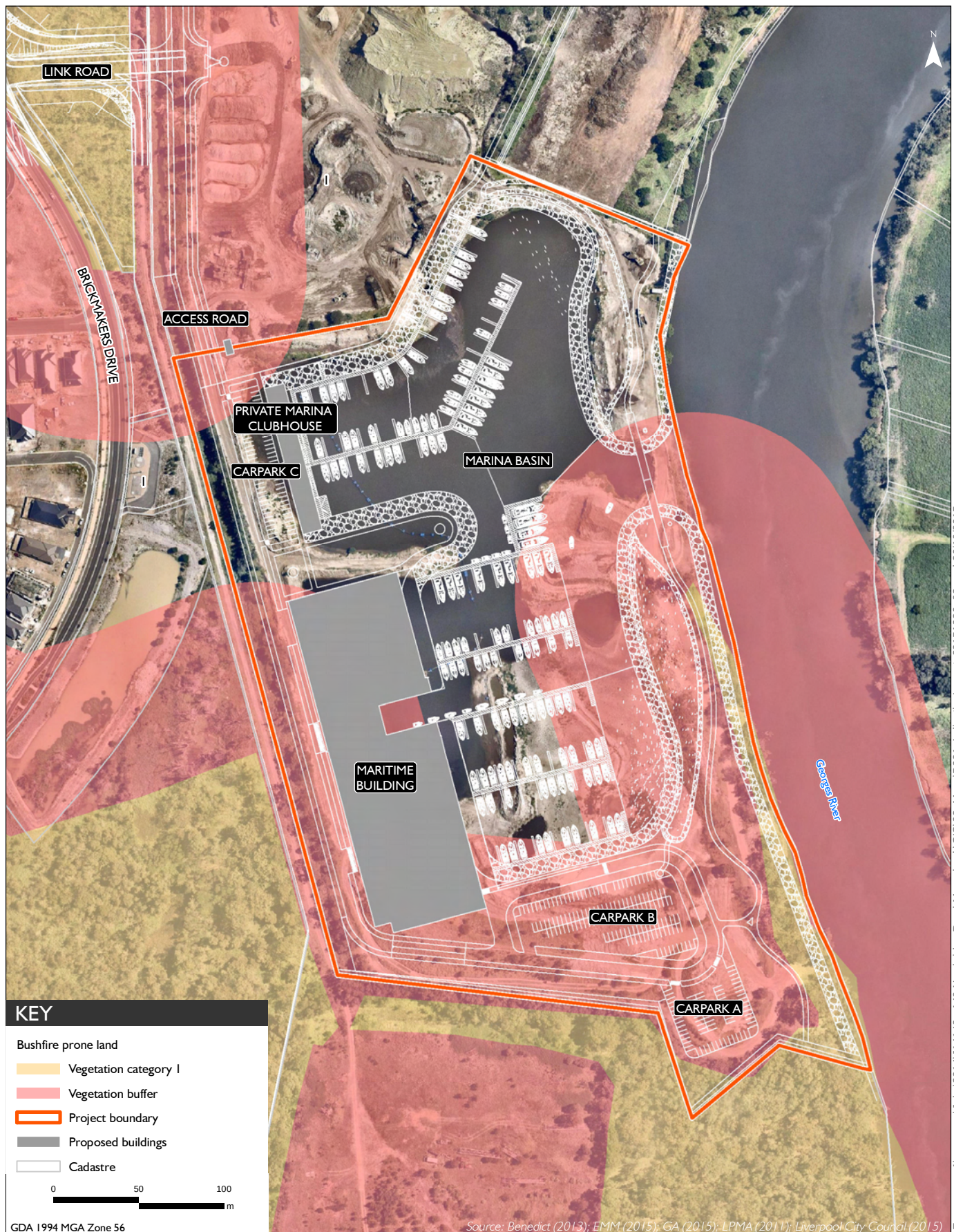
The project will be on the southern portion of Lot 7 DP 1065574, Moorebank, in the Liverpool Local Government Area (LGA) (the site).

The proposed development includes the construction and operation of the following main elements (Figure 1.1):

1. The Maritime Building located near the south-western boundary of the marina site. This structure will house:
 - a dry berth facility providing 250 berths for small craft;
 - a function centre;
 - tourist, entertainment and recreational and club facilities; and
 - a petrol tank (about 60,000 L) and a diesel tank (about 60,000 L).
2. A wet berth facility for 186 small craft (including casual berths) which will comprise:
 - a marina basin;
 - rock protection of the basin and foreshore including embellishment and revegetation of the river foreshore;
 - construction of public recreational facilities on the foreshore including bike paths, barbeque facilities and shelters;
 - floating berths and walkways;
 - fuel pumping facilities;
 - sewage pumpout facilities; and
 - emergency berth access.
3. Three external carparking areas and basement carparking providing a total of 637 car spaces.
4. A private marina clubhouse in the north-west of the site.
5. Support infrastructure – power, water and sewerage.

1.1.1 Designated development application

An application for Secretary's environmental assessment requirements (SEARs) for designated development was submitted to the NSW Department of Planning and Environment on 19 March 2015 (application number SEAR 912). The SEARs for the project were issued on 24 April 2015.



Indicative Georges Cove Marina Layout and Liverpool Bushfire Prone Land Map

1.2 Bushfire assessment statutory requirements

Section 79BA of the *Environmental Planning and Assessment Act 1979* (EP&A Act) requires developments on bushfire prone land to conform to the specifications in the PBP. This assessment has been prepared in accordance with the PBP.

Section 63(2) of the *NSW Rural Fires Act 1997* requires the owners of land to prevent the ignition and spread of bushfires on their land. The recommended measures in this bushfire assessment will ensure that the risk of bushfire ignition and spread will be as low as practically possible.

The Liverpool Local Environmental Plan 2008 (LEP) covers the project application area and Section 5 of the Liverpool Development Control Plan 2008, made under the LEP, requires that development on bushfire prone land comply with PBP. This bushfire assessment has been prepared in accordance with the PBP.

1.3 Objective and scope

1.3.1 Objective

The project is categorised in section 1.1 of the PBP as ‘other development’, that is, development which is not an ‘integrated development’ such as residential/rural residential subdivision or special fire protection purposes. For ‘other development’, only the aim and objectives of the PBP apply.

The aim of the PBP is:

to use the NSW development assessment system to provide for the protection of human life (including fire-fighters) and to minimise impacts on property from the threat of bushfire, while having due regard to development potential, onsite amenity and protection of the environment.

The objectives of the PBP are as follows:

- *afford occupants of any building adequate protection from exposure to a bushfire;*
- *provide for a defendable space to be located around buildings;*
- *provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent direct flame contact and material ignition;*
- *ensure that safe operational access and egress for emergency service personnel and residents is available;*
- *provide for ongoing management and maintenance of bushfire protection measures, including fuel loads in the asset protection zone (APZ); and*
- *ensure that utility services are adequate to meet needs of firefighters (and other assisting in bushfire fighting).*

1.3.2 Scope

The PBP focuses on protection of habitable buildings from bushfire. However, while the marine buildings are not currently intended for use as residences this report assesses the proposed as if they are habitable buildings as they are intended for public use.

2 Existing environment

This chapter determines if the proposed buildings will be on bushfire prone land and describes vegetation and slope within 100 m of the project boundary, as required by Appendix 4 of the PBP.

2.1 Bushfire prone land

The southern and north-western sections of the site are in the 100 m bushfire prone vegetation buffer on the Liverpool Bushfire Prone Land Map (Figure 1.1).

2.2 Vegetation

Dr David Keith compiled broad scale native vegetation classifications and maps between 2001 and 2004 for NSW (the Keith formations) (Keith 2004). The PBP uses the Keith formations to classify bushfire hazard vegetation (the PBP classifications). Vegetation on the site was investigated between 2006 and 2015 (EMM 2015). This mapping does not extend beyond the site boundary so the Sydney Metropolitan Catchment Management Authority (2009) vegetation mapping was used for this assessment. The PBP classifications, distance and direction of native vegetation from buildings within 100 m of the project boundary on bushfire prone land are shown in Table 2.1 and on Figure 2.1. In areas where there are two or more vegetation types, the PBP states that the vegetation type providing the greatest bushfire hazard should be considered as predominant. The predominant PBP vegetation is used to determine APZs (see Section 3.1).

Table 2.1 Vegetation on bushfire prone land within 100 m of the project boundary

Building	Vegetation community ¹	PBP classification	Direction
Maritime Building	Cumberland Riverflat Forest	Forest	S, W
	Coastal Sand Swamp Mahogany Forest	Forested wetlands	W
	Coastal Freshwater Reedland	Freshwater wetlands	W
Private Marina Clubhouse	Castlereagh Shale-Gravel Transition Forest	Forest	SW
	Cumberland Riverflat Forest	Forest	NW

Source: EMM (2015).

1. Sydney Metropolitan Catchment Authority (2009).

2.3 Slope

Slope is an important contributor to a bushfire's rate of spread. A bushfire will spread quicker up a steep slope compared to a gradual slope or flat land. Slopes are classified according to the PBP, and are combined with vegetation classes in an area to determine appropriate APZs (see Section 3.1). The slope over a distance of 100 m from the project boundary on bushfire prone land was determined using a digital terrain model (1 m height resolution). The slopes were classified according to the PBP (Table 2.2 and Figure 2.2):

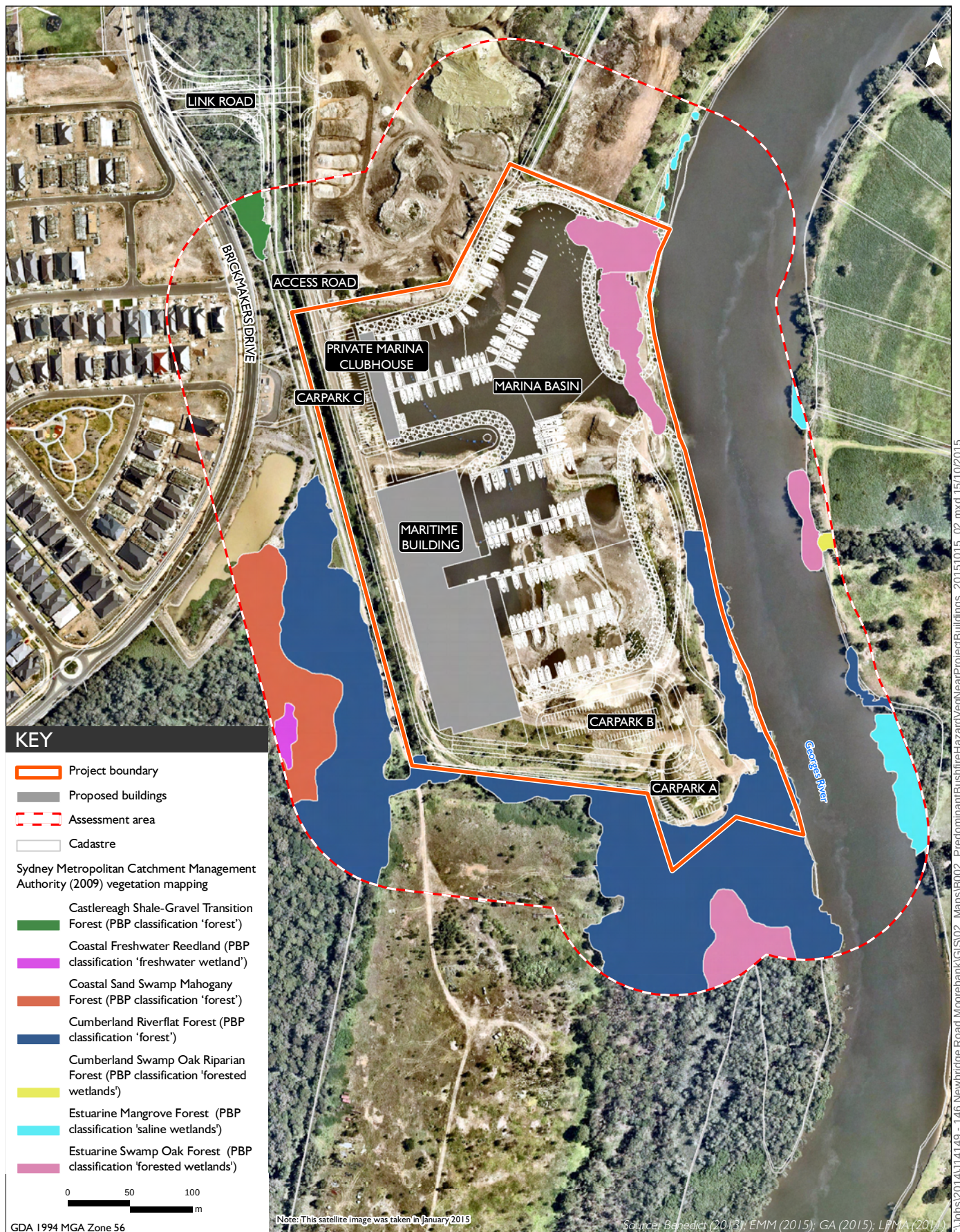
- i) All flat and upslope vegetation (considered 0°);
- ii) >0 to 5° downslope vegetation;
- iii) >5 to 10° downslope vegetation;

- iv) >10 to 15° downslope vegetation; and
- v) >15 to 18° downslope vegetation.

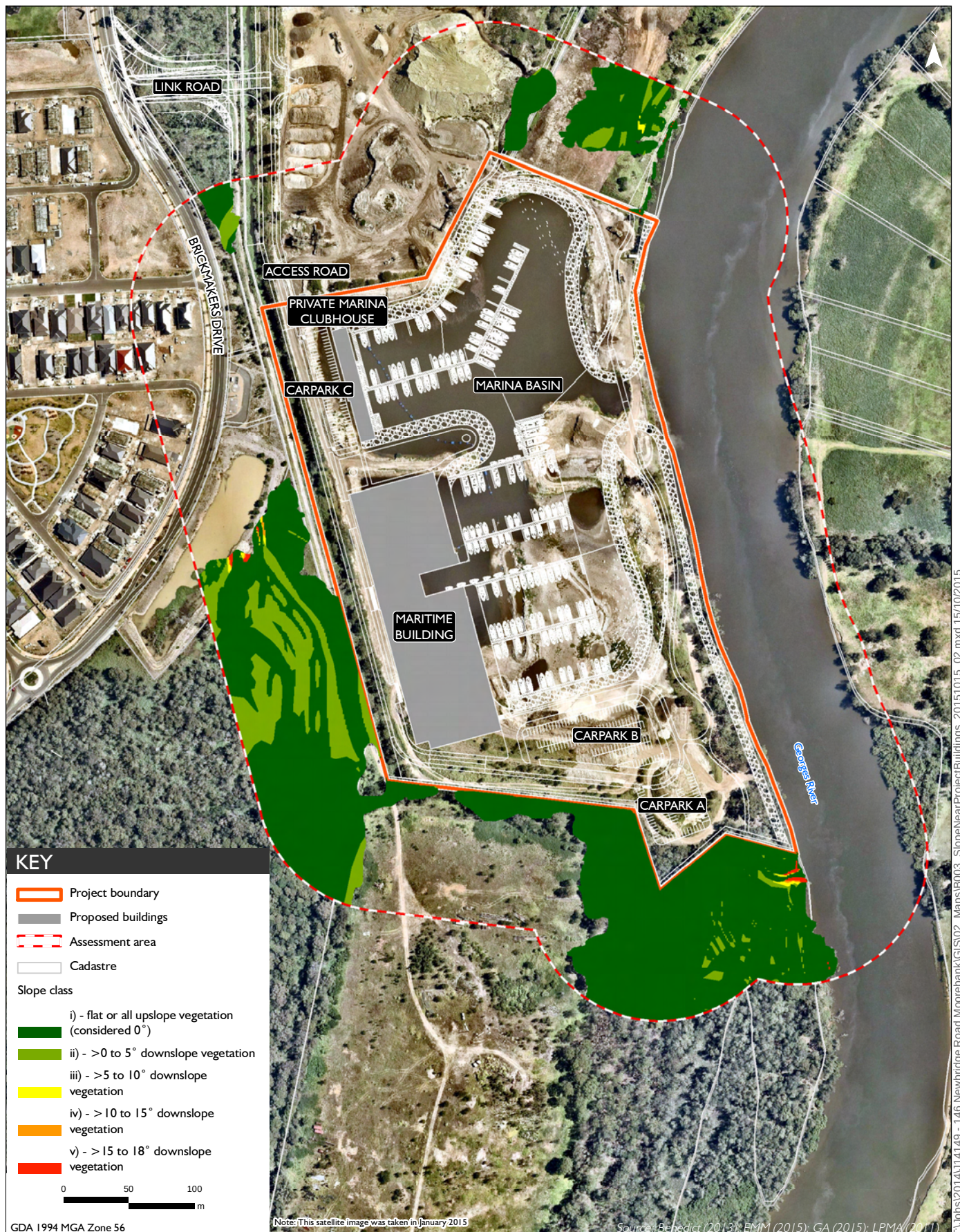
Table 2.2 Slope on bushfire prone land within 100 m of the project boundary

Buildings	The PBP slope class in direction of bushfire hazard vegetation							
	N	NE	NW	S	SE	SW	E	W
Maritime Building	–	–	–	i)	i)	i)	–	i), ii)
Private Marina Clubhouse	–	–	i), ii)	–	–	i)	–	–

The slope class with the most significant hazardous vegetation (forest) for both buildings is i).



Predominant bushfire hazard vegetation within 100 m of the Project boundary



T:\Jobs\2014\14149 - 146 Newbridge Road Moorebank\GIS\02_Maps\B003_SlopeNearProjectBuildings_20151015_02.mxd 15/10/2015

3 Bushfire prevention and protection

This chapter identifies APZs, including appropriate widths, maintenance requirements and specifications for service and access provision as provided in Chapter 4 of the PBP.

3.1 Asset protection zones

The PBP does not specify APZ for ‘other development’, including industrial buildings. However, such development is required to comply with the objectives of the PBP, including provision of buffers between buildings and bushfire prone vegetation. Appendix 2 of the PBP provides a procedure for determining APZs for habitable buildings, which has been adopted in this bushfire assessment.

An APZ is the distance that buildings are set back from vegetation that represents a bushfire hazard (see Appendix 2 of the PBP). APZs are provided for the following reasons:

- to provide sufficient separation from buildings for safe fire fighting;
- to reduce radiant heat at buildings;
- to reduce the influence of convection driven winds;
- to reduce the threat of ember attack on buildings; and
- to allow for dispersal of smoke.

APZs are divided into an ‘inner protection area’ (IPA) and an ‘outer protection area’ (OPA) where there is adjacent forest vegetation. Only an IPA is required where there is adjacent woodland vegetation. The IPA provides a defensible space and reduces heat intensities near buildings. The OPA helps reduce the length of flames, the speed of fire advance and the likelihood of fire spread by ‘crowning’.

APZs are determined by referring to tables A2.5 and A2.7 (for forest and woodland vegetation) in the PBP, which compare predominant fire hazard vegetation formations (see Table 2.1), highest slope classes near subject buildings (see Table 2.2) and fire weather at a site. The fire weather or ‘fire danger index’ (FDI) for Liverpool LGA is 100 (Table A2.3 in the PBP). The resulting APZs for the project are shown in Table 3.1 and on Figure 3.1.

The APZs will comprise roads, car parks and vegetation maintained as described in Section 3.1.1. No clearing of existing vegetation will be required to accommodate the APZs.

Table 3.1 Asset protection zones

Buildings	Asset protection zone (m)		Direction from building
	Inner protection area	Outer protection area	
Maritime Building	10	10	S, SW, W, NW
Private Marina Clubhouse	10	10	SW, NW