trinity point

LAKE MACQUARIE

CONCEPT PLAN MODIFICATION: STORMWATER AND FLOODING MANAGEMENT PLAN

October 2014

Document Control Sheet

Issue No.	Amendment	Date	Prepared by	Checked by
A	DRAFT Issue	29 September 2014	MK	LG
B	Issue	30 October 2014	MK	SH

Executive Summary

Johnson Property Group (JPG) are seeking to modify an approved Concept Plan (MP06-0309) to carry out development of a marina and mixed use development for the Trinity Point site near Bluff Point, Morisset Park.

The proposed modifications reduce the extent of paved surfaces and allows for more landscaping opportunities. The reduced extent of impervious surface area reduces potential sources of waterway pollutants. With regard to the proposed modifications ADW Johnson was engaged to review the stormwater management strategy and flooding impacts for the site.

The review found:

- ***Stormwater Management***: Broadly, the proposed stormwater management strategy in the approved concept plan is appropriate. Minor amendments to proposed treatment measures have been proposed to enable more efficient treatment of stormwater runoff and increased opportunities for rainwater harvesting.

- ***Flooding.*** All buildings are proposed to be located above flood levels, consistent with the approved concept plan. It is noted that Lake Macquarie City Council (LMCC) has initiated a Flood Plain Risk Management Plan which supersedes the proposed levels flood planning in the approved concept plan.

Although some amendments to the stormwater strategy and flood planning levels are proposed, the general principles and objectives of stormwater management and flooding can be met under the proposed modification.

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APPENDICES

1.0 Introduction

1.1 Background

Johnson Property Group (JPG) are seeking to carry out the development of a marina and mixed use development for the Trinity Point site near Bluff Point, Morisset Park (refer Figure 1 for site locality). The site is located approximately 6km from Morisset, which has been identified in the *Lower Hunter Regional Strategy* as an emerging regional centre. The site is within the Lake Macquarie City Council Local Government Area (LGA), however the original concept plan was assessed under Part 3A of the EP&A Act as a 'major project', and as such was referred to the NSW Department of Planning (NSW DoP) for assessment and approval.

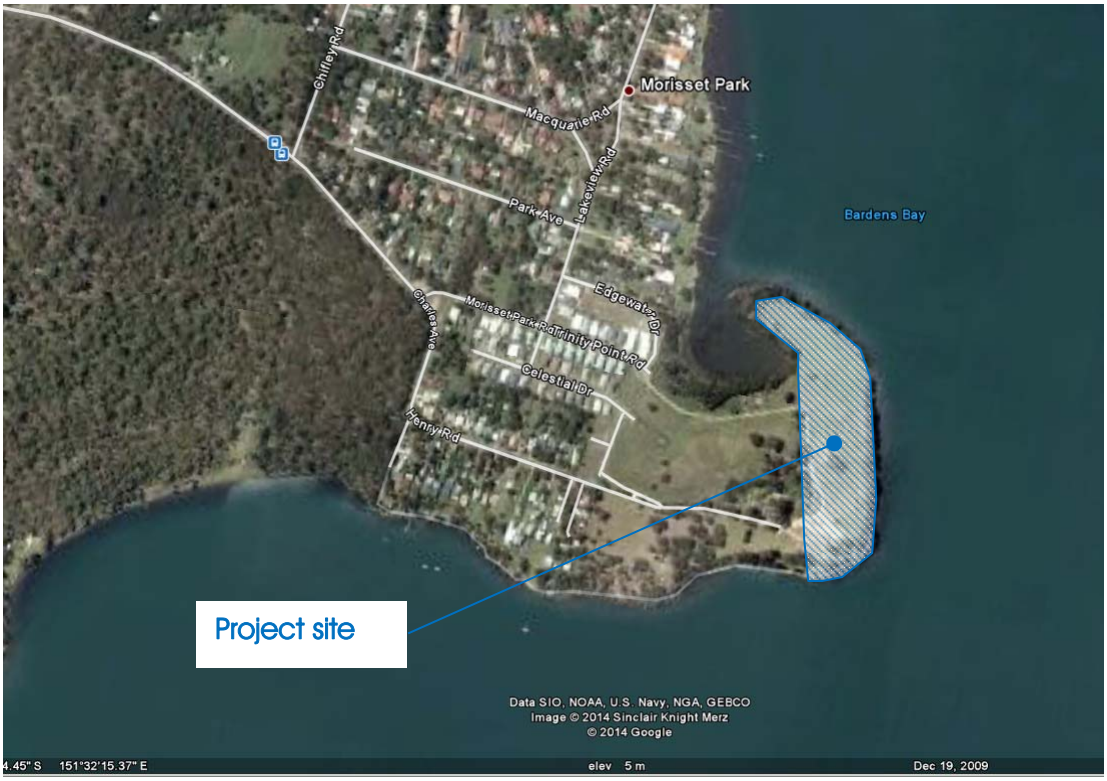

Figure 1: Locality Plan

The Concept Plan was approved by the NSW DoP in 2009, which included a stormwater and flood management report in support of an earlier version of the concept. Attached to the concept plan was a preferred Project Report, in which the objectives and principles of stormwater management and flooding were established for the site (being Principals 11 and 12). Conditions C19 and C20 also relate to stormwater management and flooding.

The developer, Johnson Property Group, are seeking approval to modify the concept plan, whilst progressing with Development Applications for parts of the site.

This report addresses the stormwater, flooding and water quality management issues as they apply to the modified concept plan.

This report is intended to accompany the Concept Plan modification application (75W) and should be read in conjunction with the drawings attached at Appendix A.

1.2 Report Objectives

The objectives of this report are as follows:

- To summarise the proposed amendments to the previously approved concept plan from a stormwater and flooding perspective.
- To summarise how the new proposal meets the intent of the concept plan.
- To detail how the new proposal meets the relevant principles and objectives as referenced in the Preferred Project Report and relevant approval conditions.

1.3 Previous Reports

A previous report *"Trinity Point Marina Development- Stormwater Management Plan"* Patterson Britton – October 2008 accompanied the Concept Plan Environmental Assessment Reports.

"Lake Macquarie Water Flood Risk Management Study and Plan" WMA Water 2012 has been prepared following concept plan approval and adopted by Lake Macquarie City Council to inform flood planning levels around Lake Macquarie.

"Mixed Use Development (Tourism and Hospitality) Development Application: Stormwater and Flood risk Management Plan" has been prepared to accompany the Development Application of the combined restaurant/function centre and a marina/hotel accommodation facility.

"Trinity Point Stormwater and Flood Risk management Plan" - Patterson Britton – September 2014 accompanied the Development Application for the Stage 1 marina site only

2.0 Project Description

2.1 Approved Concept Plan Proposal

The approved concept plan included 188 marina berths, workshop maintenance and club facilities with residential and tourist accommodation and a café, restaurant and function centre and other uses. Following the approval several modifications have been lodged with NSW Department of Panning as follows:

- Modification 2, which is currently undergoing assessment, seeks a range of modifications to marina related matters, notably including the removal of the workshop and maintenance facilities.
- Modification 3 sought to include a Helipad, which is water based and to be subject to separate environmental assessment.
- Modification 4 sought extend the lapse date, and has been approved.

This report accompanies Modification 5 which incorporates land based changes.

2.2 Proposed Modifications

Architectural drawings of the approved and proposed modification are shown on Figure 2 on the following page. The proposed modifications reduces the extent of paved surfaces and allows for more landscaping opportunities. The reduced impervious services reduce the impact upon the catchment hydrology and reduces potential sources of waterway pollutants.

It is noted that the concept plan varied from that originally submitted in 2008 to that approved in 2009 (these changes did not arise as a result of water cycle management issues, and where relevant to water cycle management, they include a change of built form style from U-shaped apartment buildings to small integrated housing on an internal grid driveway system for the southern part of the site). The original 2008 stormwater management report was not updated to reflect the approved concept and there is no stormwater management plan, analysis or reporting available in which to draw direct comparisons. At that time, it was acknowledged that notwithstanding the built form changes, similar principles to be achieved by water cycle management on site remained relevant, and Principle 19 was updated to reflect the principles as they applied to the approved concept and future applications.

Whilst not relating to the approved concept, the 2008 report identified 9,000m^2 of rooftop and 12,300m^2 of other impervious areas (driveways, paths etc). By rough estimation only from scaling off the approved summary concept figure, it appears that the approved concept had something in the order of 19,000m^2 rooftop and 9,300m^2 of other area. By comparison the proposed modifications have reduced impervious areas of approximately 11,080m^2 rooftop and 7,640m2 of other impervious surfaces.

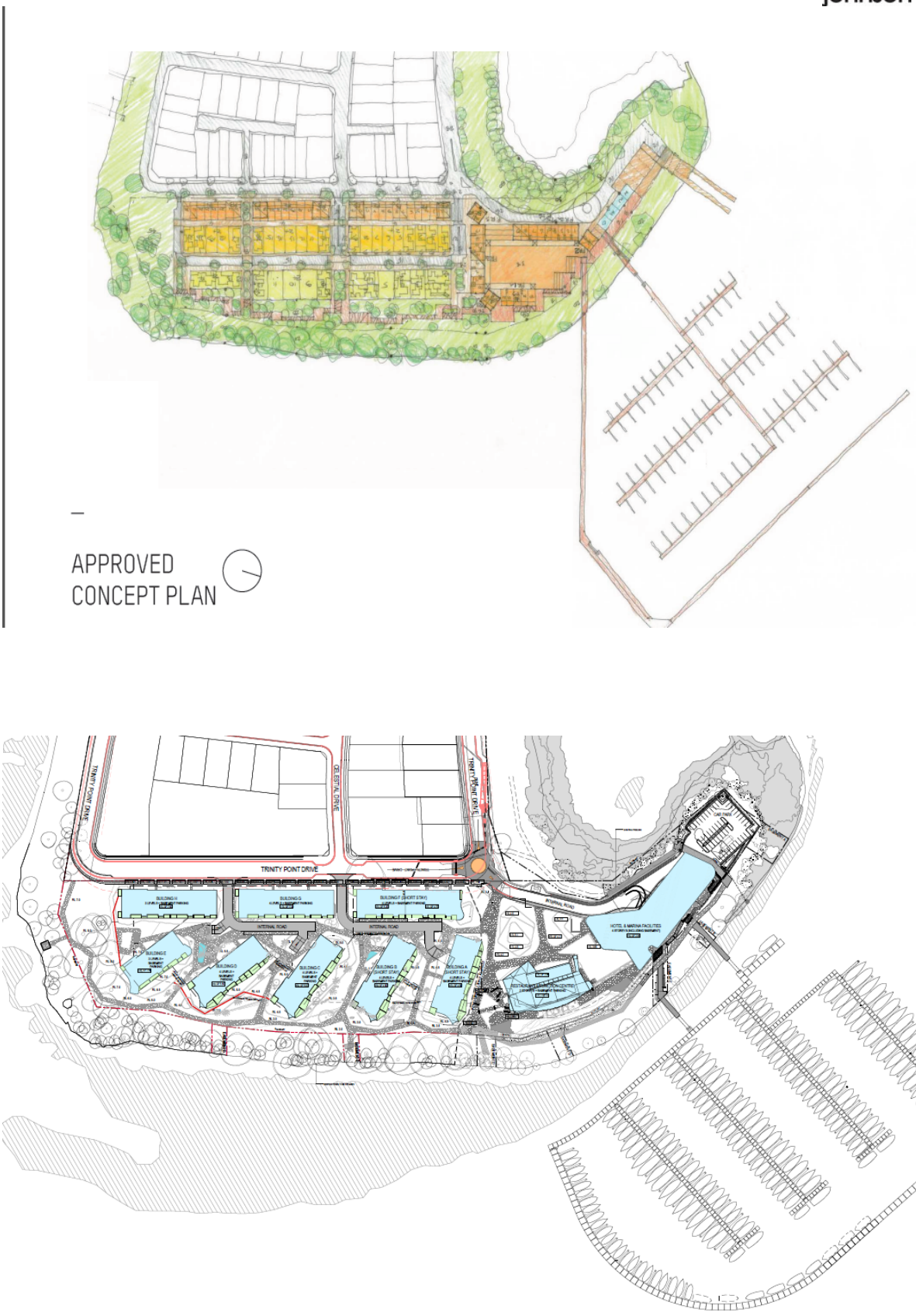

Figure 2 original and proposed modification – Squillace Architects

3.0 Water Quality Impacts

3.1 Stormwater Management Principles in Concept Plan

The principles established in the approved preferred project report (Principle 11) include:

Objective

To provide preventative measures to ensure no impact on aquatic environment and lake water quality and to provide for water harvesting and re-use opportunity.

Guidelines

- *Stormwater Management Plans are to be provided with Project Applications, incorporating the following measures:*
- *Adopt a best practice water sensitive urban design approach, focusing on preventative and source controls where possible.*
- *Provide rainwater harvesting, permeable pavements and bio-filtration swales as part of overall stormwater strategy (where deemed appropriate). Residential dwellings to achieve water efficiency targets as required by BASIX.*
- *Incorporate and adopt a range of preventative, containment and treatment measures for stormwater management from the marina workshop and hardstand area. To include a first flush tank and treatment of captures stormwater for reuse/ trade waste discharge, and segregations of hardstand surface area into three areas to facilitate waste collection and treatment.*
- *Provide oily waste recycling tank for wastes from workshop and from oily bilge water from the pump out facility on the marina.*
- *Fuel storage tanks to be designed according to authority requirements including double skinned tanks.*
- *Implement a water quality monitoring program during construction and for three years of marina operation.*
- *Design and install sediment and erosion control structures during construction according to an erosion and sediment control plan.*
- *Incorporate overland flow paths as necessary.*

In addition:

- *Consider acid sulphate soils management, in line with a management plan, in design and construction methodologies.*
- *Consider groundwater implications in design and construction methodologies.*

These matters are to be considered in further detail with Development Applications where relevant, and Section 3.4 of this report considers these against the proposed modification.

3.2 Water Quality Strategy - General Development Area

Stormwater runoff treatment targets for commonly occurring urban pollutants were discussed in the concept plan report based on a review of relevant guidelines, specifically, those included in the "*Managing Urban Stormwater: Environmental Targets".* The suggested rainwater quality treatment targets are as follows:

- *Total Suspended Solids (TSS) – 85% mean annual retention*
- *Total Phosphorus (TP) 65% mean annual retention*
- *Total Nitrogen (TN) 45% mean annual retention*

These targets are compared to best practice targets suggested in Australian Rainfall Quality, and Lake Macquarie City Council Guidelines. No stormwater treatment measures were proposed to manage peak flow, as such treatments would be ineffective when discharging to Lake Macquarie.

The original stormwater report (2008) identified a water quality treatment train to achieve the stormwater management objectives for the Trinity Point site. Specific stormwater quality improvement devices included:

- ***Rooftop Gardens.*** To reduce the impact of impervious rooftop surfaces
- ***Rainwater Harvesting***. To reduce runoff volume and decrease demand on potable water supplies.
- ***Permeable Pavement***. To reduce the runoff from impervious road surfaces and provide some infiltration.
- ***Bio-Filtration swales.*** To provide high levels of pollutant removal before discharging off site.

To augment the proposed source control measures, a number of preventative measures were proposed including minimising impervious areas, drought tolerant plantings, fertiliser management regimes, public education on environmentally responsible behaviours and provision of rubbish bins.

The proposed treatment train was modelled using MUSIC, a water quality model that is widely used to simulate the performance of proposed treatment train.

3.2.1 Proposed Modifications to the Water Quality Strategy

The proposed modifications to the concept plan have been considered in reviewing the stormwater treatment strategy for the entire site.

Broadly, as discussed in Section 2.2, the proposed amendment to the concept plan can be summarised as:

- A net decrease in impervious roof area with the accommodation precinct.
- A net decrease in road and paved areas.
- A net increase in landscaped area.

Based on the above it is proposed to undertake a number of changes to the stormwater treatment train to optimise performance within the new site conditions.

Table 2. Approved Concept plan source controls compared to proposed controls.

2008 Stormwater Report Source Control	Proposed Source Control	Comment/ Justification
Rooftop Gardens	N/A	Rooftop Gardens were unlikely to form part of the treatment rain for the approved concept plan based on built forms (inclusive of a pitched roof) and they are not proposed for revised stormwater strategy. Further, rooftop gardens are difficult to maintain, often require potable water during time of drought and can lead to poor visual amenity if not properly cared for. The approved concept plan notes that alternative to green roofs would be to increase rainwater harvesting directly from the roof source, which is what is currently proposed.
Rainwater Harvesting	Rainwater Harvesting	Rainwater tanks are proposed to provide a supply of non-potable water for toilet flushing and irrigation. The demands and sizes of the rainwater water tanks have been updated to reflect the modified concept plan. Updated demands include: • 35l/day for toilet flushing per person. Occupancy rates have been sourced form Water by Design Guidelines- MUSIC Modelling Guidelines for residential and short stay accommodation demands. • 1020 kl/year for 800m2 of irrigated lawns. Seasonal Irrigation demand patterns have been adopted as per the original 2008 report.
Permeable Pavement	N/A	Permeable Pavement is not proposed in the revised overall stormwater strategy. Given the significant decrease in road paving this is not considered to be required.
N/A	Gross pollutant Traps	In addition to the above measures it is proposed to include Gross pollutant traps that will treat any overflow from rainwater tanks and runoff collected from paved areas. Gross pollutant traps provide a space efficient and practical means of primary stormwater treatment.
Bio filtration Swales	Bio filtration Swales	Bio filtration swales are proposed at appropriate discharge points along the perimeter of the site, similar to what was proposed in the concept plan. It is noted that parts of the lakeside shared pathway will likely be constructed on Council land and hence the swales will be placed on the edge of the promenade, within the site boundary.

3.2.2 MUSIC Modelling

A MUSIC Model was prepared to model the performance of the revised strategy.

Meteorological data including rainfall and evapotranspiration data was obtained from Lake Macquarie Council's *MUSIC Link* files.

The MUSIC Model was setup in four sub catchments. That is, the dual use short stay and permeant residential precinct, the short stay precinct (with upper levels also for permeant residential) and two catchments in the tourism and hospitality precincts, and the marina (refer to Appendix A for a Catchment Plan).

Table 3. Water quality modelling results of revised treatment strategy

Catchment	Treatment Train			Treatment Train Targets (%)			Treatment Train Results (%)		
	Rainwater Tank	Gross Pollutant Trap	Bio-filtration	TSS	TP	TN	TSS	TP	TN
1	20KL (2x10KL)	Yes	45m2	85	65	60	91.9	72.6	62
2	20KL (2x10KL)	Yes	22m2	85	65	60	85.9	66.3	65
3(includes Marina and Carpark)		No	30m2	85	65	60	93.5	72.1	51
4	30KL	Yes	242m2	85	65	60	94.1	66.9	68.9
5	30KL	Yes	0[1]	85	65	45	94.1	66.9	68.9
Overall				85	65	45	**91.9**	**66.1**	**63.1**
Approved Concept Plan- Achieved Reductions[3]							89	71	46

Notes:

1. This catchment shares the bio filtration basin in catchment 3.
2. Figures obtained from Trinity Point Marina – Stormwater and Flood Risk Management Plan – Royal Haskoning DHV - 2014
3. Figures obtained from Trinity Point Marina – Stormwater/Flooding Management Plan – Patterson Britton and Partners -2008

3.2.3 Discussion

It can be seen from Table 3 above that water quality targets are achieved for the entire site, as well as on all but one catchment. Results compare similarly to the approved concept report for removal of Suspended Solids and Phosphorus, whilst providing a significant improvement in the removal of Nitrogen.

3.3 Water Quality Strategy - Marina

The Marina includes refuelling and sewerage disposal. These services are unique and require a different approach when compared with managing stormwater runoff from typical urban catchments, and have been specifically addressed within DA 503/2014 (Stage 1 Marina DA).

The approved concept plan included a number of preventative measures to minimise the discharge of pollutants. Concept Plan Modification 2 (currently under assessment by the Department of Planning), seeks to remove the maintenance facility, vessel hardstand and travel lift which has removed the requirement for the previously proposed first flush treatment systems proposed at the vessel hardstand. The modification also seeks to remove and the Oily bilge pump out management facility.

This concept plan modification does not propose any further modifications to the stormwater strategy relating to the marina beyond those described in the Concept Plan modification 2.

3.4 Performance against Water Management Principles

The performance against the principles noted in the approved preferred project report are as follows:

Table 4. Performance against principles (Principle 11) in the preferred project report.

Principle	Comment
Stormwater Management Plans are to be provided with Project Applications	No proposed changes. A SWMP has been prepared for current development applications and will be prepared for future submissions.
Adopt a best practice water sensitive urban design approach, focusing on preventative and source controls where possible.	Source controls include rainwater tanks, Gross pollutant Traps and bio-filtration basins and meet best practice water quality treatment targets. Preventative measures are consistent with the approved concept plan. Further detail will accompany subsequent project application.
Provide rainwater harvesting, permeable pavements and bio-filtration swales as part of overall stormwater strategy (where deemed appropriate).	Rainwater harvesting and bio filtration basins are provided. Permeable paving is not considered appropriate due to the reduction in paved area and the inclusion of gross pollutant traps.

Incorporate and adopt a range of preventative, containment and treatment measures for stormwater management from the marina workshop and hardstand area. To include a first flush tank and treatment of captures stormwater for reuse/ trade waste discharge, and segregations of hardstand surface area into three areas to facilitate waste collection and treatment.	Spill containment measures and treatment measures are still proposed as per the original concept plan and where relevant. The removal of the workshop in concept modification 2 negates the need for a first flush system.
Provide oily waste recycling tank for wastes from workshop and from oily bilge water from the pump out facility on the marina.	No longer required due to the proposed removal of the marina workshop in Concept Modification 2 and alternative management proposed.
Fuel storage tanks to be designed according to authority requirements including double skinned tanks.	Fuels tanks will comply with this requirement in the course of detailed design.
Implement a water quality monitoring program during construction and for three years of marina operation.	A water quality monitoring program relating to the marina is proposed within DA 1503/2014. No proposed changes
Design and install sediment and erosion control structures during construction according to an erosion and sediment control plan.	Sediment and erosion control strategies have been provided in development applications and with future applications.
Consider acid sulphate soils management	An acid sulphate soil management plan have been provided in development applications and with future applications.
Incorporate overland flow paths	Overland flow paths have been shown on the SWMP attached Appendix A.
Consider groundwater implications in design and construction methodologies.	Management of groundwater will be considered and reported against in Geotechnical reports accompanying Development Applications.

4.0 Lake Macquarie Flood Impacts

4.1 Flooding Principals in Concept Plan

Principles established in the approved preferred project report (Principal 12) include:

Ensure that the proposed buildings consider and design for the effects of flooding.

Objective

Locate building above flood level, with flood level to be determined with regard to sea level rise through climate change.

Guidelines

Flood planning levels have been devised taking into account frequency, still water level, wave action, potential climate change impact and design life of various components of the site.

The proposed minimum flood planning levels are:

- *Habitable Floor Levels – 2.85m AHD.*
- *Hardstand Area and workshop – 1.1m AHD (with electrical wiring above 2.42m AHD).*
- *Road level and foreshore regrading to protect marina village undercroft parking spaces – 1.60m AHD.*
- *Marina Structures – 1.60m AHD.*
- *Where necessary, Project Applications relating to the village piazza (including undercroft parking area) and marina utility components of the project are to document broad sea level rise adaption measures and strategies available and how they have been, or can be, incorporated. These are to integrate with other principles of this Concept Plan.*
- *Appropriate evacuation strategies and draft evacuation plans are to be prepared and submitted with relevant project applications for village piazza undercroft parking area, village piazza and marina utility buildings and areas.*

Adaptive Management in response to Climate Change

- *Habitable floor levels for buildings are to be designed based on the 100 year design life above the 100 year ARI flood level plus 100 year sea level rise allowance.*
- *Evacuation routes to be defined above the anticipated PMF level in 00 years.*
- *Adoption of shorter design life for structures with adaptive capability and higher acceptable flood risk such as marina piles, breakwater, boat lift facility, marina access walkways. Piles can be extended to accommodate rising sea levels and therefore flood levels over time.*
- *Marina hardstand and workshop area – practicalities of purpose dictate lower levels and wet flood proofing is possible. Retrofitting to changes in levels in the future is possible for these land uses.*

In 2012, Lake Macquarie City Council (LMCC) initiated a Flood Risk Management Plan which included a detailed study into the flood behaviour of Lake Macquarie. This study has refined the anticipated flood levels in Lake Macquarie under present and climate change conditions. LMCC refers to this document when establishing flood planning levels for developments within the flood impacted foreshore of Lake Macquarie. A copy of the flood inundation certificate is attached at **Appendix B.**

4.2 Proposed Flood Planning Levels

The estimated flood levels in Lake Macquarie are listed in the Lake Macquarie's Flood Risk Management Plan illustrated in Table 5 below.

Table 5. Estimated flood levels form Lake Macquarie Council's Flood Risk Management plan.

Flood Level	Current	Projected – Year 2050	Projected – Year 2100
Still Water Level	0.10 AHD	0.50 AHD	1.00 AHD
1 in 20 year ARI probable flood level	1.23 AHD	1.61 AHD	2.10 AHD
1 in 100 year ARI probable flood level	1.50 AHD	1.86 AHD	2.32 AHD
Probable Maximum Flood	2.45 AHD	2.81 AHD	3.27 AHD

Based on the above, LMCC have provided minimum flood levels based on the development type and anticipated design life. Interpretation of the appropriate levels was discussed with representatives of ADW Johnson and LMCC in the preparation of this report. A summary of the flood planning levels and development notes are summarised in Table 7 on the following page.

Table 6. Flood planning levels depending on Development type

Development type	Flood Planning Levels	Notes and Justification
Commercial development Retail and Basement Car parking	2.36m AHD at entry	Hotel foyer, retail and undercroft car parking is set at RL 2.36, which is equivalent to the year 2050 flood level with 500mm freeboard. One exception is the outdoor marina car park (not basement) that is set a 1.23 AHD, which is equivalent to a 1 in 20 year ARI flood event under current conditions. This car park is rated as a High flood hazard rating. To manage this flood risk it is proposed to prepare a flood evacuation strategy. It is noted that flood water within Lake Macquarie would rise relatively slowly, allowing time for egress via the primary access road that rises above the flood hazard level.

Mixed use Development and Medium Density and High rise Basement Car parking	2.82m AHD at entry	Vehicular entries to Basement car parking for mixed use and residential car parking will be set at minimum levels of 2.82m AHD A single corridor from the main foyer entry at 2.36m AHD is proposed to provide pedestrian connectivity between the basement car parking and the retail precinct. To prevent flooding from the retail precinct into the basement car park, it is proposed to install a flood gate which will provide flood immunity to a level of 2.82m AHD. All internal floor heights for residential and hotel room are above the 2.82m AHD level.

4.3 Performance against flood management principles

The performance against the principles noted in the approved preferred project report are as follows:

Table 7. Performance against principles in the preferred management report.

Principle	Comment
Locate buildings above flood level, with flood level determined with regard to sea level with climate change	Buildings have been located above flood levels as per LMCC Flood Inundation Certificate. This includes allowance for anticipated sea level rise in the years 2050 (0.4m rise) and 2100 (0.9m rise).
Flood Planning levels take into account still water level, wave action, climate change and design life.	Flood planning levels include still water level, climate change and design life. Although no specific allowance for wave action has been allowed for all levels include 500mm freeboard.
Minimum Flood Levels: • *Habitable Floor Levels – 2.85 AHD* • *Hardstand area and Workshop – 2.42 AHD* • *Marina Structures – 1.6 AHD*	Levels have been revised in accordance LMCC's Flood Inundation Certificate. Levels are indicated in Table 5 above. The Marina Hardstand area is no longer proposed, however the adjacent carpark is located at level 1.23 AHD, which is above the 20 year ARI storm event.
Project applications relating to the village piazza and marina are to document broad sea levels rise adaption measures.	Where relevant appropriate design to flood planning levels will be incorporated.

Evacuation routes are to be defined for the Probable Maximum flood (PMF) in 100 years.	This will be provided for in future applications, however broadly the evaluation strategy will include leaving the site via the main access road that rises to a level above the project PMF (3.27 AHD) at Trinity Point Drive.
Adoption of shorter design life for structures with adaptive capacity and higher acceptable flood risk such as marina piles, breakwater and boat lift.	This will be accounted for in future submissions relating to the marina design.
Marina Hardstand and workshop area – practicalities of purpose dictate lower levels and wet proofing is possible. Retrofitting changes in levels in the future is possible for these land uses.	The Marina Hardstand area is no longer proposed, however the adjacent carpark is located at level 1.23 AHD, which is above the 20 year ARI storm event.

5.0 Conclusion

A review of the stormwater management strategy and flooding impacts was undertaken in light of the proposed Concept Plan modification. A summary of specific consequences of the proposed modifications on stormwater management and flooding is outlined below:

- *Stormwater Management*. Broadly, the proposed stormwater management strategy is similar to the approved concept plan. Minor amendments include removing the proposed green roofs and permeable paving. Instead it is proposed to increase the extent of stormwater harvesting via rainwater tanks and add Gross Pollutant Traps.

  The revised approach is considered more effective in treating stormwater runoff under the proposed modifications and meets the treatment targets as set in the approved concept plan.

- *Flooding.* All buildings are proposed to be located above flood planning levels, consistent with the approved concept plan. It is noted that Lake Macquarie has undertaken a Flood Plain Risk Management Plan that supersedes the proposed levels in the approved concept plan.

Although, some amendments to the stormwater strategy and flood planning levels are proposed, the general principles and objectives of stormwater management and flooding have been met.

Appendix A

Drawings

Plan of:	OVERALL CONCEPT STORMWATER MASTERPLAN	Location:	TRINITY POINT DRIVE MORISSET PARK	Datum:	AHD	Date:	8th SEPTEMBER 2014
				Origin:	PM 58712	Sheet:	4 OF 8
				Projection:	MGA ZONE 56	Plan By:	AM
				Origin:	DCDB	Project Manager:	MK
		Council:	LAKE MACQUARIE	North Direction:	GRID	Office:	COAST
				Contour Interval:		Plan Purpose:	ENGINEERING DESIGN

Version:	C (17th OCTOBER 2014)		
Client:	JOHNSON PROPERTY GROUP		
Survey:			
AutoCAD:	S:\237429(2)E\237429(2)E_SK_004		
Our Ref:	237429		

adw johnson

LEGEND

- SW — PROPOSED STORMWATER
- BIO RETENTION BASIN
- GRATED INLET PITS
- PROPOSED GPT
- CATCHMENT FLOW ARROW
- RW — RAINWATER TANK
- EDGE OF BASEMENT CARPARK
- IMPERVIOUS PAVED SURFACE
- LANDSCAPED AREAS POTENTIAL FOR IRRIGATION

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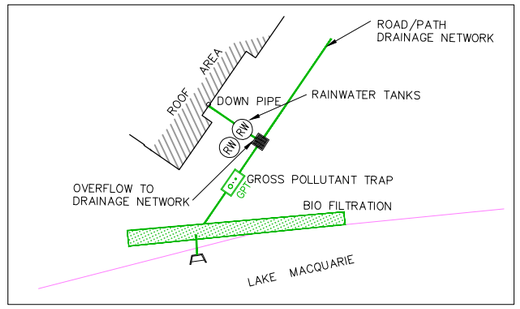


DETAIL 1
SCHEMATIC OF TREATMENT TRAIN
N.T.S.

CELESTIAL DRIVE

TRINITY POINT ROAD

TRINITY POINT ROAD

TRINITY POINT ROAD

INDICATIVE ONLY. NOT PART OF TOURIST AND HOSPITALITY DA

LAKE MACQUARIE

MARINA CATCHMENT REFER TO RHDHV DRAWINGS FOR DETAILS

MARINA ROOFLINE STAGE 1

ACCESS ROAD

CATCHMENT 3

PROPOSED HOTEL AND MARINA

BLDG. H

BLDG. G

BLDG. F

CATCHMENT 5

CATCHMENT 4

CATCHMENT 1

CATCHMENT 2

BLDG. E

BLDG. D

BLDG. C

BLDG. B

BLDG. A

FUNCTION CENTRE REFER TO ARCHITECTS PLANS

POOL

LAKE MACQUARIE

Ver.	Date	Comment
C	17/10/2014	LAYOUT & NOTES UPDATED
B	15/09/2014	GENERAL REVISION
A	8/09/2014	PRELIMINARY ISSUE

adw johnson pty. ltd. 2 bounty close, tuggerah nsw 2259, po box 3717 tuggerah nsw 2259 ph: (02) 43054300 fax: (02) 43054399 coast@adwjohnson.com.au abn 62 129 445 398

Appendix B

LMCC Flood Inundation Certificate

Lake Macquarie City Council

~~# 57429(2)~~

Lake Macquarie City Council

RECEIVED
23 JUN 2014
BY:

20 June 2014

Johnson Property Group
c/- ADW Johnson Pty Ltd
7/335 Hillsborough Rd
WARNERS BAY NSW 2282

Our Ref: 987
Your Ref:
ABN 81 065 027 868

FLOOD / TIDAL INUNDATION CERTIFICATE

Land fronting or located adjacent to Lake Macquarie Waterway

Fee Paid: 104.55

Receipt No:

DESCRIPTION OF LAND

Address:	71 Trinity Point Drive, MORISSET PARK NSW 2264
Lot Details:	Lot 31 DP 1117408
County:	Northumberland
Owner:	THE TRUSTEE OF THE HOSPITALLER BROTHERS OF ST JOHN

G D Jones
Senior Sustainability Officer (Natural Disaster Management)

For: BRIAN BELL
GENERAL MANAGER

The following information is provided from the records of the Council pursuant to the Local Government Act 1993, in response to your request for details of the possible effects on the above land from flooding, tidal inundation, and predicted sea level rises.

Levels shown are in metres on Australian Height Datum (AHD). Refer to Flood Information Sheet attached for information on the AHD.

The likelihood of the land and buildings thereon being flooded can be assessed from the following information:

1. Highest observed flood over or adjacent to the land:

1.20m AHD (1949 Lake flood)

NOTE: Applicants are advised that where highest observed flood levels are stated, this data may not have been observed by Council, but may be the result of local information and, therefore applicants may consider it advisable to carry out their own investigations.

2. Information derived from Flood Studies and Floodplain Risk Management Studies/Plans:

A *Lake Macquarie Waterway Flood Study* and *Lake Macquarie Waterway Flood Risk Management Study and Plan (June 2012)* were undertaken in 2011 and approved by Council at its meeting held on 25 June 2012.

The endorsed *Lake Macquarie Waterway Flood Risk Management Study and Plan* has indicated the following results, which are extracted from Table 7 of the report:

Current Year (using Year 1990 as baseline)	▪ Lake mean still water level	0.10m AHD
	▪ 1 in 20 year probable flood level	1.23m AHD
	▪ 1 in 100 year probable flood level	1.50m AHD
	▪ Probable Maximum Flood level	2.45m AHD

Year 2050 (projected sea level rise 0.4 metres)	▪ Predicted Lake mean still water level	0.50m AHD
	▪ 1 in 20 year probable flood level	1.61m AHD
	▪ 1 in 100 year probable flood level	1.86m AHD
	▪ Probable Maximum Flood Level	2.81m AHD

Year 2100	▪ Predicted Lake mean still water level	1.00m AHD
(projected sea level rise 0.9 metres)	▪ 1 in 20 year probable flood level	2.10m AHD
	▪ 1 in 100 year probable flood level	2.32m AHD
	▪ Probable Maximum Flood level	3.27m AHD

The final inundation levels at the foreshore will depend on the combination of:

- the lake still water level (to include normal and rainfall event conditions)
- the wind wave climate
- the local bathymetry and foreshore structures, and
- the impacts of climate change, including sea level rise

3. **Existing ground levels at site:**

See copy of Detail Survey Plan No 1320 by SurDevel Surveyors dated 28-10-2013, on page 9 below.

4. **Existing Dwelling floor level** ... Not available / applicable

5. **Existing Garage floor level** ... Not available / applicable

The nature and extent of flooding of any land or buildings will be affected by the fill (if any) upon the land and the floor heights of the buildings.

6. Flood Planning Levels:

To reduce the risk from flooding, including predicted sea level rises, over the life of assets, the following flood planning levels have been adopted for new development:

Development Type (including extensions)	Minimum Height Requirements	
Dwellings		
Habitable rooms	1 in 100 year probable flood level for Year 2050 + 500mm freeboard (post and beam rather than slab on ground preferred)	2.36m AHD
Non-habitable rooms and garages	1 in 20 year probable flood level for Year 2050	1.61m AHD
Carports, boat sheds, garden sheds, and other ancillary structures (excluding garages)	No requirement	-
Unsealed electrical installations	1 in 100 year probable flood level for Year 2050 + 500mm freeboard	2.36m AHD
Medium and high density residential development		
Habitable rooms	1 in 100 year probable flood level for Year 2100 + 500mm freeboard	2.82m AHD
Non-habitable rooms and garages	1 in 20 year probable flood level for Year 2100	2.10m AHD
Carports, boat sheds, garden sheds, and other ancillary structures (excluding garages)	No requirement	-
Basement car parking	Constructed to preclude entry of floodwater at levels up to the 1 in 100 year probable flood level for Year 2100 + 500mm freeboard. Basement levels to have a failsafe means of evacuation, and a pump-out.	2.82m AHD at entry
Unsealed electrical installations	1 in 100 year probable flood level for Year 2100 + 500mm freeboard	2.82mAHD

Development Type (including extensions)	Minimum Height Requirements	
Commercial and retail*		
* NOTE: Flood Planning Levels for "Commercial and Retail" also apply to places of public worship, restaurants, clubs, entertainment facilities, warehouses and bulky goods showrooms.		
Internal floor height	1 in 100 year probable flood level for Year 2050 + 500mm freeboard	2.36m AHD
Basement car parking	Constructed to preclude entry of floodwater at levels up to the 1 in 100 year probable flood level for Year 2050 + 500mm freeboard. Additional requirement for basement levels to implement a failsafe means of evacuation, and a pump-out system to remove flood waters.	2.36m AHD at entry
Unsealed electrical installations	1 in 100 year probable flood level for Year 2050 + 500mm freeboard	2.36m AHD
Mixed use development		
Internal floor height	1 in 100 year probable flood level for Year 2100 + 500mm freeboard	2.82m AHD
Basement car parking	Constructed to preclude entry of floodwater at levels up to the 1 in 100 year probable flood level for Year 2100 + 500mm freeboard. Additional requirement for basement levels to implement a failsafe means of evacuation, and a pump-out system to remove flood waters.	2.82m AHD at entry
Unsealed electrical installations	1 in 100 year probable flood level for Year 2100 + 500mm freeboard	2.82m AHD
Industrial		
Internal floor height	1 in 100 year probable flood level for Year 2050	1.86m AHD
Unsealed electrical installations	1 in 100 year probable flood level for Year 2050 + 500mm freeboard	2.36m AHD
Sensitive uses (Residential care facilities, hospitals, etc)		
Internal floor height	Probable Max Flood level Year 2100	3.27m AHD
Unsealed electrical installations	Probable Max Flood level Year 2100	3.27m AHD

7. Applications for approval of/consent to major additions or relocation of existing buildings will be required to observe the relevant floor height (flood planning level) adopted by Council at the time the development proposal is considered by Council. Applications for approval of/consent to minor additions of existing buildings will be considered on the merits of the application.

Additional conditions may apply to applications involving subdivisions (see below).

8. **Implications of climate change and sea level rise:**

Council at its meeting held on 23 July 2012, adopted a *Lake Macquarie Waterway Flooding and Tidal Inundation Policy* for properties located at or adjacent to the lake waterway. This policy accords with expert advice from the NSW Government on sea level rise benchmarks of a rise in the ocean from the Baseline Year 1990 levels, of 0.4 metres by Year 2050 and 0.9 metres by Year 2100. It requires new developments on affected land to apply the Flood Planning Levels (floor levels) recommended by the *Lake Macquarie Waterway Flood Study* and *Lake Macquarie Waterway Flood Risk Management Study and Plan, June 2012.*

The *Lake Macquarie Waterway Flooding and Tidal Inundation Policy* adopts the recommendations from Section 5.3 Flood Hazard Classification of the *Lake Macquarie Waterway Flood Risk Management Study and Plan, June 2012.* Based on the survey information (Sections 3 to 5 above) some or all of the subject property is classified as indicated below.

The hazard category applies to the susceptibility of the land to flooding and inundation, and guides planning and development decisions.

It is not an indication of the risk to buildings, which depends on other factors such as floor height, construction methods, and construction materials.

[X] LOW flood hazard = properties in the flood fringe area between the 1 in 100 year ARI flood for Year 2011 (1.50m AHD) and the limit of the flood planning area (3.0m AHD).

Conditions may apply to new developments to reduce the risk from flooding.

[X] HIGH flood hazard = properties at or below the 1 in 100 year ARI flood level for Year 2011 (1.50m AHD)

Development conditions similar to LOW flood hazard, but additional conditions may apply to new developments to further manage the risk from flooding.

[X] HIGH permanent inundation hazard = properties at or below the Lake mean still water level for Year 2100 (1.00m AHD)

Development conditions similar to HIGH flood hazard, but additional conditions may apply to new developments to further manage the risk from future tidal inundation.

9. Filling

Filling the subject land would require Council's consent.

Filling of flood affected land may have an impact on the nature and extent of flooding downstream or on neighbouring land and generally is not favoured as a planning response on flood prone land.

10. Exempt and complying development in the Flood Planning Area

Development on a flood control lot would need to comply with conditions as defined in SEPP (Exempt and Complying Development) 2008.

11. Other development conditions and approvals

Development approval/consent for this property is dependent on a range of issues, including compliance with all relevant provisions of Lake Macquarie Local Environmental Plan 2004 (LM LEP 2004) and Development Control Plan (DCP) No. 1, including Part 2.1.7 Flood Management and these should be used in conjunction with DCP 2013 (to come into effect when draft LMLEP 2014 comes into effect likely mid 2014).

Copies of these documents and further information in regard to development on this property can be obtained from Council's website. Compliance with these requirements does not guarantee Council will approve a development on this property.

12. Further information

Procedure - Assessing Development Proposals on Land Affected by Sea Level Rise – Version 7, 1 August 2013

Acceptable Solutions for Residential Development - New Subdivisions

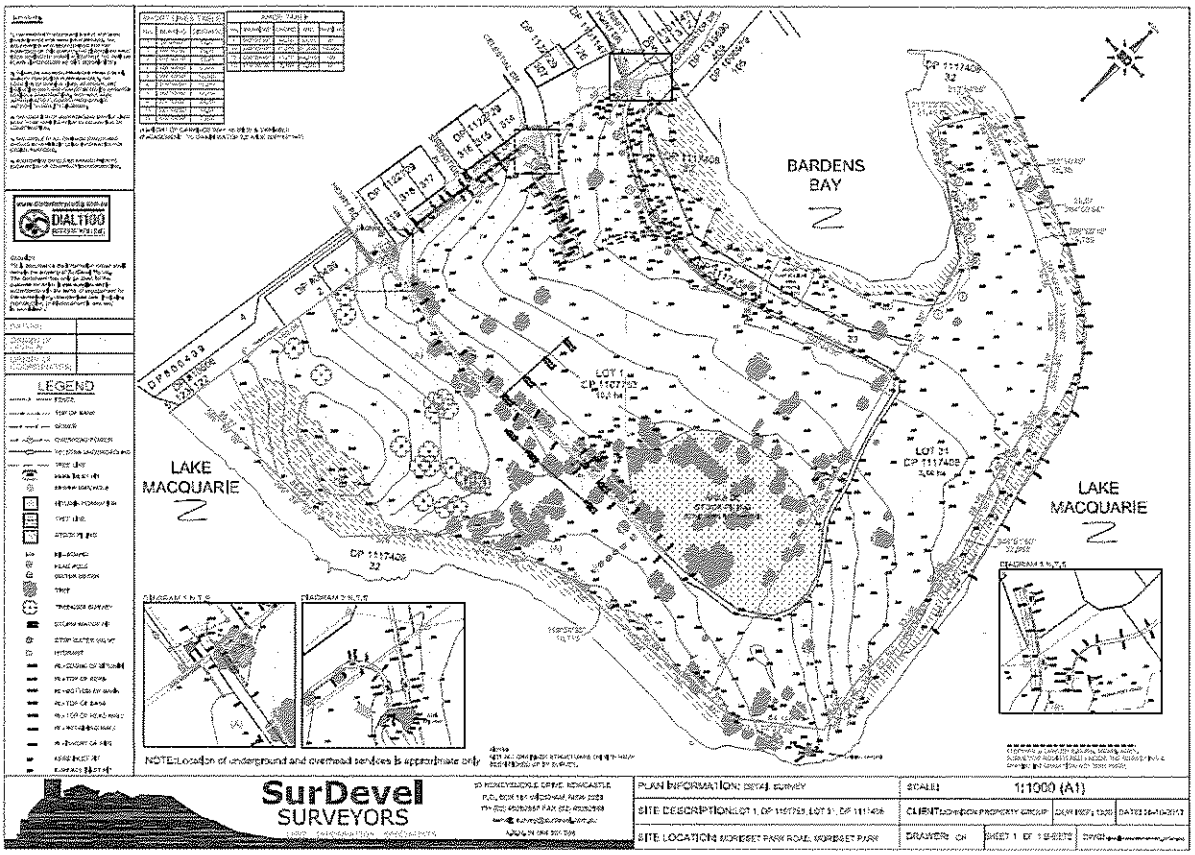
New residential subdivisions in 'greenfield' or new urban area should provide all new roads, other above-ground infrastructure and building envelopes above 3.0m AHD.

Subdivisions in established urban areas with a 2(1) Residential zoning may be considered where each lot has a building area with a minimum area of 250 square metres located at a minimum height of 2.0 metres AHD, and it can be demonstrated that there is adequate flood free access to the site including the impact of sea level rise.

Subdivisions in established urban areas with a 2(2) Residential zoning should be located on land above 3.0 metres AHD, unless it is a subdivision of an approved and constructed development.

Filling sites to achieve these minimum levels will not be supported due to potential impacts on adjoining development, drainage, access, foreshore function, ecological values and visual amenity.

13. This certificate considers the relevant flood and flood planning levels for the specific property. There may be other issues to do with flooding, sea level rise, filling, and emergency access and egress that are not addressed in this document.


BARDENS BAY
LAKE MACQUARIE
LAKE MACQUARIE
LEGEND
NOTE: Location of underground and overhead services is approximate only
SurDevel
SURVEYORS
PLAN INFORMATION: DETAIL SURVEY
SCALE: 1:1000 (A1)
SITE DESCRIPTION: LOT 1, DP 1107759, LOT 31, DP 1117408
SITE LOCATION: MORISSET PARK ROAD, MORISSET PARK

Attachment to Certificate
Flood Explanation Sheet

1 in 100 year Probable Flood Level
The 1 in 100 year flood is one that has a 1% chance of occurring in any year, or has the chance of occurring once every 100 years. The term "100-year flood" is really a statistical probability designation stating there is a 1-in-100 chance that a flood this size will happen during any year. Another interpretation could be the "1-in-100 chance flood". The I in 100 year flood does not mean that if a location floods one year, it will definitely not flood for the next 99 years. Nor, if it has not flooded for 99 years, will it necessarily flood this year. Some parts of Australia have received more than one 1 in 100 year flood in one decade. Lake Macquarie waterway (the Lake) has not experienced a 1 in 100 year flood since written records began 150 years ago. The 1 in 100 year flood is a serious but infrequent event, and is used widely as the risk threshold for flood planning.

1 in 20 year Probable Flood Level
The 1 in 20 year flood is one that has a 5% chance of occurring in any year, or has the chance of occurring once every 20 years. This is a statistical probability, and does not mean that if a location floods one year, it will definitely not flood for the next 19 years. .

The 1 in 20 year flood is less serious but more frequent than the 1 in 100 year flood.

Flood Planning Level (FPL)
The Flood Planning Level is the risk threshold set for new buildings in flood-affected areas, and is usually applied as a minimum floor level. It is commonly based on the 1% (1-in-100 year) flood level plus 'freeboard' (see below).

Freeboard
Freeboard is included in the Flood Planning Level to allow a safety margin for unpredictable factors such as waves, localised hydraulic effects, blockages, flood debris, and uncertainties in the computer flood modelling. A freeboard of 500mm is typically applied to the 1-in-100 year probable flood level for residential / commercial developments (see page 3).

Probable Maximum Flood (PMF)
The Probable Maximum Flood is the largest flood that could feasibly occur. However, it is an extremely rare event. Despite this, some floods in Australia have approached the PMF. Council provides the PMF level on this Flood Certificate, if it is available, to indicate the full extent of risk, even if the chance is very small.

Some essential services (such as hospitals) and retirement housing, are required to locate above the PMF to avoid any risk from flooding.

Australian Height Datum (AHD)
Australian Height Datum refers to the elevation relative to a reference point. In Australia this reference point approximates mean sea level, which is taken as 0.00metres AHD. Flood levels, ground levels, floor levels, and flood planning levels are shown in metres on AHD.