NORTHROP

STORMWATER MANAGEMENT REPORT

Gosford Regional Library

123A Donnison Street, Gosford NSW 2250

PREPARED FOR
Central Coast Council
C/- LahzNimmo Architects
Suite 404, 3 Gladstone Street
Newtown NSW 2042
Tel: 02 9550 5200

Ref: SY200096-CR01
Rev: 3
Date: 28.07.2021

Stormwater Management Report

Revision Schedule

Date	Revision	Issue	Prepared By	Approved By
11.09.2020	1	Issued for Development Application	D. Tenhave	T. Howe
20.10.2020	2	Re-Issued for Development Application	D. Tenhave	T. Howe
28.07.2021	3	Re-Issued for Development Application	E. Flack	E. Flack

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1. General

1.1 Introduction

Northrop Consulting Engineers Pty Ltd (Northrop) have been engaged to prepare a conceptual stormwater management design for the proposed Gosford Regional Library development at 123A Donnison Street, Gosford NSW 2250.

The purpose of this report is to summarise the proposed design solutions for the stormwater management for a Development Application submission to Central Coast Council. The proposed design has been considered with regard to Central Coast Council's Gosford Development Control Plan 2013 (GDCP2013), in particular section 6.7 – Water Cycle Management Guidelines and, Central Coast Council's design guidelines as well as industry best practice.

We note the information contained in this report is not intended to present detailed design solutions but rather provide solutions commensurate with a conceptual design suitable for Development Application assessment.

1.2 Related Reports and Documents

This report is to be read in conjunction with the following reports and documents:

1. Civil Documentation prepared by Northrop:
   - Civil Engineering Drawings 200096 DA1.01 – DA5.01
2. Design Guidelines Developments prepared by Central Coast Council;
3. Water Sensitive Urban Design of Development Control Plan (DCP) prepared by Central Coast Council;
4. NSW MUSIC Modelling Guidelines prepared by NSW Local Land Services August 2015;
5. Using MUSIC in Sydney's Drinking Water Catchment prepared by WaterNSW 2019;

1.3 The Development

1.3.1 Site and Surrounds

The site is located at 123A Donnison Street, Gosford (Lot 100 DP 711850) NSW 2250, within the Gosford city centre in the Central Coast Council (Council) Local Government Area (LGA) and is currently known as the 'Parkside' development. The site is approximately 0.14 hectares, situated between commercial development to the west, tertiary education and the Uniting Church to the east, Donnison Street to the north and a car park on the adjoining site to the rear, accessible off Henry Parry Drive to the south.

The existing site is fully developed, falling generally from south to north based on survey undertaken across the site and immediate surrounds by Project Surveyors.

Refer to Figure 1 below for an aerial image of the current site.

Figure 1: Aerial image of site location

1.3.2 Proposed Development

The development, located at 123A Donnison St, Gosford, proposes to knock down and rebuild the existing development as a community hub primarily incorporating a library, with other facilities such as council meeting rooms, an Innovation Hub, general amenities and car parking on the adjoining site to the rear, accessible via Henry Parry Drive. The development aims to be flexible and accessible to encourage community participation within and pay homage to the local history and geography.

The development is proposed to be accessed from Donnison St by pedestrian traffic at ground level and have a vehicular access loading bay from the car park on the adjoining site to the rear, accessible via Henry Parry Drive, at first level to the south-east.

The development will tie in with existing public domain and street level of approximately RL7.5 and meet the car park on the south eastern corner at approximately RL13, grading down to approximately RL11 at the south western corner.

2. Proposed Stormwater Management Strategy

2.1 General Strategy

Northrop have undertaken the following activities in determining an appropriate, site specific stormwater management strategy:

- reviewed the relevant sections of the DCP and accompanying flood information;
- preliminary assessment of existing and proposed site; and
- had discussions and sought advice from council to determine specific requirements for this development.

In demonstrating compliance with Chapter 6.7 of GDCP2013, this proposed stormwater management strategy has considered the following, which will be discussed in this report:

- Water conservation;
- Stormwater harvesting and reuse;
- Nutrient and pollution control;
- Onsite detention;
- Flooding.

2.2 Water Conservation

The water conservation target for new developments is to reduce potable water demand by 40% through the specification of water saving devices and potable water substitution where appropriate. It is proposed that the redevelopment will incorporate the following water saving measures:

- Using AAA+ efficient taps, hoses and fittings and undertaking regular maintenance of these fixtures;
- The use of 4.5/3 dual flush toilet cisterns;
- Landscaping with plant species that require minimal watering and irrigation with appropriate systems to minimise water loss and evaporation. This includes native plant species, using mulch around garden beds, avoiding watering during windy weather, watering during the coolest parts of the day and using drip irrigation;
- Harvested rainwater from the roof is proposed to be collected and reused for irrigation of landscaped areas and toilet flushing.

It is our opinion that the measures outlined will provide adequate reduction in potable water demand to meet the intent of the water conservation target.

2.3 Stormwater Harvesting and Reuse

The intent of stormwater retention targets is to mimic the natural hydrology from all development sites, in terms of:

- Quantity – the annual volume of stormwater reaching natural creeks and waterways;
- Rate – the peak flow rates leaving the site; and
- Response – the time it takes for rain to runoff the site.

For this development council advice was sought with relation to rainwater harvesting and reuse tank provision. Rather than adopting the deemed to comply sizing methodology outlined in the DCP it was

determined that a site and development specific water balance be undertaken, refer to correspondence with council in Appendix A.

To conduct the water balance exercise rainwater reuse rates were estimated from review of the following publications:

- Central Coast Council Water Cycle Management Guidelines (2007)
- Using MUSIC in the Sydney Drinking Water Catchment (2019)
- Sydney Water Average daily water use

The rates adopted for the water balance exercise are presented in Table 1 below.

Table 1: Average daily reuse demand

Usage	Average demand
Toilet flushing (per fixture)	0.1kL/day
Landscape (per m^2)	0.4kL/yr

The catchment area and rainwater tank was modelled in MUSIC based on historical 6 minute time step rainfall data over 20 years (1974 - 1993) from the Sydney (Observatory Hill) rain gauge.

To determine the optimum and most sustainable tank size for the site the percentage of reuse demand met (%) was plotted against the proposed tank storage volume (m^3). Figure 2, below, demonstrates the water balance exercise undertaken.

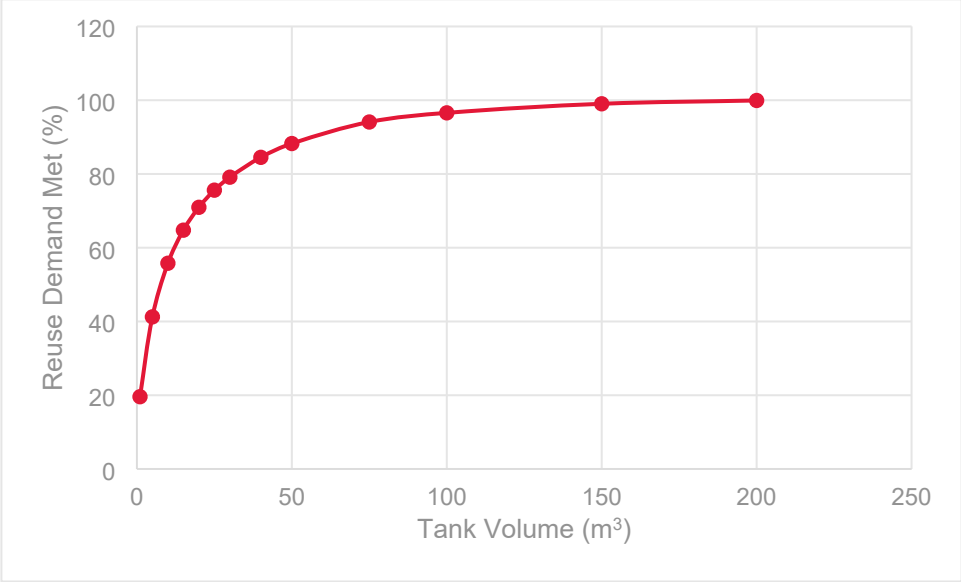

Figure 2: Rainwater Reuse Water Balance

As outlined in the graph, the most significant increase in dement met occurs between 0 and 15 m^3, while increasing the tank sizing incrementally beyond 30m^3 sees a diminishing return (negligible benefit). Based on this assessment it has been determine that provision of a 20m^3 rainwater tank will provide the most sustainable outcome for the project.

2.4 Nutrient and Pollution Control

In order to minimise and adverse impacts upon the ecology of downstream watercourses, stormwater treatment devices have been incorporated into the design of the development. The adopted stormwater quality reduction targets were as specified in Council's Engineering Guidelines, shown in Table 2 below.

Table 2: Water Quality Reduction Targets

Pollutant Criteria	Required Reduction Target (%)
Total Suspended Solids (TSS)	80%
Gross Pollutants (GP)	90%
Total Phosphorus (TP)	45%
Total Nitrogen (TN)	45%

The performance of the proposed stormwater quality management measures was assessed against these targets using the conceptual design software MUSIC (Version 6). The MUSIC model was developed using parameters recommended in the *NSW MUSIC Modelling Guidelines* (WBM, 2018) and Council's MUSIC Link.

The total catchment area was split into sub-catchments representing the areas draining to the treatment devices. A schematic of the MUSIC model if provided in Figure 3 below.

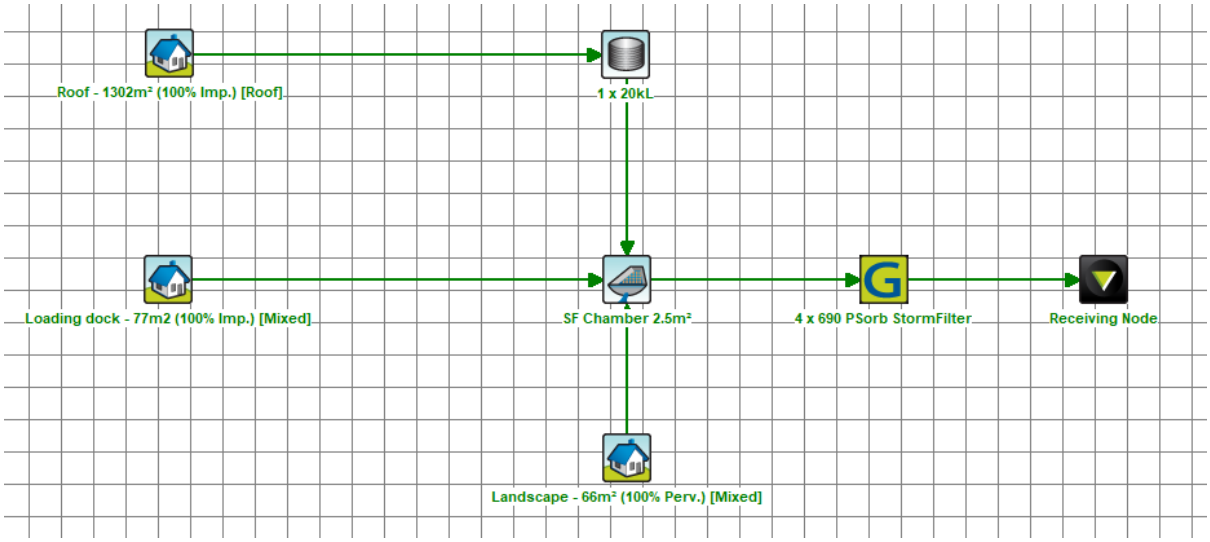

Figure 3: MUSIC Model Schematic

Multiple factors were considered in advising the most appropriate stormwater quality improvement devices (SQIDS). The proposed development footprint, usage and scale was determined to restrict treatment measures to more mechanical systems with no opportunity for more natural treatment methods. In addition to these practical constraints maintenance, operability and aesthetics were considered.

The proposed treatment train incorporates the following measures:

- Primary treatment via the rainwater harvesting tank and first flush devices; and

- Secondary treatment via proprietary Ocean Protect filter cartridges.

The following is a summary of the water quality treatment devices that have been utilised in the proposed treatment train. The modelling parameters can be found in the MUSIC Link report in Appendix B.

- Rainwater Harvesting Tank – Runoff from roof areas is to be directed to a rainwater harvesting tank. The tank is to be fitted with a proprietary first flush device which will effectively remove dead insects, birds and animal droppings and concentrated tannic acids from the stormwater system. The rainwater tank will also provide secondary treatment by acting as an initial sediment trap, collecting suspended solids and nutrients attached to those sediments. The volume collected in the harvesting tank is to be reused as previously outlined in this report.
- Detention Storage – Overflow from the rainwater tank and flow from the stormwater drainage in landscaped areas are collected and directed into an underground detention tank. This also assist to collect gross pollutants and sediments.
- Ocean Protect filter cartridges – Proprietary filter cartridges will be provided within the detention tank that will allow for the treatment of runoff. The filters act to remove fine sediment, suspended solids as well as removing nutrients such as nitrogen and phosphorus before the runoff is discharged offsite.

The Council MUSIC Link rainfall template has been used to create the model. Source nodes have been adopted from the *NSW MUSIC Modelling Guideline* (2018) alongside Council Civil Works design Guidelines. Treatment nodes have been adopted from Ocean Protect.

The MUSIC modelling results for the abovementioned stormwater treatment strategy are in Table 3 below.

Table 3: MUSIC Modelling Results

Pollutant Criteria	Reduction Target (%)	Sources (kg/yr)	Residual Load (kg/yr)	Achieved Reduction (%)
Total Suspended Solids (TSS)	80	58.5	11.1	80.7
Total Phosphorus (TP)	45	0.265	0.06	77.3
Total Nitrogen (TN)	45	3.61	1.42	60.7
Gross Pollutants (GP)	90	39.5	0	100

Note: The MUSIC model can be provided to Council upon request.

Table 3 shows that the proposed stormwater quality management strategy will achieve the required load reduction targets. A copy of the MUSIC Link report has been included in Appendix B.

2.5 On-Site Detention

Northrop have sought advice from Council regarding the provision of on-site detention (OSD) for this development, as the existing site is fully developed and has no existing pervious area. At the advice of Council, we have provided an OSD facility, limiting the post-development discharge rates to undeveloped greenfield conditions for the site area. A copy of this correspondence has been attached to this report in Appendix A.

Runoff from the pre-existing greenfield site and proposed development was modelled using the DRAINS software package, incorporating ARR2019 rainfall data and methodology. The proposed site was calculated to be 93% impervious.

The ILSAX hydrological model in DRAINS was used to generate runoff hydrographs for the pre-existing greenfield and post-developed site. Data from the Bureau of Meteorology (BoM) was used to generate the design storms. Runoff parameters were selected to replicate the site conditions that will be present in the post-developed scenario and that which occurred in the pre-existing greenfield scenario. A summary of parameters used for the model are in Table 4 below.

Table 4: DRAINS model parameters

Parameter	Value
Impervious depression storage	1 mm
Pervious depression storage	5 mm
Time of concentration (pre)	5 min
Time of concentration (post)	5 min
Soil type	2.5

Storm durations ranging from 5 minutes to 360 minutes were investigated for each of the design storm events that were analysed for the catchment of 0.14Ha. For the purposes of the investigation the rainwater reuse tank was not included in the sizing of the OSD facility.

It is proposed that OSD will be provided via an underground tank with a volume of 23.5m^3 dedicated storage. A combination of low and high flow orifices proposed to control the discharge from the post-developed site, with opening diameters of 135mm and 170mm respectively. Both orifice openings discharge into an internal chamber, separated by an internal emergency overflow weir, which then discharges to a proposed extension of the street drainage system in Donnison St. A section through the proposed OSD facility has been included in the Engineering Drawings.

A comparison between the pre-existing and post-developed scenario runoff for design storm events up to and including the 1% AEP are presented in Table 5 below.

Table 5: DRAINS Peak Discharge Comparison

AEP	Pre-existing Peak discharge (L/s)	Post-developed Peak discharge (L/s)
20%	31	30
10%	46	43
5%	60	60
2%	73	72
1%	90	82

As shown above, the peak discharge for all design storms in the post-developed scenario have been detained to equal or less than that for the pre-existing greenfield site, confirming the proposed OSD facility will achieve the design intent.

2.6 Flooding

Northrop have received model extracts of flood level data and inundation mapping for the 1% AEP and PMF storm events in the immediate site surrounds. Upon review of this information, Council were contacted to discuss the implications for the proposed development and provide the following comments:

- The site is not considered to be flood affected;

- There is no applicable Flood Planning Level (FPL) for the determination of floor levels;
- Minor regrading at the interface between the loading dock and vehicular access at the south eastern corner of the site is recommended to discourage overland flows from the existing car park on the adjoining site to the rear entering the loading dock.

The application and received flooding information from Council have been attached in Appendix C.

3. Conclusion

The proposed stormwater management design presented within this report and documented within the Engineering Drawings has been demonstrated to comply with Council's DCP, in accordance with advised requirements exceeding Council's OSD guidelines and industry best practice. The design philosophy is based on the principle of at source treatment, to reduce conveyance infrastructure and manage water quantity and quality aspects.

The proposed stormwater management system has been designed to cater for both frequent and infrequent storm events.

Based on the above, our investigation and concept designs indicate the proposed development can be adequately managed and address all known regulatory and agreed requirements pertaining to stormwater runoff.

Appendix A – Council Correspondence

Dane Tenhave

From: Tim Howe
Sent: Tuesday, 30 June 2020 09:56
To: Anthony Favetta
Cc: Dean McNatty; John Noakes; Michael Horan
Subject: RE: Proposed Gosford Library - 123A Donnison Street, Gosford - Stormwater Requirements

Follow Up Flag: Follow up
Flag Status: Completed

Hi Anthony,

Thank you for the prompt response, that all make sense.

Regarding the site discharge I anticipate we will need to extend the existing Donnison Street drainage, but if we can get the levels to work to discharge to the kerb I will ensure we comply with the below.

In terms of flooding we will lodge a Flood Information Request and go from there.

Kind Regards,

Tim Howe
Senior Civil Engineer

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From: Anthony Favetta <Anthony.Favetta@centralcoast.nsw.gov.au>
Sent: Tuesday, 30 June 2020 9:30 AM
To: Tim Howe <THowe@northrop.com.au>
Cc: Dean McNatty <Dean.McNatty@centralcoast.nsw.gov.au>; John Noakes <John.Noakes@centralcoast.nsw.gov.au>; Michael Horan <Michael.Horan@centralcoast.nsw.gov.au>
Subject: RE: Proposed Gosford Library - 123A Donnison Street, Gosford - Stormwater Requirements

Hi Tim

I do not know what plans may have been prepared for the redevelopment proposed for this site (123A Donnison Street), however, the following is provided in response to your enquiry:

- ***Onsite detention*** *– can Council confirm if OSD is required? We note the site is within the lower third of the catchment and as such OSD will have negligible impact on the receiving system/waters. As noted above the site is also 100% impervious at present.*

The development site will require the provision of on-site detention for the following reasons:

- The site is located uphill of a developed drainage catchment that presently experiences flooding problems. On-site detention is required so that any development on the site does not exacerbate downstream flooding issues.
- Chapter 6.7 of Council's Gosford DCP requires:
  - on-site detention for commercial developments.

- The site to be taken as 0% impervious for the purposes of a redeveloped site in relation to on-site detention calculations.

- There is no existing longitudinal street drainage in Donnison Street within the frontage of the site. Volume 1 of Council's Civil Works Specification requires that where stormwater will connect directly to a kerb & gutter in the street, that the stormwater discharge from the site is to be limited to 25 litres/sec.

In view of the above, on-site detention will be required to limit post development flows back to predevelopment flows (assuming 0% predevelopment impervious area) for all storms up to and including the 1%AEP storm event, and limiting maximum flows to the kerb and gutter to 25 litres / sec. A run-off routing method would be required for the design of the OSD system.

- ***Stormwater retention/reuse*** *– we are proposing to provide a rainwater tank for reuse on site to reduce the demand on potable water. However, noting Council's 'Deemed to Comply' Retention Targets, the development would need to provide approximately 52 cu.m of rainwater storage. Whilst we have not yet carried out reuse calculations it is expected that this volume is well in excess of what can be reused on site and due to the nature of the development there is no scope to provide infiltration or similar. Would Council accept a Water Balance model or similar to size to retention storage?*

A water balance method would be acceptable provided it is realistic in relation to the development proposed on the site and maximises the reuse of water within the development, e.g flushing toilets, irrigating landscaped areas, etc.

- ***Water Quality*** *– are Council's Pollutant Removal Reduction targets as listed in Council Design Guideline applicable to this development? It is noted the deemed to comply methodology in the DCP is not achievable for a development of this nature at the building footprint will take up the majority of the site.*

Water quality reduction targets are applicable to redevelopment of this site as per Chapter 6.7 of Council's GDCP2013. The use of proprietary drainage inserts in pits etc can be utilised within the internal drainage system provided they achieve the reduction targets in the DCP.

- ***Flooding*** *– Council's flood mapping identifies the south-western corner of the site as a 'Flood Planning Area', see extract below. It is understood this may be to do with the coarse scale of the model. Can Council confirm if the site is to be considered flood affected and if flood controls need to be implemented?*

Council's records do not indicate the lot as being a flood control lot, however, it is noted that the rear south-western corner of the site is marginally affected by a flood planning level, and that the rear of the site is affected by overland flows related to the PMF (Probable Maximum Flood). Any future development of the would need to comply with the flood planning level and appropriately consider the impact of stormwater & overland flows that may impact the rear of the subject site associated with the car park on adjoining property (No 123B-125 Donnison Street).

Depending on the size of the development proposed on the site, either a Water Cycle Management Plan or a Water Cycle Management Plan Strategy would need to be prepared and submitted with a future development application for the site as per the requirements of Chapter 6.7 of Council's GDCP2013.

Regards

Anthony Favetta

Please be advised that although Council continues to operate business hours through the developing COVID19 situation, it is likely that Council staff may be required to intermittently or permanently work from home or outside of the office. During this time the preferred method of communication is via email. If you wish to speak to a staff member, please email the relevant staff member to advise that you request a call back, and they will contact you via email and return phone call.

Anthony Favetta
Senior Development Assessment Engineer
Engineering Assessment South
Central Coast Council
P.O. Box 21 Gosford, NSW 2250
t: 02 4325 8204
m: 0408 891 479
e: Anthony.Favetta@centralcoast.nsw.gov.au

Please consider the environment before printing this email

From: Dean McNatty <Dean.McNatty@centralcoast.nsw.gov.au>
Sent: Monday, 29 June 2020 9:01 AM
To: Anthony Favetta <Anthony.Favetta@centralcoast.nsw.gov.au>
Subject: RE: Proposed Gosford Library - 123A Donnison Street, Gosford - Stormwater Requirements

Hi Tony,
Hope you are well! Are you able to assist Tim with his queries regarding development engineering requirements?

Please let me know if you are not the right person for this enquiry.

Thanks
Have a great day!

Dean McNatty
Team Leader
Drainage Assets
Central Coast Council
P.O. Box 21 Gosford, NSW 2250
t: 02 4350 5541
e: Dean.McNatty@centralcoast.nsw.gov.au

Please consider the environment before printing this email

From: Tim Howe <THowe@northrop.com.au>
Sent: Monday, 29 June 2020 8:57 AM
To: Dean McNatty <Dean.McNatty@centralcoast.nsw.gov.au>
Subject: FW: Proposed Gosford Library - 123A Donnison Street, Gosford - Stormwater Requirements

Hi Dean,

I am the Civil/Stormwater Engineer working on the proposed Gosford Library project. Mike Horan, who is the Council Project Manager for the job provided me with your details.
Please see below email, we are wanting to confirm the Stormwater requirements for the site to inform our DA documentation.

Your assistance would be much appreciated. I will follow up either later today or tomorrow to discuss; however, should you have any queries in the meantime please don't hesitate to contact me.

Kind Regards,

Tim Howe
Senior Civil Engineer

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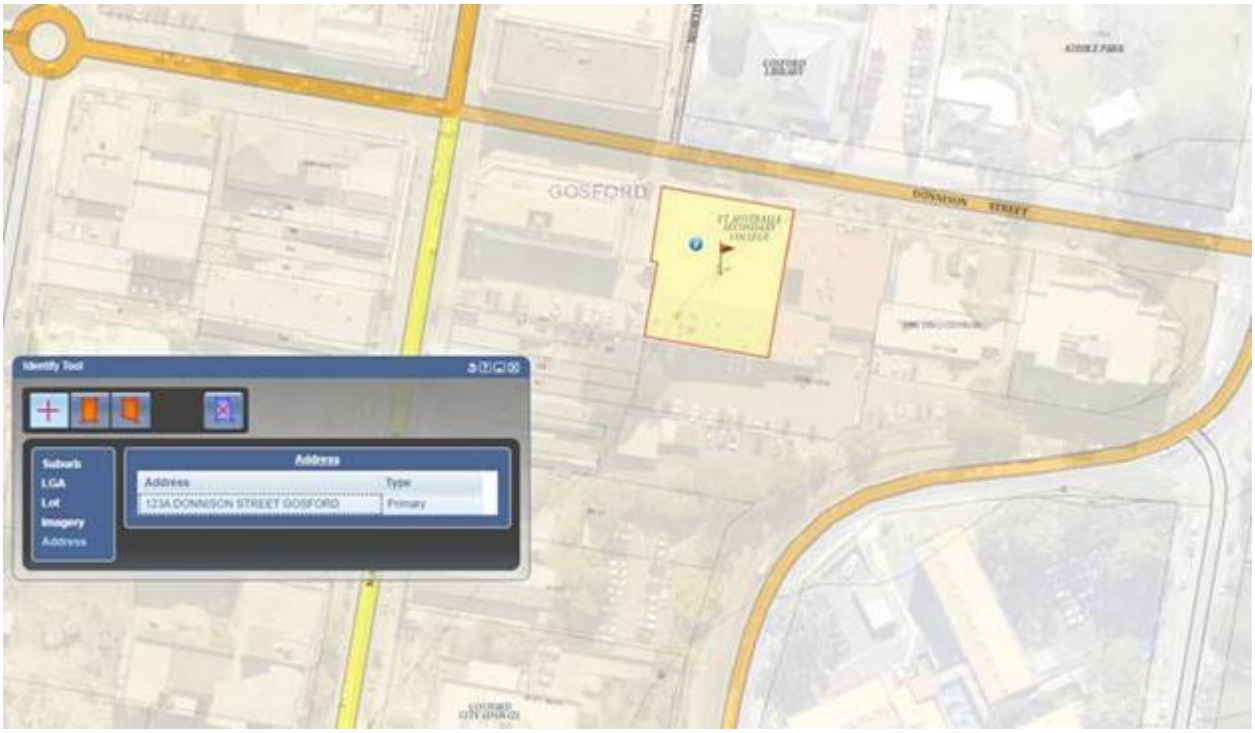
From: Tim Howe
Sent: Wednesday, 17 June 2020 3:30 PM
To: ask@centralcoast.nsw.gov.au
Subject: Proposed Gosford Library - 123A Donnison Street, Gosford - Stormwater Requirements

Attention: Duty Planner

Northrop are the Civil/Stormwater Engineers working on the proposed Gosford Library. The project is currently in the concept development stage and we would like to confirm the stormwater controls to inform our DA documentation.

The Subject site is 123A Donnison Street, Gosford. The site area is 1,450 sq.m (small scale development as described in Chapter 6.7 of the DCP) and is currently contains an existing building (fully impervious).



We are engaged by Lahznimmo Architects, with the ultimate client being Central Coast Council.

- **Onsite detention** – can Council confirm if OSD is required? We note the site is within the lower third of the catchment and as such OSD will have negligible impact on the receiving system/waters. As noted above the site is also 100% impervious at present.

- **Stormwater retention/reuse** – we are proposing to provide a rainwater tank for reuse on site to reduce the demand on potable water. However, noting Council's 'Deemed to Comply' Retention Targets, the development would need to provide approximately 52 cu.m of rainwater storage. Whilst we have not yet carried out reuse calculations it is expected that this volume is well in excess of what can be reused on site and due to the nature of the development there is no scope to provide infiltration or similar. Would Council accept a Water Balance model or similar to size to retention storage?

- **Water Quality** – are Council's Pollutant Removal Reduction targets as listed in Council Design Guideline applicable to this development? It is noted the deemed to comply methodology in the DCP is not achievable for a development of this nature at the building footprint will take up the majority of the site.

- **Flooding** – Council's flood mapping identifies the south-western corner of the site as a 'Flood Planning Area', see extract below. It is understood this may be to do with the coarse scale of the model. Can Council confirm if the site is to be considered flood affected and if flood controls need to be implemented?

Thank you in advance for your assistance.

Please don't hesitate to contact me should you have any queries.

Kind Regards,

Tim Howe
Senior Civil Engineer

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Appendix B – MUSIC Link Report

MUSIC-*link* Report

Project Details		Company Details	
Project:	200096 Gosford Library	**Company:**	Northrop
Report Export Date:	10/09/2020	**Contact:**	D Tenhave
Catchment Name:	14826 - 118 Donnison St	**Address:**	L1 57 Kembla St Wollongong NSW 2500
Catchment Area:	0.145ha	**Phone:**	02 4226 3333
Impervious Area*:	95.17%	**Email:**	dtenhave@northrop.com.au
Rainfall Station:	66062 SYDNEY		
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/1974 - 31/12/1993 23:54:00		
Mean Annual Rainfall:	1297mm		
Evapotranspiration:	1261mm		
MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.33		
Study Area:	Lowland		
Scenario:	Central Coast Development		

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness

Node: Receiving Node	Reduction
Flow	28%
TSS	80.7%
TP	77.3%
TN	60.7%
GP	100%

Treatment Nodes

Node Type	Number
Sedimentation Basin Node	1
Rain Water Tank Node	1
Generic Node	1

Source Nodes

Node Type	Number
Urban Source Node	3

Comments

N/A

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Receiving	Receiving Node	% Load Reduction	None	None	28
Receiving	Receiving Node	GP % Load Reduction	90	None	100
Receiving	Receiving Node	TN % Load Reduction	45	None	60.7
Receiving	Receiving Node	TP % Load Reduction	45	None	77.3
Receiving	Receiving Node	TSS % Load Reduction	80	None	80.7
Sedimentation	SF Chamber 2.5m^2	Exfiltration Rate (mm/hr)	0	0	0
Sedimentation	SF Chamber 2.5m^2	Extended detention depth (m)	0.25	1	0.77
Sedimentation	SF Chamber 2.5m^2	High Flow Bypass Out (ML/yr)	None	None	0
Urban	Landscape - 66m^2 (100% Perv.)	Baseflow Total Nitrogen Mean (log mg/L)	0.11	0.11	0.11
Urban	Landscape - 66m^2 (100% Perv.)	Baseflow Total Phosphorus Mean (log mg/L)	-0.85	-0.85	-0.85
Urban	Landscape - 66m^2 (100% Perv.)	Baseflow Total Suspended Solids Mean (log mg/L)	1.2	1.2	1.2
Urban	Landscape - 66m^2 (100% Perv.)	Stormflow Total Nitrogen Mean (log mg/L)	0.3	0.3	0.3
Urban	Landscape - 66m^2 (100% Perv.)	Stormflow Total Phosphorus Mean (log mg/L)	-0.6	-0.6	-0.6
Urban	Landscape - 66m^2 (100% Perv.)	Stormflow Total Suspended Solids Mean (log mg/L)	2.15	2.15	2.15
Urban	Loading dock - 77m2 (100% Imp.)	Baseflow Total Nitrogen Mean (log mg/L)	0.11	0.11	0.11
Urban	Loading dock - 77m2 (100% Imp.)	Baseflow Total Phosphorus Mean (log mg/L)	-0.85	-0.85	-0.85
Urban	Loading dock - 77m2 (100% Imp.)	Baseflow Total Suspended Solids Mean (log mg/L)	1.2	1.2	1.2
Urban	Loading dock - 77m2 (100% Imp.)	Stormflow Total Nitrogen Mean (log mg/L)	0.3	0.3	0.3
Urban	Loading dock - 77m2 (100% Imp.)	Stormflow Total Phosphorus Mean (log mg/L)	-0.6	-0.6	-0.6
Urban	Loading dock - 77m2 (100% Imp.)	Stormflow Total Suspended Solids Mean (log mg/L)	2.15	2.15	2.15
Urban	Roof - 1302m^2 (100% Imp.)	Baseflow Total Nitrogen Mean (log mg/L)	0.32	0.32	0.32
Urban	Roof - 1302m^2 (100% Imp.)	Baseflow Total Phosphorus Mean (log mg/L)	-0.82	-0.82	-0.82
Urban	Roof - 1302m^2 (100% Imp.)	Baseflow Total Suspended Solids Mean (log mg/L)	1.1	1.1	1.1
Urban	Roof - 1302m^2 (100% Imp.)	Stormflow Total Nitrogen Mean (log mg/L)	0.3	0.3	0.3
Urban	Roof - 1302m^2 (100% Imp.)	Stormflow Total Phosphorus Mean (log mg/L)	-0.89	-0.89	-0.89
Urban	Roof - 1302m^2 (100% Imp.)	Stormflow Total Suspended Solids Mean (log mg/L)	1.3	1.3	1.3

Only certain parameters are reported when they pass validation

Failing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Sedimentation	SF Chamber 2.5m³	Notional Detention Time (hrs)	8	12	0.156
Sedimentation	SF Chamber 2.5m³	Total Nitrogen - k (m/yr)	500	500	1
Sedimentation	SF Chamber 2.5m³	Total Phosphorus - k (m/yr)	6000	6000	1
Sedimentation	SF Chamber 2.5m³	Total Suspended Solids - k (m/yr)	8000	8000	1

Only certain parameters are reported when they pass validation

Appendix C – Council Flood Information

Flood Information Application

Reference No:	5efd1a4ded860
Applicant Details	
Full Name:	Tim Howe
Company Name:	Northrop Consulting Engineers
Position in Company:	Senior Civil Engineer
Address:	L1, 57 Kembla Street
Phone No.:	0424312761
Postal Address (if different from above):	2500
Email:	thowe@northrop.com.au
Property Details	
Suburb:	Gosford
Street:	Donnison ST
Street No.:	123A
Lot No(s):	100
DP/SP No.:	DP711850
Reason for this application	Preparation for Development Application
Details for DA:	Proposed Gosford Regional Library
Is the 1:20 year flood information (5%AEP) required for development or on-site sewer management purposes?	No
Fee ($):	166.00
Terms and Conditions	

Flood levels and minimum floor levels are provided in relation to Council`s current records at the time of application.

Council reserves the right to review and amend these levels from time to time.

Acknowledgement:	I have read and agree to the Terms and Conditions
*** **Office Use** ***	
Browser:	Chrome (Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/83.0.4103.97 Safari/537.36)
Form Id:	917

21 July 2020

Tim Howe
Northrop Consulting Engineers
thowe@northrop.com.au

Minimum Floor Level Enquiry:
Property: Lot 100 DP711850 123A Donnison Street, GOSFORD

This information requested by Northrop Consulting to Prepare a DA for the site. Due to the level differences in site and flooding is from Overland flow we cannot simply give a flood height. After a discussion with Robert Baker, we decided to issue the following maps to get the idea of Overland flow surrounding the site. It is advised that you study the surrounding area shown in below map When you designed the new buildings specially the flow pattern of the rear of the site.

See Attachment to this email for the Maps as referred to above

ENQUIRY DATE:	2 July 2020

DISCLAIMERS: Council provides you with the above information as general advice only, and you should not rely upon that information when making decisions relating to the purchase or development of the above property. Council **strongly recommends** that you seek site specific flooding advice from a suitably experienced expert prior to making any decisions relating to the purchase or development of the above property. That disclaimer and recommendation is provided for the following reasons:

1. The information in the above table is based on Council's records. Those records do not include a recent flood study or a recent detailed survey of the above property. For example, a recent detailed survey would provide precise ground levels for the subject property as well as identify, with precision, the location of any watercourses, drainage structures and systems, overland flowpaths and built structures that might impact on the extent and degree to which the subject property might flood.
   Council does not have sufficient information to provide you with accurate prediction of the likelihood and extent to which the above property might flood, and so cannot provide you with accurate design levels for potential development of that property.

2. Council does not, and cannot, warrant that it will, in its capacity as a consent authority under the *Environmental Planning and Assessment Act 1979*, grant consent to a development application that seeks to erect or use dwellings or other structures on the above property that conform with the levels set out in the above information. As a consent authority, Council is required to consider the suitability of the above property for the specific development proposed as well as consider the requirements of Council's Development Control Plan 2013 – Chapter 6.7 Water Cycle Management (this is available on Council's website).

GLOSSARY OF TERMS

Term	Definition
AHD	The Australian Height Datum (AHD) is the reference level for defining reduced levels adopted by the National Mapping Council of Australia. The level of 0.0 m AHD is approximately mean sea level.
AEP	The Annual Exceedance Probability (AEP) is the chance of a flood of a given or larger size occurring in any one year. Usually expressed as a percentage. Eg a 1% AEP flood event has a 1% chance of occurring in any one year. Equally, it is likely to occur on average once every 100 years.
Minimum Floor Level	The minimum floor level (MFL) provides a freeboard to building within flood prone land. This is also referred to as the Flood Planning Level.
Freeboard	A factor of safety usually expressed as a height above the adopted Flood Level. A freeboard tends to compensate for factors such as wave action and historical and modelling uncertainties.

The information provided in this letter is provided only to you and is not intended to be provided to any third party.

Should you have any enquiries with regard to this letter, please do not hesitate to contact G. Abeywardena on 1300 463 954 during the hours of 8.30am to 5.00pm Monday to Friday.

Yours faithfully,

G. Abeywardena

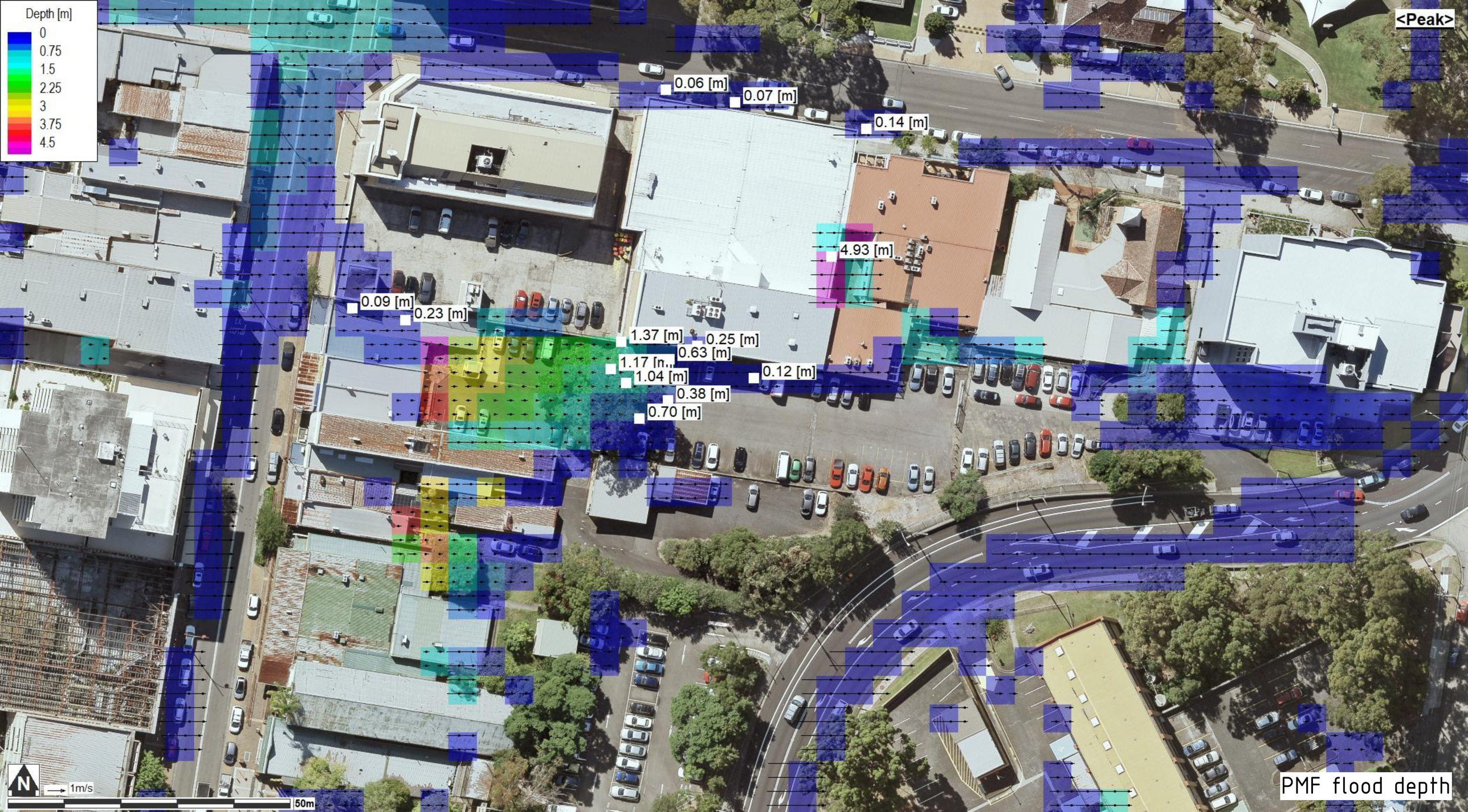
G. Abeywardena

Engineer – Development Assessment

Phone: 1300 463 954
Reference: D14057583


Depth [m]
0
0.75
1.5
2.25
3
3.75
4.5
<Peak>
0.08 [m]
0.06 [m]
0.05 [m]
0.17 [m]
0.54 [m]
0.46 [m]
0.65 [m]
0.65 [m]
0.12 [m]
N
1m/s
50m
100yr flood depth


Level [m]
0
14
28
42
56
70
84
98
<Peak>
6.85 [m]
.39 [m]
8.27 [m]
12.56 [m]
10.58 [m]
10.92 [m]
N
50m
100yr flood level


Depth [m]
0
0.75
1.5
2.25
3
3.75
4.5
<Peak>
0.06 [m]
0.07 [m]
0.14 [m]
4.93 [m]
0.09 [m]
0.23 [m]
1.37 [m]
0.25 [m]
0.63 [m]
1.17 [m]
1.04 [m]
0.12 [m]
0.38 [m]
0.70 [m]
N
1m/s
50m
PMF flood depth


Level [m]
0
21
42
63
84
105
126
147
<Peak>
6.14 [m]
9.66 [m]
6.31 [m]
9.48 [m]
8.27 [m]
7.55 [m]
8.31 [m]
9.10 [m]
6.14 [m]
7.36 [m]
11.45 [m]
13.55 [m]
13.55 [m]
11.87 [m]
12.17 [m]
13.60 [m]
12.36 [m]
12.17 [m]
12.17 [m]
12.73 [m]
14.62 [m]
12.17 [m]
12.17 [m]
12.18 [m]
N
50m
PMF flood level