NORTHROP
Level 1, 215 Pacific Highway Charlestown NSW 2290
PO Box 180 Charlestown NSW 2290
T (02) 4943 1777 F (02) 4943 1577
E newcastle@northrop.com.au

NL161584_B01 [A]

13th May 2016

Core Projects Group
Attention: Mr Tom Elliot
122A Hannell Street
WICKHAM NSW 2293

Dear Tom,

Re: Birdwood Park Development, King Street, Newcastle

Northrop Consulting Engineers have been engaged on behalf of the Core Projects Group to provide engineering design services for the proposed mixed use development, within Lots 6 & 7 DP95174 & Lot 8 DP95173, Hunter Street Newcastle. The site, which previously contained Newcastle City Holden is bordered by King Street to the southwest and existing commercial & residential premises to the remaining sides. A schematic of the area is shown below with the proposed site highlighted in yellow.

Figure 1 – Site Schematic

Prepared	CS	13/05/2016
Reviewed	JH	13/05/2016

Stormwater Management

A stormwater management strategy has been completed in accordance with the Newcastle City Council (NCC) Development Control Plan (DCP) 2012, with special consideration given to Section 7.06 Stormwater and also the Stormwater and Water Efficiency for Development Technical Manual (2015).

Site storage for the development will be provided in accordance with Figure 1 from Section 7.06 of the NCC DCP. Required site storage has been calculated as follows;

Total Site Area	= 2,627 m^2
Impervious Area	= 2,627 m^2 (100%)
Required Storage	= 2,627 (m^2) x 0.025 (m)
	= 66 m^3

It is proposed that this storage volume will be provided via a proposed 66 kL detention tank located on the ground floor of the development. The detention tank shall be designed to limit post development runoff to pre-development flow rates, with all runoff from the site being discharged to the existing stormwater drainage system located in King Street. Please refer to the civil drawings for additional information.

It is noted that the current proposal does not intend to utilize rainwater reuse within the development due to the end use being over 55's accommodation. Traditionally rainwater reuse is not utilized within aged care developments as the untreated water is considered to pose a health risk to residents. Notwithstanding this, there is sufficient space available within the ground floor parking area to accommodate rainwater reuse should it be desired or required.

A MUSIC model was used to ensure the proposed treatment train for the development meets council's stormwater pollution reduction targets. Stormwater runoff from the remaining podium and balcony hardstand and pervious areas will be collected by and conveyed to the proposed ground floor detention tank. The Onsite detention tank will then discharge through a GPT (Humegard or approved equivalent) before it is conveyed to the proposed proprietary treatment device (Humes Jellyfish JF-3000-11-3 or approved equivalent). The below image shows the treatment train and effectiveness for the development modelled in MUSIC.

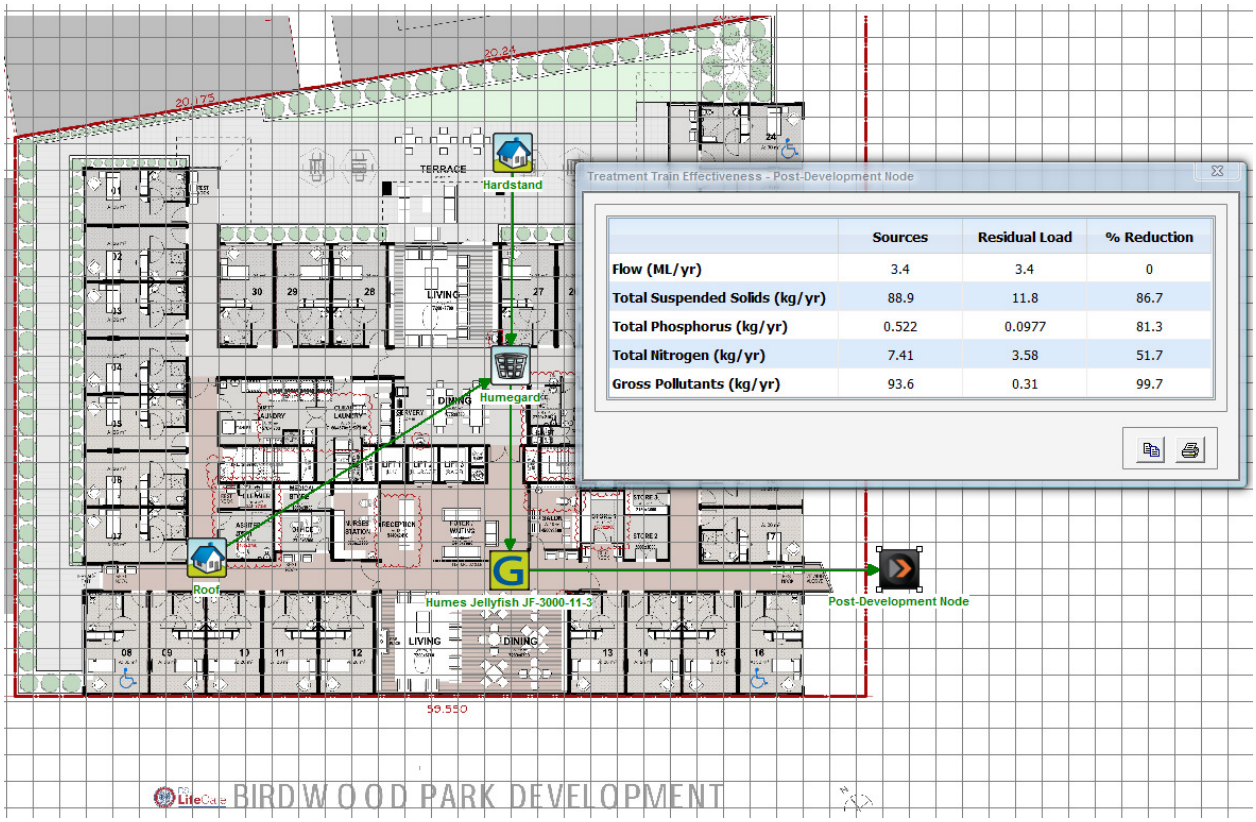

Figure 1 – MUSIC treatment train and effectiveness

Figure 2 above shows the treatment train modelled in MUSIC. Table 1 below summarises the results from the MUSIC model and compares the modelled reduction in pollutants to the council reduction targets from the NCC DCP Section 7.06 Table 3;

Table 1 – MUSIC modelling results

	Sources (kg/yr)	Residual Load (kg/yr)	Reduction (%)	Council Reduction Target (%)
Total Suspended Solids (TSS)	88.9	11.8	86.7	85
Total Phosphorus (TP)	0.522	0.1	81.3	65
Total Nitrogen (TN)	7.41	3.58	51.7	45
Gross Pollutants (GP)	93.6	0.31	99.7	90

Table 1 shows that the treatment train modelled in MUSIC is effective in meeting councils reduction targets for reducing pollutants discharged from the development in stormwater runoff. A report generated from MUSIC-link for Newcastle Council has been included in the attachments of this report. A copy of the MUSIC model is available upon request.

Flooding

A flood certificate obtained from NCC indicates that the site has flood classification of flood storage. Based on Councils information, the site is effected by both the 1% Annual Exceedance Probability (AEP), and the Probable Maximum Flood (PMF) flood event. The critical flood level in the 1% AEP event is estimated to be 2.72m AHD whilst the critical flood level in the PMF is 4.10m AHD.

The NCC DCP Section 4.01 relates to flood development controls. In particular;

- The floor level for habitable rooms should be at the Flood Planning Level (1%AEP + 500mm freeboard).
- Filling should be limited to 20% of the site area.

We note the flood certificate specifies a minimum habitable floor level of 3.22m AHD, this has been adopted as the finished floor level for the proposed ground floor tenancy. Flood refuge will be available on upper levels of the development, which are well above the PMF level of 4.10m AHD.

In order to confirm the impact of the development on flood storage, the volume of storage available below the PMF level for both the proposed developed and undeveloped scenarios has been assessed via 3D surface modelling. Our assessment confirms that the predeveloped volume of 3,624m^3 is reduced to 3,126m^3 in the post development scenario, resulting in a reduction in existing flood storage of approximately 13.8%. This is within Councils limits outlined Section 4.01 of the DCP and summarised above, and is considered to be acceptable.

The above measures described will assist in mitigating the flood risk to both property and life. Through incorporation of these measures into the design we believe the development complies with the flooding requirements of DCP 2012.

Conclusion

Given the results of the above investigations, it is reasoned the development meets NCCs requirements for stormwater management and flooding.

I trust the above meets your requirements; however, if you would like to discuss the development further, then please do not hesitate to contact the undersigned on 4943 1777.

Yours sincerely,

Chris Smith
BEng (Civil) MIEAust
Civil Engineer

ATTACHMENTS

Maintenance and Monitoring

The following details the components of the stormwater system which will require continual monitoring and regular maintenance. The importance of regular inspections and maintenance are fundamental in ensuring the system is functioning as designed. A summary of the items to be considered during monitoring with the associated consequences and recommended actions to be taken are provided below in Table 2.1. It is recommended that all of these inspections be undertaken at three monthly intervals for the first year of operation. Any major problems encountered during this time should be documented and conveyed to the owner to seek appropriate action. To ensure monitoring is occurring regularly a 'Maintenance and Monitoring Schedule' has been included. The time frames in this schedule should be adopted after the initial twelve months. The schedule details the frequency of inspections and the appropriate remediation steps required to ensure adequate operation of the infrastructure. The schedule is to be implemented upon commissioning of the stormwater management infrastructure and remain in place for the life of the development; with all records kept on site for inspection should the approval authority deem it necessary. A less or more frequent schedule may be able to be adopted after the system is fully established depending on the outcomes of the inspections. It is also recommended that inspections take place as soon as possible after any heavy rain or major storm events.

Table 2.1 outlines the potential issues which may occur within the system. These issues have been separated into general site items and device specific monitoring. This summary should be used in conjunction with the Stormwater Maintenance Schedule, where by the following are considered when carrying out inspections. The general items listed would be visually apparent during day to day activities. If an issue is identified appropriate action should be taken immediately, waiting until the next scheduled monitoring inspection is not advised.

Table 2.1 - Monitoring and Maintenance Summary

Item to be Monitored	Monitoring Task	Purpose of Monitoring	Maintenance Action
GENERAL			
Sub-soil drains	• Ensure that sub soil pipes are not blocked to prevent filter media and plants from becoming waterlogged.	• If the sub soil pipes become blocked, percolation of water through the system may be reduced, resulting in poor treatment performance and permanent waterlogging of the plants and filter media.	• Flush sub soil drains.
Sediment build up	• Check for built up of sediment in pre-treatment devices. • If sediment build up is noted, identify source of sediment.	• If sediment accumulates in the detention basin, percolation of water into the media may be reduced, resulting in poor treatment performance.	• Once sediment source is identified and stabilised, remove accumulated sediment by flushing the system.
Erosion or Scour	• Check for erosion and scour around the structures. • If scour is noted check for source of scour.	• Erosion impairs filtration systems by preventing uniform distribution of flow from the detention basin. • If left untreated, small concentrations of erosion can quickly spread over large areas becoming costly to repair.	• Once source of damage is identified and rectified, infill any holes with appropriate filter media. • Provide energy dissipation if required. • Replace any damaged plants to meet the design plant schedule.
Litter (Organic)	• Check for litter in and around treatment areas.	• Organic litter can provide an additional source of nutrients to the filtration systems. • Accumulated organic matter can also cause offensive odors and can reduce percolation of water into the filter media.	• Address source of organic litter with appropriate action. • Remove litter.
Litter (Anthropogenic)	• Check for litter in and around treatment areas and structures.	• Litter can potentially block the inlet and outlet structures resulting in flooding, as well as detract from the system's visual amenity.	• Address source of litter with appropriate action. • Remove litter.

Item to be Monitored	Monitoring Task	Purpose of Monitoring	Maintenance Action
DEVICES			
Inlet and Outlet Pits	• Ensure inflow areas and grates over pits are clear of litter and are in good/safe condition. • Check for dislodged or damaged pit covers and ensure general structural integrity.	• If the pits become blocked it is likely to cause the basins to not function correctly. • Dislodged or damaged pit covers can be a safety hazard.	• Remove debris and repair any structural damage as required.
Detention Tank	• Check for build up of sediment in pre-treatment trash racks.	• If sediment accumulates in the detention tank, the orifice controlled outlet may become restricted meaning that detained water will not discharge from the device as intended.	• Remove all sediment from the upstream trash racks. If sediment is suspected to be in the tank flush with potable water.
Proprietary Treatment Devices (Humegard and Jellyfish or approved equivalent)	• Check for build up of sediment and larger pollutants/rubbish	• If proprietary systems become overfull then there removal efficiencies are reduces, allowing a greater amount of stormwater pollutants to leave the system	• Remove all sediment and pollutants/rubbish in accordance with manufacturer's specifications.

THE CITY OF NEWCASTLE

MUSIC-*link* Report

Project Details		Company Details	
Project:	Birdwood Park	**Company:**	Northrop Consulting Engineers
Report Export Date:	5/13/2016	**Contact:**	Jordan Hoey
Catchment Name:	NL161584_Birdwood MusicLink	**Address:**	
Catchment Area:	0.379ha	**Phone:**	489431777
Impervious Area*:	100%	**Email:**	
Rainfall Station:	61078 WILLIAMTOWN		
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/2002 - 31/12/2006 11:54:00 PM		
Mean Annual Rainfall:	974mm		
Evapotranspiration:	1730mm		
MUSIC Version:	6.1.0		
MUSIC-link data Version:	6.0		
Study Area:	Newcastle		
Scenario:	Newcastle		

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

Treatment Train Effectiveness

Node: Post-Development Node	Reduction
Flow	2.04E-07%
TSS	86.7%
TP	81.3%
TN	51.7%
GP	99.7%

Treatment Nodes

Node Type	Number
GPT Node	1
Generic Node	1

Source Nodes

Node Type	Number
Urban Source Node	2

Comments

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
GPT	Humegard	Hi-flow bypass rate (cum/sec)	None	None	0.031
GPT	Humegard	IN - Gross Pollutant Mean Annual Load (kg/yr)	None	None	93.6
GPT	Humegard	OUT - Gross Pollutant Mean Annual Load (kg/yr)	None	None	15.8
Post	Post-Development Node	% Load Reduction	None	None	2.04E
Post	Post-Development Node	GP % Load Reduction	90	None	99.7
Post	Post-Development Node	TN % Load Reduction	45	None	51.7
Post	Post-Development Node	TP % Load Reduction	65	None	81.3
Post	Post-Development Node	TSS % Load Reduction	85	None	86.7
Urban	Hardstand	Area Impervious (ha)	None	None	0.263
Urban	Hardstand	Area Pervious (ha)	None	None	0
Urban	Hardstand	Total Area (ha)	None	None	0.263
Urban	Roof	Area Impervious (ha)	None	None	0.116
Urban	Roof	Area Pervious (ha)	None	None	0
Urban	Roof	Total Area (ha)	None	None	0.116

Only certain parameters are reported when they pass validation