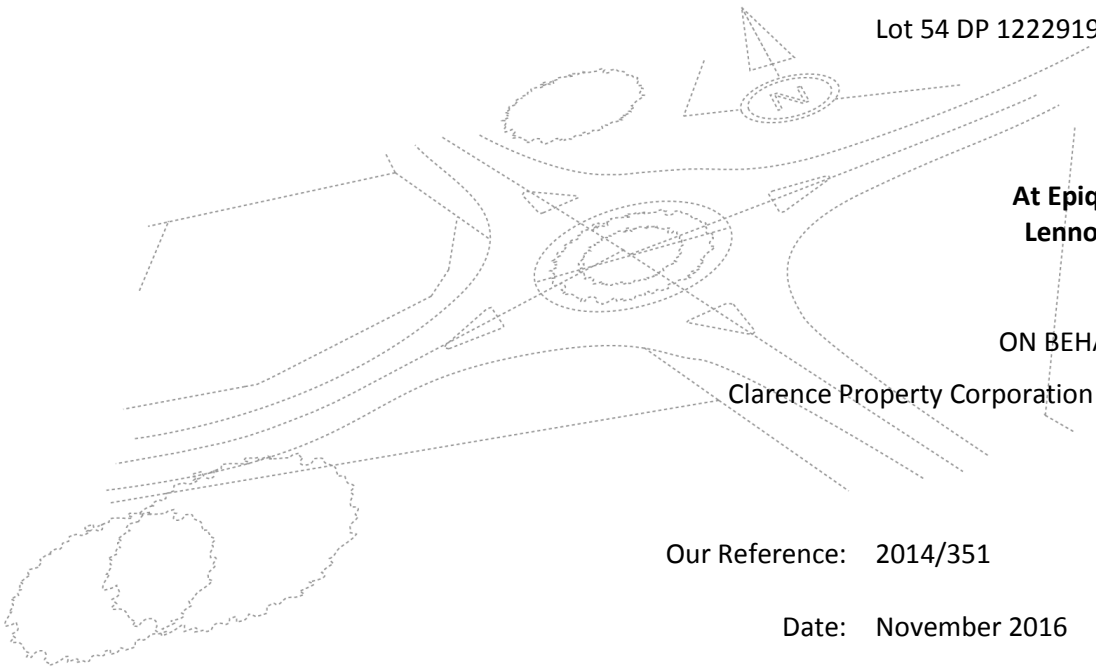
• JOHN NEWTON B. Surv; M.I.S. Aust. • TONY DENNY B. Surv; (Hons); M.I.S. Aust. • DAMIAN CHAPELLE BTP. CPP

Engineering Services Report

Modification to Concept & Project Plan Approval for
Mixed Residential / Commercial Development
Epiq Supermarket Precinct
Concept Approval 07_0026
Stage 2 and Stage 6

Upon:

Lot 54 DP 1222919



At Epiq Estate
Lennox Head

ON BEHALF OF:

Clarence Property Corporation Pty Ltd

Our Reference: 2014/351

Date: November 2016

Newton Denny Chapelle
CONSULTING SURVEYORS & PLANNERS

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Revision History

REVISION #	DATE	DESCRIPTION	ORIGINATOR	APPROVED
A	17/11/2016	Issued for Use	CP	DC

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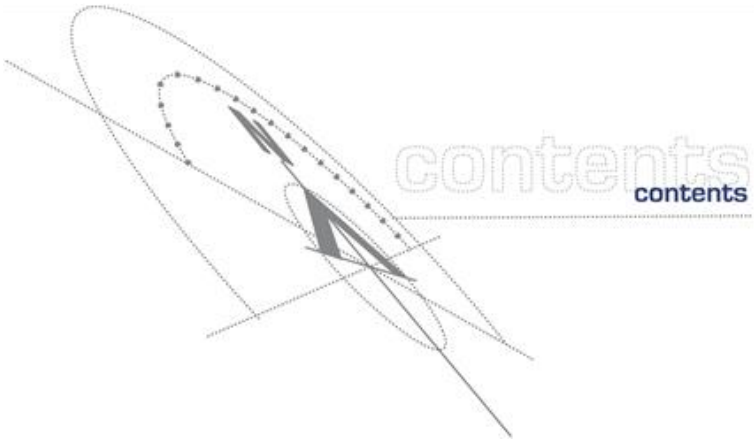

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Appendices

Appendix A	**Architectural Lennox Head Retail Centre Concept Plan** - CCN Architects Plan P1624-SK-02-E

Note: Please also refer to the Concept Plans attached with the modification

1 Introduction

Newton Denny Chapelle has been engaged by Clarence Property Corporation Ltd to prepare an Engineering Services Report to accompany a modification to the 07_0026 Concept Approval. The development has previously been known as Pacific Pines and is now referred to as Epiq Lennox. Epiq is located at Lot 54 DP1222919, Lennox Head, NSW.

The total development site is approximately 80.5ha in size with this modification relating to the area surrounding the proposed neighbourhood centre also referred to as the supermarket precinct. The supermarket precinct is approximately 6.32ha and is located on the western side of the greater development site (refer Figure 1-1).

Figure 1-1 – Epiq Estate Development Site

The supermarket precinct is a mixed use precinct comprising of both commercial and residential allotments.

This report covers the engineering requirements (traffic, earthworks, stormwater and servicing) for the proposed modification. Several elements of the engineering design have already been completed as part of previous approvals (eg stormwater, traffic) issued by Ballina Shire Council for the estate. This report is intended to append the original designs where necessary and also demonstrate that the proposed engineering modifications meet the relevant consent conditions.

2 Report Scope

This report focuses on providing sufficient concept engineering design details to facilitate a thorough understanding of the proposed works. The works covered by this report include new infrastructure for traffic, earthworks, stormwater (quality and attenuation) and servicing provisions for the proposed development.

It is recognised that a subsequent submission of detailed engineering design plans and specifications are required to be made before final approval of the development by Ballina Shire Council. At this stage any minor amendments of the design elements proposed will be addressed to meet any of the concerns raised through the approvals process.

2.1 Reference Documents

The following documents have been used in the preparation of this report:

- Gilbert + Sutherland, *Revised Stormwater Assessment & Management Plan, Pacific Pines Estate, Montwood Drive & Hutley Drive, Lennox Head, New South Wales, July 2014*
- Ballina Shire Council, *Ballina Development Control Plan 2012 - Chapter 3 – Urban Development*
- Cardno Eppell Olsen, *Pacific Pines Estate, Traffic and Transport Statement, November 2011*
- Ballina Shire Council – *Stormwater Management Standards for Development – 2015*
- Ardill Payne and Partners, P*roject Application Stage 1, Engineering Report – Pacific Pines Subdivision*
- Water Services Association of Australia, *Sewerage Code of Australia, WSA 02-2002*
- Geolink, *Water Reticulation Hydraulic Analysis – Addendum Report*
- Geolink, *Investigation of Gravity Sewer Augmentation On Hutley Drive*
- Cardno Eppell Olsen, Pacific Pines Estate, Traffic & Transport Statement, November 2011
- Northern Rivers Local Government – *Development Design Manual*
- Ballina Shire Council, *Development Control Plan - Chapter 13 – Stormwater Management 2006*
- SMEC Urban, *Pacific Pines Estate - Water Reticulation Hydraulic Analysis, March 2012*
- SMEC Urban, *Pacific Pines Estate – Dual Reticulation Analysis, Letter Dated 30 March 2012*

3 Site Description

3.1 Existing Site Conditions

The site primarily consists of cleared land previously used for agricultural activities. The greater site area is currently subject to construction works associated with construction of previous stages of the Epiq development. The previous works undertaken on the site include:

- Stage 1A – 51 Residential allotments on the southern side of the site
- Stage 1B – The extension of Hutley Drive and construction of the sports fields

The supermarket precinct generally grades north east to south west with an average slope of approximately 7.5%. The areas surrounding the precinct can be summarised as:

- Northern Boundary – Is formed by Super Lot 8 and Stage 3. Construction of this area is expected to begin in the short term with the construction approvals currently before Ballina Shire Council.
- Eastern Boundary – Is formed by Stoneyhurst Drive and the future stages of Epiq Estate

- Southern Boundary – Is formed by Main Street constructed as part of Stage 1B
- Western Boundary – Is formed by Hutley Drive constructed as part of Stage 1B

3.2 Description of Previously Approved Development

The supermarket precinct has previously been approved as part of Concept Approval 07_0026. Refer to Figure 3-1.

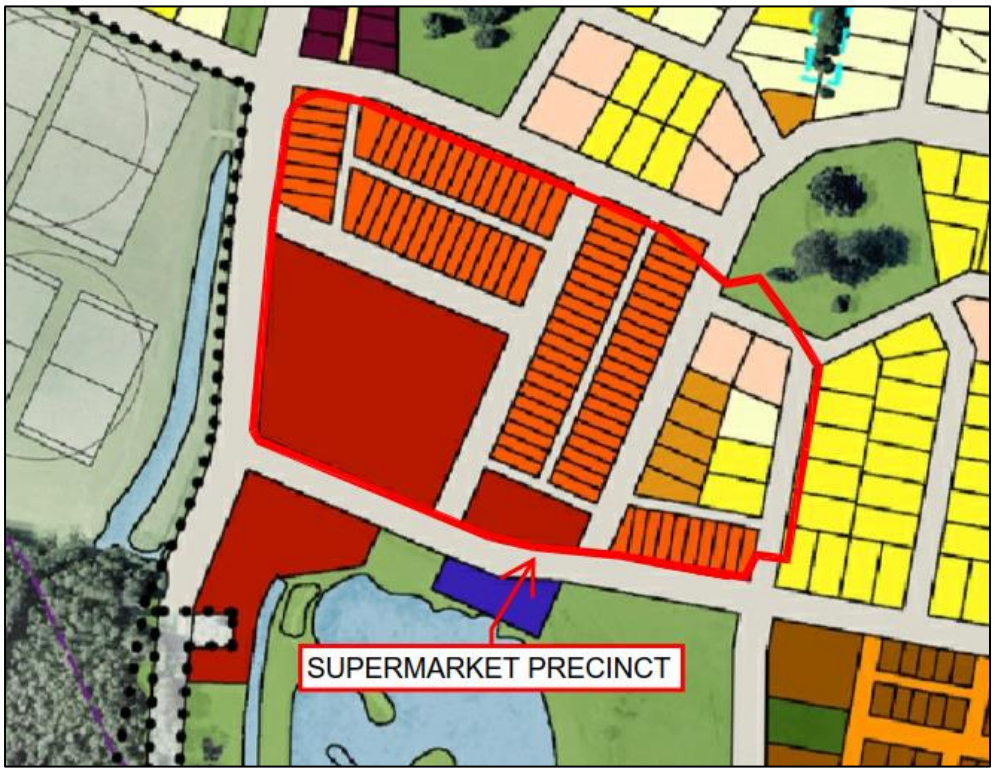


Figure 3-1- Excerpt from Geolink Illustration C8 Lot Typologies

The approved site consists of 89 dwelling allotments and a 16,410m² commercial area. The previously approved lot configuration is summarised in Table 3-1.

Table 3-1 - Summary of Lot Typologies

Type of Development	Quantity
Rear Lane Lots	79
Small Affordable Lots (450-600m²)	5
Duplex Lots (900m²)	2
Traditional Lots (600-800m²)	2
Traditional Lots (>800m²)	1
Neighbour Centre (Commercial)	16,410m²

3.3 Description of Proposed Modification

The proposed modification includes increasing the commercial area by 4,650m² to approximately 21,060m². The number of equivalent dwellings is expected to decrease by 16 to 73 and a 3,000m² Childcare centre has been repositioned with the neighbourhood centre (refer to Figure 3-2).

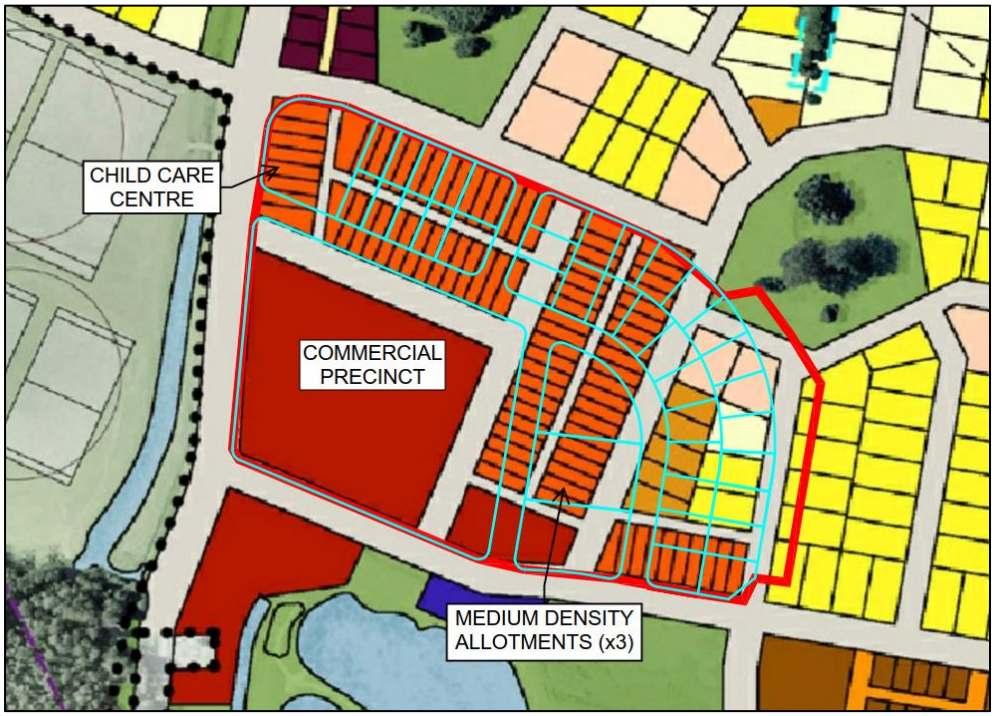


Figure 3-2 Proposed Modification Overlaid on Geolink Illustration C8 Lot Typologies

The proposed modified layout is summarised in Table 3-2.

Table 3-2 - Summary of Modified Lot Typologies

Type of Development	Quantity
Residential Allotments	35
Medium Density Allotments*	3 (6,906m²)
Childcare Centre	1 (3,000m²)
Neighbour Centre (Commercial)	21,060m²

*Based on the maximum density permitted in the zoning of 1 dwelling per 250m² there are 27 equivalent dwellings

4 Bulk Earthworks and Geotechnical Considerations

The construction of the commercial site is expected to involve significant bulk earthwork activities. The site will be levelled to provide a base pad between RL2m to RL5m with the works requiring a maximum cut of approximately 5.7m. Retaining structures to a maximum height of 5.7m will be required along the northern and eastern boundaries.

As per consent condition *C2 – Acid Sulfate Management Plan* an acid sulfate management plan will be prepared during detailed design for all works below 10m AHD.

5 Road Layout and Site Access

Modification to the approved road layout throughout the supermarket precinct is proposed (refer Figure 5-1). Access will primarily be from Hutley Drive and Main Street. The works will require the construction of a portion of Stoneyhurst Drive along the eastern boundary of the site with the roads bounding the remainder of the precinct being constructed as part of previous works.

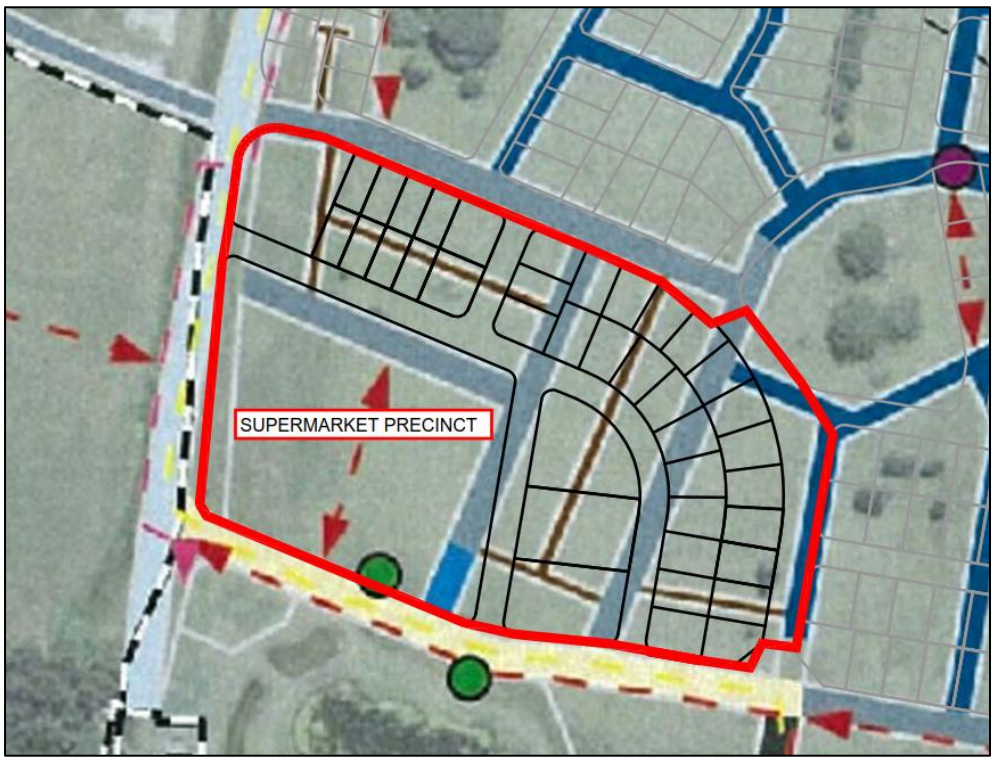


Figure 5-1 - Modified Site Road Layout

5.1 Road Hierarchy and Pedestrian Access

The road hierarchy for the supermarket precinct and future stages has been updated to reflect the characteristics outlined in the *Northern Rivers Development Design and Construction Manual* and as specified in condition B5 – Road Hierarchy of the current consent. The *Illustration C6* previously approved has also been updated for the supermarket precinct (and future stages) to reflect this condition and to remove confusion surrounding the hierarchy of the road network. A 1.35m wide foot path will also be provided on all local streets where possible in accordance with Ballina Shire Councils current footpath standard.

6 Revised Traffic Assessment

6.1 Background Information

Analysis of the Road network surrounding development has been previously undertaken in 2011[1] by Cardno and further revised in 2014[2] based on additional information supplied by Ballina Shire Council. The existing network capacity and current traffic volumes for the surrounding road network are summarised in Figure 6-1:

Table 2 2014 Surveyed Volumes and Available Capacity

Road Name	Environmental Capacity (Vehicles per Day)	2014 Surveyed Volumes (Vehicles per Day)	Spare Capacity (Vehicles per Day)
Montwood Drive	3,500	1,712	1,788
Henderson Lane	3,500	1,634	1,866

Figure 6-1 - Surveyed Volumes and Available Capacity (Cardno 2014)

[1] Lennox Head - Pacific Pines Estate - Traffic and Transportation Statement prepared by Cardno Eppell Olsen (November 2011)

[2] Letter response to Council RFI dated 10th July 2014 prepared by Cardno (Qld) Pty Ltd

6.1.1 Previous Traffic Assessments

The expected traffic volumes for the development have been previously assessed by Cardno in 2011 and revised in 2014. This assessment was based on the expected development yield outlined in Figure 6-2:

Table 3 Proposed Development Yield

Stage	Residential (Dwellings)	Senior, Assisted and independent Living (Dwellings)	Commercial and Retail (GFA)
1A	54		
1B	92		4,800
2	154		
3	37	145	
4	77		
5	57		
6	42		
Total	**513**	**145**	**4,800**

Figure 6-2 - Development Yield (Cardno 2014)

Based on the expected development configuration, the daily traffic generation rates and Cardno's self-contained assumptions, the previous assessment determined the number of vehicles per day (vpd) the proposed development would generate. The previous Cardno external traffic figures are summarised in Table 6-1 below:

Table 6-1 - Summary of External Traffic Generation (Cardno 2014)

Cardno Stage	Total External Traffic Generation (vpd)
1A	306
1B	1683
2	924
3	393

4	462
5	342
6	252
Total:	**4362**

6.2 Exceedance of Network Capacity and Council Approval

Cardno previously highlighted that the whole development cannot be serviced by the existing road network alone, with the extension of Hutley Drive required to service the fully developed site. In the Cardno addendum letter dated 10th July 2014 it is highlighted that Cardno Stage 6 (refer Figure 6-3Table 6-1) cannot be released as the capacity of the existing road network is exceeded (ie Henderson Lane and Montwood Drive). To service the fully developed site requires the northern connection of Hutley Drive to be completed.

Figure 2 Network Option 2

Figure 6-3 - Cardno Staging Plan (Network Option 2)

Upon completion of the first 5 stages Cardno estimated the existing network capacity along Henderson Lane and Montwood Drive would be exceeded by 456 vpd (refer Figure 6-4).

Table 5 Network Option 2 Capacity Analysis

	Resultant External Traffic Generation		
Stage	**Montwood Drive**	**Henderson Lane**	**Total**
Capacity	*3,500*	*3,500*	*7,000*
1A	230	77	306
1B	697	986	1,683
2	624	300	924
3	265	128	393
4	312	150	462
5	231	111	342
Existing	1,712	1,634	3,346
TOTAL	**4,070**	**3,386**	**7,456**

Figure 6-4 – Cardno External Traffic Generation

6.3 Previous Exceedance of the Local Traffic Network

As part of previous project approvals the Cardno traffic study has been exhibited with the temporary local road capacity exceedance noted. The exceedance outlined in the report of 456 vpd has been put before the Ballina Shire Council Ordinary Council meeting on the 23rd October 2014. The following documents have been endorsed by Council:

- Geolink Cover Letter dated 17th October 2013
- Lennox Head - Pacific Pines Estate - Traffic and Transportation Statement prepared by Cardno Eppell Olsen (November 2011)
- Letter response to Council RFI dated 10th July 2014 prepared by Cardno (Qld) Pty Ltd

MINUTES OF THE ORDINARY MEETING OF BALLINA SHIRE COUNCIL HELD IN THE BALLINA SHIRE COUNCIL CHAMBERS 40 CHERRY STREET BALLINA, ON 23/10/14 AT 9.00 AM

9.1 Pacific Pines Development Lennox Head

231014/2 RESOLVED

(Cr Ben Smith/Cr Sharon Cadwallader)

That Council endorses the approval of the Traffic and Transportation Statement for the remaining stages of the Pacific Pines Estate development by staff for the purposes of meeting the Minister for Planning's condition of consent requiring preparation and Council approval of a traffic management plan prior to the release of a construction certificate for Stage 1B of the Pacific Pines Estate.

FOR VOTE - Cr David Wright, Cr Sharon Cadwallader, Cr Keith Williams, Cr Keith Johnson, Cr Ken Johnston, Cr Paul Worth, Cr Robyn Hordern and Cr Ben Smith
AGAINST VOTE - Cr Susan Meehan
ABSENT. DID NOT VOTE - Cr Jeff Johnson

Figure 6-5 - Excerpt from Council Meeting Minutes 23/10/2014

As shown above the temporary exceedance of the local road network by 456 vehicles a day has been approved by Council. This exceedance has been adopted as part of the revised traffic assessment.

6.4 Revised Traffic Generation Rates

The trip generation rates and development configurations outlined by Cardno have been revised based on current RMS standards and Local Traffic Data. The staging, number of dwellings and commercial areas have also been revised based on the current proposed development configuration. The staging and revised development yields are outlined in Figure 6-6 and Table 6-2.

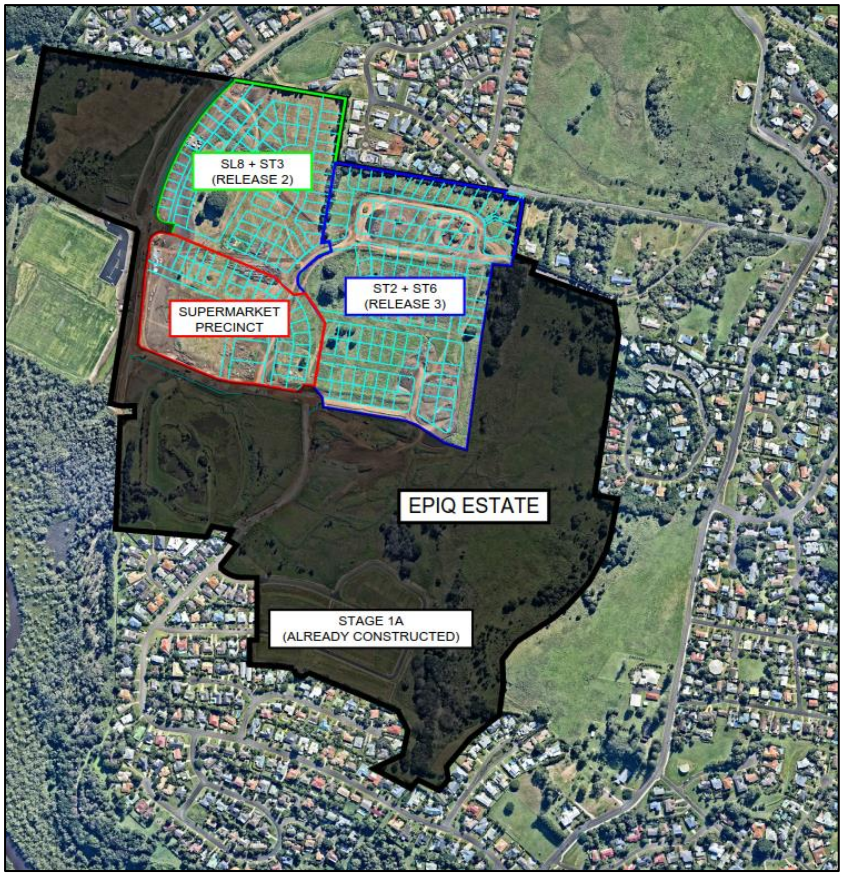


Figure 6-6 – Epiq Estate Proposed Staging

Table 6-2 - Revised Development Yield

Epiq Releases	Revised Proposed Yield			
	Residential (Dwellings)	Medium Density (Dwellings)*	Commercial / Retail (GFA – m²)	Child Care Centre (m²)**
1A	51			
1B				
2 (SL8+ST3)	82			
Supermarket	35	27	5350	3000
3 (ST2+ST6)	120			

*The number of dwellings has been based on the maximum density allowed for the zoning (1 dwelling/250m² - total area 6,906m²)

**The total number of children used for the calculations is 90

6.4.1 Residential Development

The traffic generation rates for the residential component of the development have been adopted in accordance with the local trip generation rates outlined in the Ballina Shire Council Road Contribution Plan.

Table 6-3 - Ballina Shire Residential Trip Generation Rates

Category	Daily Trip Rate
Residential Dwelling (3+ Bedrooms)	6.45 trips/dwelling
Residential Dwelling (1-2 Bedrooms)	3.9 trips/dwelling

The traffic generated by the residential component of the development has been divided into internal and external trips as recommended in Section 3.3.1 of the Guide to Traffic Generating Developments (RMS). In accordance with the RMS, 75% of all trips will travel external to the development with 25% of trips staying within the development. **Table 6-4** outlined the expected daily trips to be generated by the residential component of the development.

Table 6-4 - Daily Vehicle Trips Generated by the Residential Development

Epiq Releases	Residential (vpd)			Medium Density (vpd)		
	I[1]	E[2]	T[3]	I[1]	E[2]	T[3]
1A	82	247	329	0	0	0
1B						
2 (SL8+ST3)	132	397	528.9	0	0	0
Supermarket	56	169	225.8	26	79	105
3 (ST2+ST6)	194	581	774	0	0	0
Totals:	**464**	**1393**	**1858**	**26**	**79**	**252**

[1] Internal Trips

[2] External Trips

[3] Total Trips

6.4.2 Supermarket

The traffic generation rates for supermarkets have been investigated in detail in the "*Trip Generation and Parking Demand of Shopping Centres, Analysis Report, Halcrow for the NSW Roads and Traffic Authority, September 2011"*. Halcrow states that the total trip generation rate for a shopping centre is dependent on the retail categories within the centre and proportion of gross leasable floor area (GLFA) each of these categories occupy. The revised retail categories proposed by Halcrow are:

- A(S): Slow trade includes major department stores such as David Jones and Myer, furniture, electrical and whitegood stores
- A(F): Faster trade includes discount department stores such a K-Mart and Target, together with larger specialist stores, eg Lowes, Lindcraft, etc
- A(SM): Supermarket includes stores such as Woolworths, Coles, IGA, Franklins and large fruit markets
- A(SS): Speciality shops / Secondary retail / Automobile services includes smaller retail outlets (eg clothing, jewellery, hairdressers, footwear, fast food, delicatessens, newsagents, sports stores, chemists, service stations, etc)
- A(OM): Offices / Medical / Child Care / Other including medical centres, general business offices, child care, library, etc
- A(C): Cinemas

The GFA for the development has been determined from the CCN Architects plan P1624-SK-02-E (Appendix A). As suggested in Section 3.6.1 of the *RTA Guide to Traffic Generating Developments* a GLFA of 75% of the GFA has been adopted. The areas for each retail component of the supermarket precinct are summarised in Table 6-5.

Table 6-5 - Summary of Supermarket Precinct Retail Areas

Use	Revised Retail Category	GFA (m^2)	GLFA (m^2)
Supermarket	A(SM)	3,400	2,550.0
Shops, Kiosk and Commercial	A(SS)	1,750	1,312.5
Offices	A(OM)	200	150.0

Halcrow proposed the following daily and peak hour traffic generation rates for shopping centre sites based on GFLA:

Daily Vehicle Trips (DVT)

Thursday:
DVT = 0.288 A(S) + 0.074 A(F) + 1.455 A(SM) + 0.288 A(SS) + 1.787 A(OM) – 0.167 A(C)
Friday:
DVT = 0.175 A(S) + 0.327 A(F) + 1.171 A(SM) + 0.165 A(SS) + 0.975 A(OM) – 0.702 A(C)

Site Peak Hour Vehicle Trips

Thursday:
PVT = 0.017 A(S) + 0.003 A(F) + 0.137 A(SM) + 0.032 A(SS) + 0.164 A(OM) – 0.011 A(C)
Friday:
PVT = 0.031 A(S) + 0.032 A(F) + 0.134 A(SM) + 0.016 A(SS) + 0.158 A(OM) – 0.033 A(C)

Halcrow also determined that 54% of trips generated by a shopping centre were a single point trip while 46% were linked to another activity (ie visiting another location on the way to or the way home from the shopping centre). Accounting for linked trips within the development a reduction of external trips of 35% has been applied to the shopping centre.

Table 6-6 - Summary of Supermarket Traffic Generation

Supermarket Daily Vehicle Trips (vpd)		
	Gross Trips	Trips with Linked Trip Allowance
Thursday	4356	2832
Friday	3349	2177
Supermarket Peak Vehicle Trips (vph)		
	Gross Trips	Trips with Linked Trip Allowance
Thursday	416	270
Friday	386	251

6.4.3 Child Care Centre

The traffic generation rates for child care centres are outlined in the *RTA Guide to Traffic Generating Developments*. As the final configuration of the facility and the enrolment structure is unknown the worst case traffic generation rates for a pre-school has been adopted for the development. It is also assumed that the centre will have a maximum enrolment of 90 children.

It is considered that the total vehicle per day generated by the child care centre can be approximated as the total sum of the morning and afternoon peak trips (as the traffic during the day will be minimal). An additional allowance of 10% of the total trips has made for staff shift changes

and deliveries that are likely to occur during the day. The trips expected to be generated by the Child Care Centre are summarised in Table 6-7.

Table 6-7 - Traffic Generation - Child Care Centre

	Peak Rate	Total Trips vpd
Morning Peak Trips/Child	1.4	126
Afternoon Peak Trips/Child	0.8	72
Staff and Delivery Allowance	-	19.8
		217.8

6.4.4 Traffic Generation and Capacity Summary

This assessment has not considered the fully developed Epiq Estate as the existing Road capacity along Henderson Lane and Montwood Drive is exceeded before the site is fully developed. The assessment has considered the likely short to midterm development of the site (including the previously developed Stages 1A and 1B). The additional traffic forecast to be generated in the midterm is summarised in Table 6-8.

Table 6-8 - Summary of External Traffic Generation

Epiq Releases	Residential (vpd)	Medium Density (vpd)	Commercial / Retail (vpd)	Child Care Centre (vpd)**
1A	247			
1B				
2 (SL8+ST3)	397			
Supermarket	169	79	2832	218
3 (ST2+ST6)	581			
Sub-totals:	**1393**	**79**	**2832**	**218**
Total:	**4522**			

The outcome of the traffic assessment has identified that there will be sufficient capacity to service the proposed shopping centre precinct. The traffic assessment is summarised in Table 6-9 and shows that there is sufficient capacity to service the supermarket precinct (including the previously developed stages).

Table 6-9 - Summary of Revised Traffic Assessment

Capacity of Surrounding Road Network	7,000 vpd
Current Traffic Volumes on Surrounding Road Network	3,346 vpd
Current Excess Capacity of Surrounding Road Network	3,654 vpd
Previously Approved Temporary Increase on surrounding Road Network	7,456 vpd
Current Excess Capacity with Approved Temporary Increase	**4,110 vpd**
Traffic Generated from fully developed Supermarket Precinct (Inc 1A, 1B and SL8+ST3. Exc ST2+ST6)	**3,941 vpd**

As described in the Cardno assessment (10 July 2014) the theoretical capacities of individual links (Henderson Lane or Montwood Drive) may be exceeded at certain times until the construction of Hutley Drive is completed. The exceedance of this theoretical capacity is acceptable as it is considered that the traffic would balance itself out between the access links.

6.4.5 Limits on Future Land Release

The revised traffic assessment has identified that the local road network will exceed its approved capacity during the development of Stage 2 and Stage 6 (developed after the supermarket precinct). The assessment has identified that the existing road network (Henderson Lane and Montwood Drive) has insufficient capacity and the extension of Hutley Drive will be required for further development. The extension of Hutley Drive will increase the capacity of the local road network by 10,000 vehicles per day and is expected to be sufficient to service the entire Epiq Estate.

The development of Stage 2 and Stage 6 is likely to yield 120 residential allotments. Until the construction of the Hutley Drive extension the existing local road network will limit the release of this stage to a maximum of 35 residential lots (refer Table 6-10).

Table 6-10 – Development Limitations due to External Road Network Capacity

Epiq Releases	# Residential Dwellings	Residential (vpd)	# Medium Density Dwellings	Medium Density (vpd)	Commercial / Retail (GFA m²)	Commercial / Retail (vpd)	Child Care Centre (Places)	Child Care Centre (vpd)
1A	51	247	-	-	-	-	-	-
1B	-	-	-	-	-	-	-	-
2 (SL8+ST3)	82	397	-	-	-	-	-	-
Supermarket	35	169	27	79	5350	2832	90	218
3 (ST2+ST6)	35	169	-	-	-	-	-	-
Sub-totals:	**203**	**982**	**27**	**79**	**5350**	**2832**	**79**	**218**
Trips Generated:	**4110**							
Allowable Trips:	**4110**							

6.5 Intersection Upgrades

Cardno identify the intersections at Henderson Lane/North Creek Road and Montwood Drive/North Creek Road require upgrading to a CHR and a CHR(s) to handle the increase in traffic generated by the development. Once upgraded Cardno nominate that these intersection has sufficient capacity to service the fully developed site (ie at the capacity of the road network). These upgrade works are currently being undertaken as part of the Super Lot 8 and Stage 3 works and will be completed prior to the supermarket precinct.

6.6 Traffic Modification to Concept Approval

The traffic assessment outlined in this report is intended to demonstrate that the proposed modifications to the supermarket precinct can be serviced by the existing road infrastructure and address the requirements outlined in Section 5.2 of the *Director-General's Environmental Assessment Report Pacific Pines Estate, Lennox Head – Modification to Concept Plan and Project Approvals*. Table 2 of the *Director-General's* report regarding the upgraded and staging of project has been updated based on:

- The revised traffic assessment outlined in Section 6.4 of this report
- The lot yields outlined in Table 3 of the Revised Traffic assessment by (Cardno 2014) and the assisted living and senior lots outlined in Table 2 of the *Director-General's* report

The amended timing of road and intersection upgrades required in response to revised staging of the project (Director-General Report - Table 2) is provided in Table 6-11.

Table 6-11 – Amended – Director General Table 2: ***Timing of road & intersection upgrades required in response to revised staging of project***

Access Arrangement	Road/Intersection Upgrades Required	Development Yield Potential (approx. external vehicle trips generated)
Vehicles use Montwood Drive (South) & Hutley Drive/Henderson Lane (North)	Upgrade Henderson Lane/North Creek Road and Montwood Drive/North Creek Road intersections. (currently being completed as part of super lot 8 and stage 3 works)	= 5,350m² retail/commercial (2832) = 90 place child care centre (218) = 27 medium density dwellings (79) = 203 residential dwellings (982)
Vehicles use Montwood Drive (South), Hutley Drive/Henderson Lane (North) & Hutley Drive/North Creek Road Intersection	Extend Hutley Drive to North Creek Road with new intersection	= 283 remaining residential lots (1825) = 78 assisted and independent living dwellings (117) = 59 seniors lots (44)

As the traffic generated by the development is dependent on many variables such as the type of shops that make up the neighbourhood centre, it is recommended that a restriction based on the capacity of the surrounding network (7,456 vpd) is adopted in preference to the number of residential lots remaining. Further to the total capacity of the surrounding network a restriction on the traffic on Montwood Drive shall not exceed 3,701 vpd as previously approved by Ballina Shire Council. This will ensure the capacity of surrounding local road network is not exceeded with this traffic study to be revised for each subsequent stage to ensure compliance.

7 Stormwater Management

This section has been prepared as a supplement to the current '*Revised Stormwater Assessment & Management Plan'* prepared by *Gilbert and Sutherland* for the *Pacific Pines Estate* (now referred to as the Epiq Estate). It is intended to address condition C12 of the Concept Approval:

> ***C12 Stormwater Management***
> All future applications for development on the site are to include a detailed stormwater management plan for the proposal. These management plans shall be consistent with the Stormwater Management Plan required by term B6 of this approval.

Figure 7-1 - Excerpt from Pacific Pines - Concept Approval (MP 07_0026)

The primary purpose of this supplement is to confirm that the proposed stormwater control devices previously detailed by others and installed onsite are sufficient for any proposed changes in the layout of the subdivision. The devices installed onsite are detailed in the previous work undertaken by Gilbert and Sutherland, Geolink, and Ardill Payne and Partners. Should this review indicate that additional devices are necessary to achieve the required targets, the type, size and location of any additional devices will be detailed in this section.

7.1 Stormwater Objectives

The stormwater objectives for the site are defined in Condition B6 of the Pacific Pines – Concept Approval (MP 07_0026), see Figure 7-2 below:

> ***B6 Stormwater Management Plan***
> The proponent is to prepare a stormwater management plan for the entire site, prepared by a suitable qualified person(s) that includes detailed modelling for both water quality and quantity. The plan shall demonstrate:
> 1) That the project does not concentrate or lead to an increase in the volume or rate of flow of stormwater discharged from the site over and above pre-development flow conditions; and
> 2) That the project does not increase the average annual load of key stormwater pollutants in stormwater discharged from the site over and above pre-development conditions.
> 3) that all stormwater infrastructure is located outside the conservation zone area.
> The plan is to be prepared in accordance with the Water Sensitive Urban Design requirements of *Ballina Shire Combined Development Control Plan Chapter 13 – Stormwater Management.*
> The stormwater plan is to be submitted to and approved by Council prior to the issue of a Construction Certificate for Stage 1A.

Figure 7-2 - Excerpt from Concept Approval (MP 07_0026) - Stormwater Management Plan

The stormwater infrastructure for the site has previously been sized by *Gilbert and Sutherland* in accordance with the above project approvals. Stormwater attenuation and quality treatment devices have previously been nominated by *Gilbert and Sutherland* to ensure there is no increase in peak flows or the discharge of key stormwater pollutants from the site. This modification will assess the effectiveness of the previously designed control devices and recommend modifications to the system (as required) to ensure these objectives are achieved.

7.2 Stormwater Quality

Gilbert and Sutherland have previously modelled the development in the MUSIC software package to ensure that there is no increase in key pollutant loads post development. The water treatment for the supermarket precinct has been designed as part of the water treatment for the greater site, refer Figure 7-3.

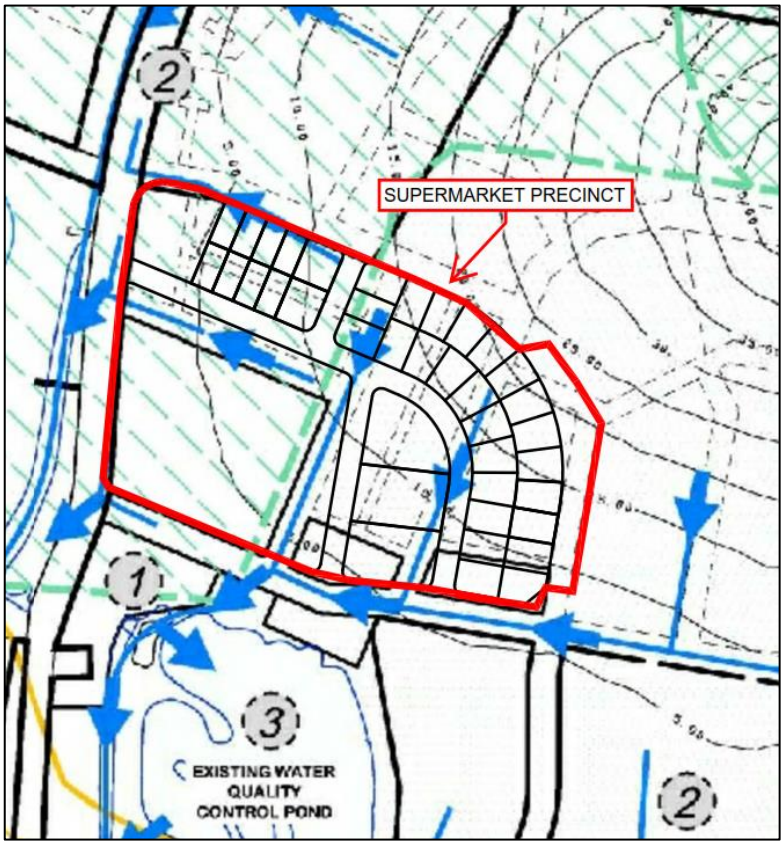


Figure 7-3 - Excerpt from Geolink Illustration C7 - Stormwater Concept Plan

As shown in Figure 7-3 the majority of the supermarket precinct receives primary treatment via a sediment basin (1) before draining to the existing water quality control pond (3). The remaining area bypasses treatment and is discharged into the swale on the western side of Hutley Drive.

7.2.1 Previous Modelling

The previous modelling undertaken by Gilbert and Sutherland has identified the supermarket precinct as being within two post development catchments (catchments 12 and 15), refer to Figure 7-4 and Figure 7-5.

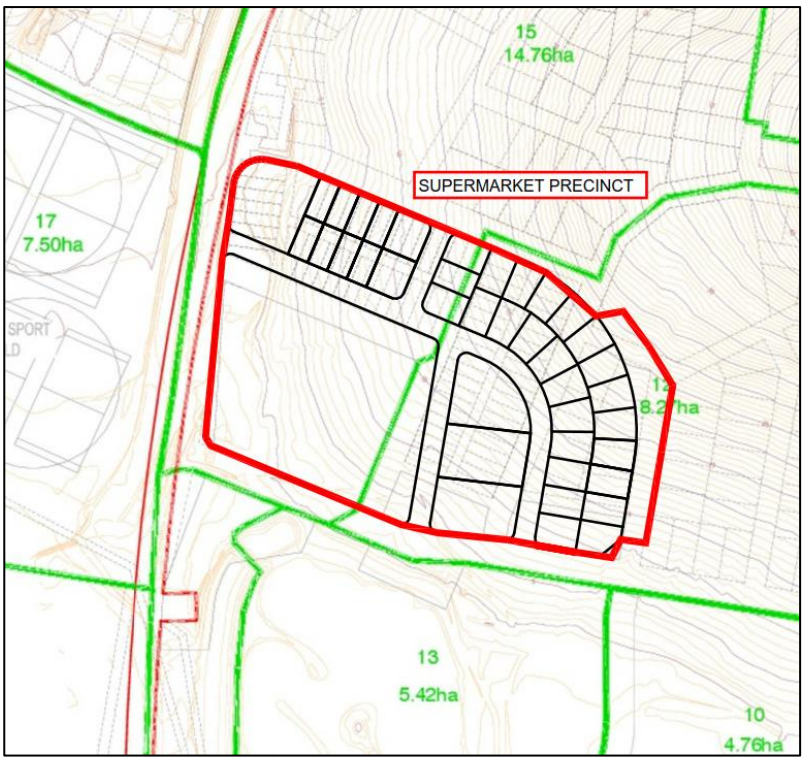


Figure 7-4 - Excerpt from G+S MUSIC Model Catchment Plan - DWG 10734-1.3-D

Catch	Area	Forest	Rural	Urban	Commercial	Townhouse	Totals
1	7.72	0.00	2.02	5.70	0.00	0.00	7.72
2	12.91	0.00	2.41	10.50	0.00	0.00	12.91
3	9.08	0.00	4.27	4.81	0.00	0.00	9.08
4	1.71	0.00	1.71	0.00	0.00	0.00	1.71
5	8.77	0.00	0.91	7.86	0.00	0.00	8.77
6	3.89	0.00	3.89	0.00	0.00	0.00	3.89
7	6.07	0.00	6.07	0.00	0.00	0.00	6.07
8D	7.00	0.00	0.00	7.00	0.00	0.00	7.00
8A	0.71	0.00	0.00	0.71	0.00	0.00	0.71
8B	1.09	0.00	0.00	1.09	0.00	0.00	1.09
8C	3.40	0.00	0.00	3.40	0.00	0.00	3.40
9	4.14	0.00	0.00	4.14	0.00	0.00	4.14
10	4.76	0.00	4.22	0.54	0.00	0.00	4.76
11	6.09	0.00	1.76	4.33	0.00	0.00	6.09
12	8.27	0.00	0.98	6.84	0.45	0.00	8.27
13	5.42	0.00	5.25	0.00	0.17	0.00	5.42
14	3.83	0.00	1.99	1.27	0.57	0.00	3.83
15	14.76	0.00	1.03	12.29	1.44	0.00	14.76
16	6.53	0.00	1.56	4.97	0.00	0.00	6.53
17	7.50	0.00	7.50	0.00	0.00	0.00	7.50
Totals	123.65	0.00	45.56	75.45	2.63	0.00	123.65

Figure 7-5 - MUSIC Catchment Areas - Excerpt from G+S Revised Stormwater Assessment 2014

An excerpt from the MUSIC model for these catchments is shown below in Figure 7-6

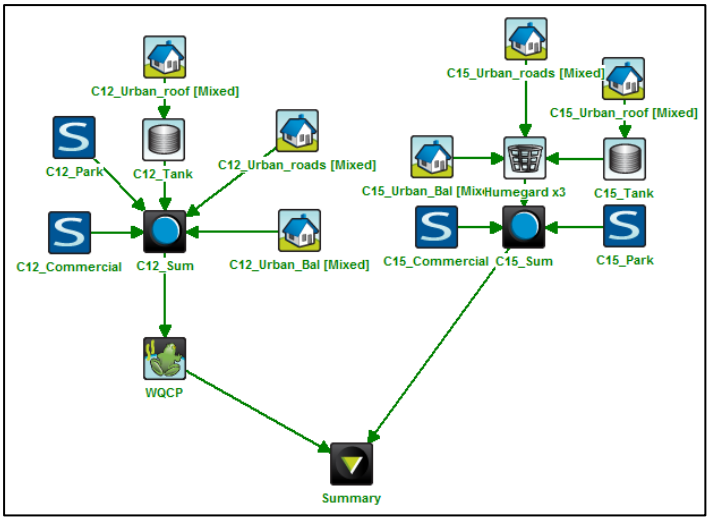


Figure 7-6 - Excerpt from G+S MUSIC Model

Note that the 3 Humegard units modelled as part of catchment 15 are currently being installed as part of the Super Lot 8 / Stage 3 works. The residual loads discharged from the site based on the original approved layout are summarised in Table 7-1.

Table 7-1 - Summary of MUSIC Results

Type of Pollutant	Residual Load
Flow (ML/yr)	252
Total Suspended Solids (kg/yr)	27300
Total Phosphorous (kg/yr)	59.1
Total Nitrogen (kg/yr)	407
Gross Pollutants (kg/yr)	839

7.2.2 Revised Modelling

To ensure the proposed modification complies with the conditions of consent the MUSIC modelling for catchment 12 and 15 has been revised to reflect the proposed changes to the supermarket precinct. The proposed modification increases the commercial area by 4,650m² and also decreases the park area by approximately 1000m². It is noted that the previously approved commercial precinct is estimated to be 16,410m² based on the approved plan and has been conservatively modelled previously at 18,900m². The total areas of both catchments stay constant, refer Table 7-2.

Table 7-2 - Revised MUSIC Catchment Areas

Catch	Area	Forest	Rural	Urban	Commercial	Townhouse	Totals
12	8.27	0.00	0.88	7.10	0.29	0.00	8.27
15	14.76	0.00	1.03	11.92	1.81	0.00	14.76

To compensate for the increase in the commercial area (with its associated greater impervious area and higher pollutant generation characteristics) an additional Gross Pollutant Trap (GPT) has been

incorporated in the design to treat the commercial area in catchment 15. This area previously discharged into the swale on the western side of Hutley Drive without any prior treatment. Refer to the revised MUSIC model in Figure 7-7.

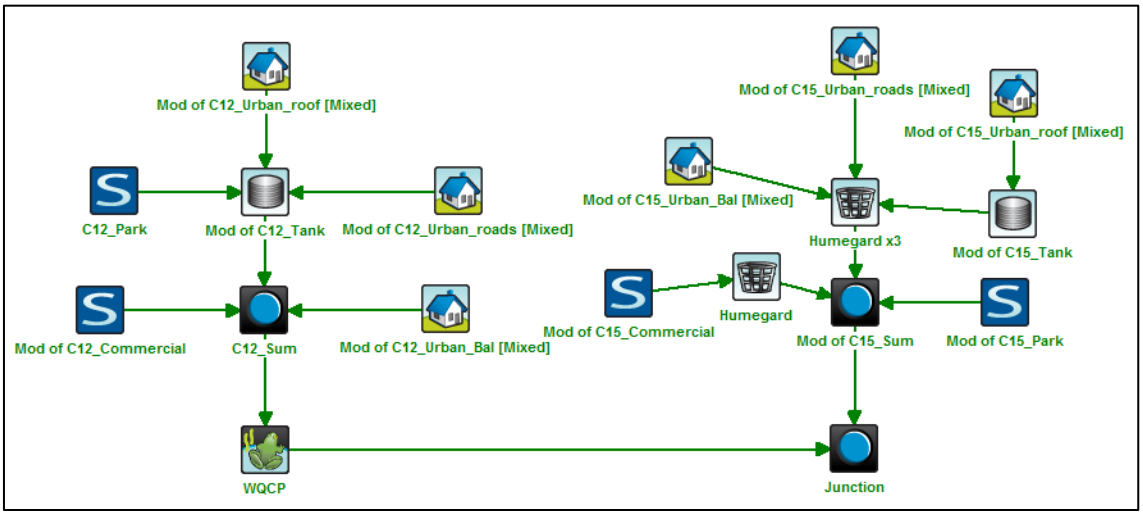


Figure 7-7 - Revised MUSIC Model

The residual pollutant loads calculated by the MUSIC Model are summarised in Table 7-3.

Table 7-3 - Revised MUSIC model results

Type of Pollutant	Residual Load
Flow (ML/yr)	255
Total Suspended Solids (kg/yr)	24700
Total Phosphorous (kg/yr)	56.4
Total Nitrogen (kg/yr)	395
Gross Pollutants (kg/yr)	410

The MUSIC results clearly show that the residual loads for all pollutants produced by the modified development are less than the existing approved development. The proposed modification is considered to fulfil the consent condition requiring no increase in the discharge of post development pollutants as the modification reduces volume of pollutants discharged from that previously approved.

7.3 Stormwater Attenuation

Stormwater attenuation for the greater development site has been assessed by *Gilbert Sutherland* using the Watershed Bounded Network Model (WBNM) computer software. The modelling was conducted over a range of rainfall events up to the 100 year ARI storm. The supermarket precinct forms part of catchments 12 and 15a, refer to Figure 7-8.

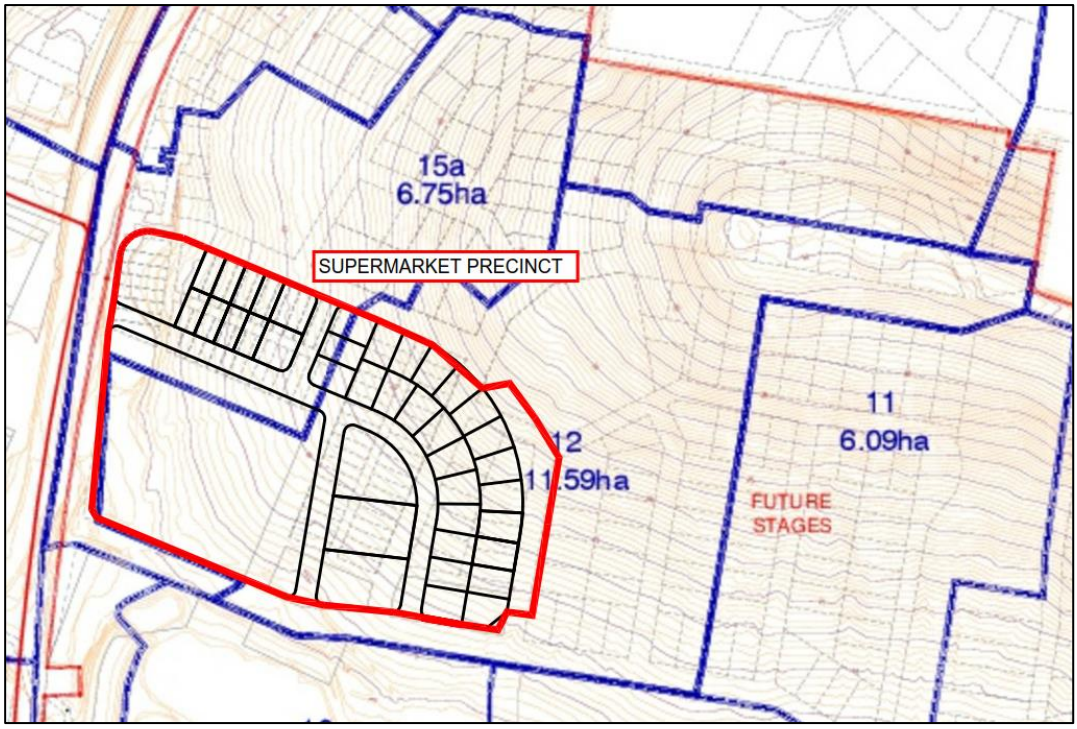


Figure 7-8 - Excerpt G+S WBNM Development Case Catchment Plan

The proposed modification to the existing development primarily involves increasing the commercial area by 4,650m². The approved and modified precincts are compared in Table 7-4.

Table 7-4 - Comparison of Approved and Modified developments

Type of Development	Previously Approved	Modification
Precinct Area	63,200m²	
Neighbour Centre (Commercial)	16,410m²	21,060m²
Park Reserve	800m²	0m²
Childcare Centre	0m²	3,000m²
Estimated Equivalent Dwellings	89	62*
Residential land area	45,360m²	39,140m²
Residential Density (dwellings/ha)	19.62	16.61

*Based on the maximum density permitted in the medium density zoning of 1 dwelling per 250m²

To determine the attenuation requirements for the supermarket precinct the following land use types have been compared:

- Residential Land
- Neighbour centre
- Child care centre

The residential land reduces in area by 6,420m² with the density of the dwellings reducing from that previously approved. It is considered that as the density of the residential area has reduced, the existing modelling is appropriate as the amount of impervious area also decreases with housing

density. Additional attenuation will be provided for the increase in the commercial zone and child care centre.

7.3.1 Neighbourhood Centre

The additional attenuation storage volume required for the 4,650m² increase in commercial area has been modelled using the Ilsax hydrological model in the Watercom Drains software program. The pre and post development site has been configured with the catchment characteristics presented in Table 7-5.

Table 7-5 – Commercial Catchment Characteristics

	Paved Area	Supplementary Area	Grassed Area
Pre Development	0%	0%	100%
Post Development	90%	0%	10%

The results from the modelling have determined that 75m³ of attenuation storage is required to ensure that no additional water is discharged from the site across a range of events up to a 100 year ARI storm. The Drains results for the Neighbourhood Centre are presented in Figure 7-9.

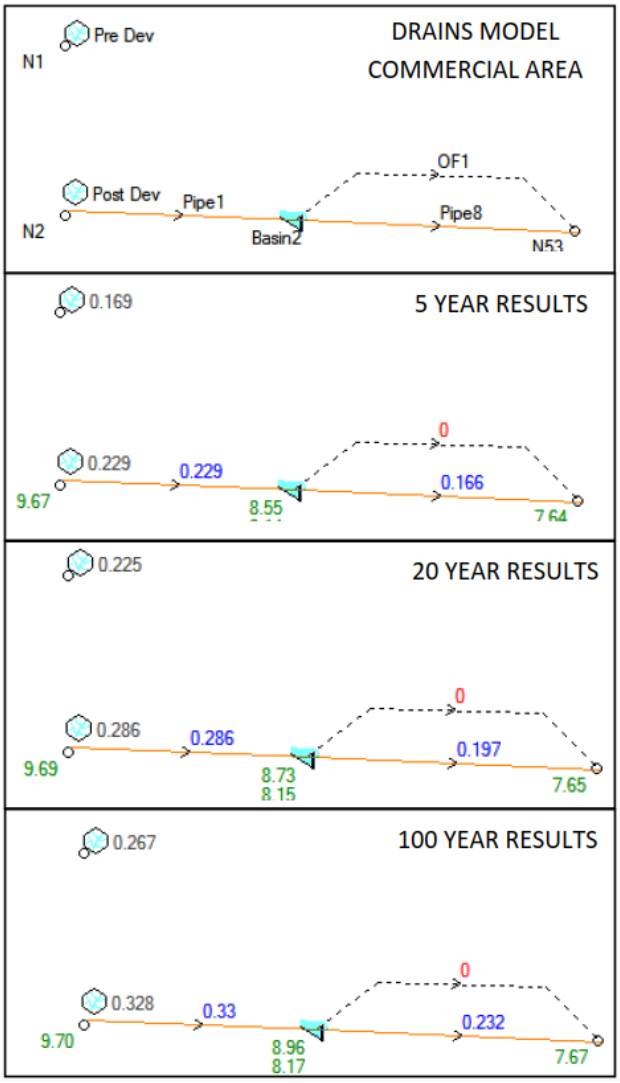


Figure 7-9 - Commercial Zone Drains Results

7.3.2 Child Care Centre

To determine the additional volume of attenuation storage required for the new 3,000m² child care centre the site has been modelled. The pre and post development site has been configured with the catchment characteristics presented in Table 7-6.

Table 7-6 - Child Care Centre Catchment Characteristics

	Paved Area	Supplementary Area	Grassed Area
Pre Development	0%	0%	100%
Post Development	75%	5%	20%

The results of the modelling shows that 40m³ of attenuation storage is required to ensure that no additional water is discharged from the site across a range of events up to the a 100 year ARI storm. The Drains results for the Child Care Centre are presented in Figure 7-10.

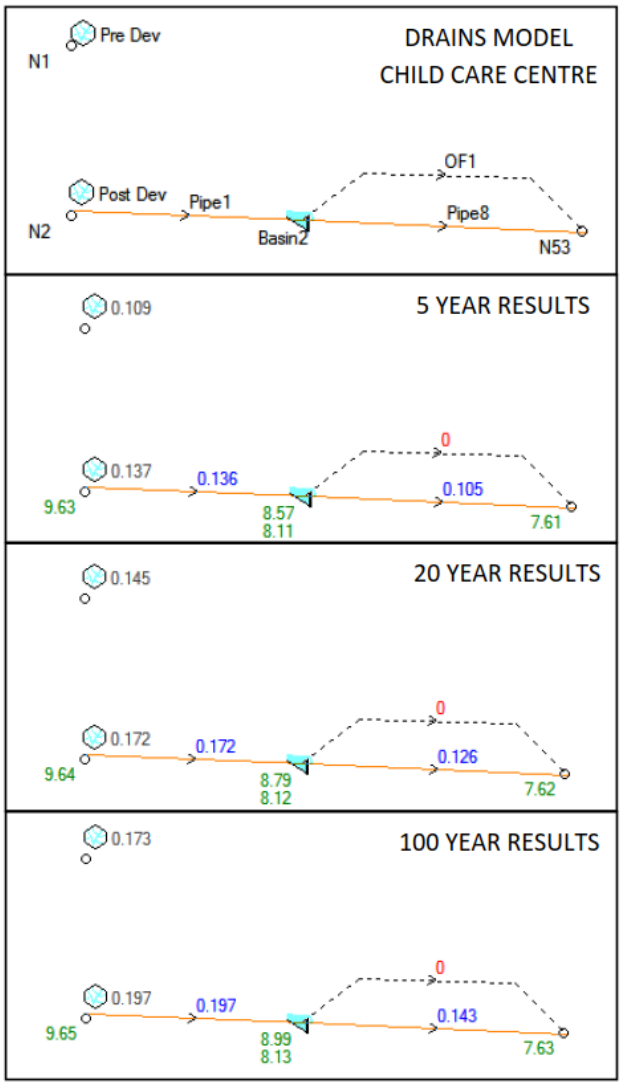


Figure 7-10 - Child Care Centre Drains Results

7.4 Stormwater Summary

The proposed modification of the supermarket precinct can achieve the stormwater objectives outlined in the consent conditions. To ensure no additional pollutants are discharged from the development an additional Gross Pollutant Trap is required. This device is to be installed to treat the stormwater generated from the commercial area within the Gilbert and Sutherland catchment 15. Additional stormwater attenuation is to be provided to ensure there is no increase in post development flows for the 100 year ARI event. The exact volumes of attenuation storage volumes will need to be confirmed based on final building layouts with indicative modelling indicating that 75m³ of storage for the neighbourhood centre and 40m³ for the child care centre is required. All stormwater infrastructure is located outside conservation areas.

8 Sewer Services

All lots in the revised lot layout will be provided with a sewer connection. The north western portion of the site is expected to drain to the existing gravity sewer main in Hutley Drive. The neighbourhood precinct and the remaining portion of the site is anticipated to drain into the trunk main along Main Street. The Hutley Drive gravity main is estimated to have sufficient capacity as the bypass works identified in the *Geolink – Investigation of Gravity Sewer Trunk Main Augmentation on Hutley Drive* are currently being installed with the Stage 1B works.

9 Water Reticulation

9.1 Potable Water Reticulation

The previous modelling undertaken by Geolink (*Pacific Pines Water Reticulation – Addendum Report*) for the development is considered conservative with 36 Equivalent Tenements (ET's) already allowed for in the commercial area. Initial estimates of the modified demand indicate that the total demand for the supermarket precinct is expected to reduce (Table 9-1).

Table 9-1 - Expected Potable Water Demand

Type of Development	Previously Modelled	Previous ET's	Modification	Modified ET's
Residential Dwellings	89 previously approved dwellings	89	62 equivalent dwellings	62
Commercial Area		36	0.005 ET/floor m² (TSC)	26.75
Child Care Centre	-	-	100 people	6
	Totals:	**125**		**94.75**

In alignment with the consent conditions the detailed hydraulic analysis and reservoir performance will be revised during detailed design based on the modified equivalent tenements for supermarket precinct.

9.2 Recycled Water Reticulation

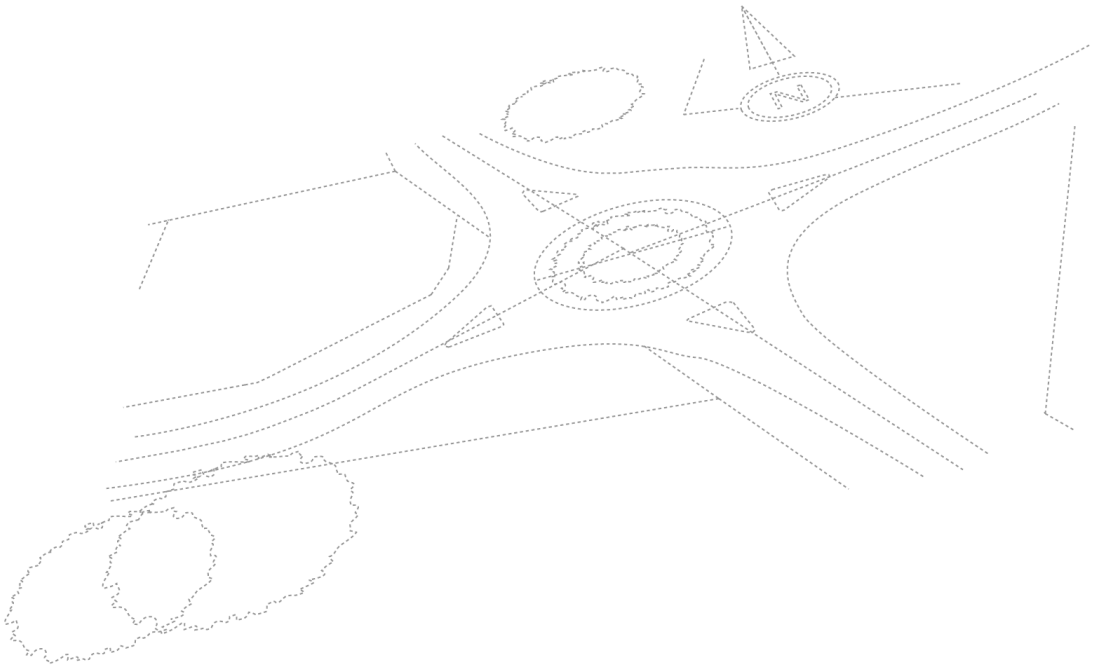
A recycled water reticulation network will be provided within the supermarket precinct. Connection to the greater Lennox Head reticulated water network will be via the recycled water mains within Main Street and Hutley Drive. The servicing plans will be updated to reflect the modified layout and will comply with the Councils *Water Reticulation Specification.*

10 Sediment and Erosion Control

During construction sediment and erosion control measures will be installed to ensure the loss of soil from the site is minimised. All control measures will be installed prior to the commencement of construction and be in accordance with *Managing Urban Stormwater-Soils & Construction Volume 1 (2004)* by Landcom.

Appendix A Architectural Lennox Head Retail Centre Concept Plan

- CCN Architects Plan P1624-SK-02-E



AREA SCHEDULE

USE	AREA-m²
Supermarket	3,400
Mezzanine Offices	200
Shops	1,350
TOTAL RETAIL	4,950
Retail / Commercial	400
TOTAL NLA	5,350

CAR PARKING

RATE	No.
5 cars per 100m²	248
5 cars per 100m²	27
TOTAL CARS REQUIRED	275
TOTAL CARS PROVIDED	282

CCN

LENNOX HEAD RETAIL CENTRE

CCN Architects Pty Ltd | 63 Edward Street BRISBANE QLD 4000 | t: (+617) 3221 0300 | e: info@ccnarchitects.com.au | www.ccnarchitects.com.au

SITE PLAN

PRELIMINARY

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