Planning Proposal for Gateway Determination – Various Properties in Mount Hutton – August 2017

Draft Amendment RZ/5/2016 to Lake Macquarie Local Environmental Plan (LM LEP) 2014

Local Government Area:	Lake Macquarie City Council (LMCC)
Name of Draft LEP:	Lake Macquarie Local Environmental Plan (LMLEP) 2014 (RZ/5/2016)
Subject Land:	• Lot 13 DP 11260, 72 Wilsons Road, Mount Hutton • Lot 141 DP 614672, 74 Wilsons Road, Mount Hutton • Lot 142 DP 614672, 74A Wilsons Road, Mount Hutton • Lot 26 DP 17261, 85 Tennent Road, Mount Hutton • Lot 14 DP 874801, 1-7 Merrigum Street, Windale • Scrubby Creek Reserve unidentified parcel (Creek channel allotment)

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Part 1 – Objectives or Intended Outcomes

Council is reviewing the LRA Maps in Mount Hutton to ensure that they reflect land that Council currently wants to acquire for a public purpose. Figures 1 and 2 below show the land included in the LRA map review in Mount Hutton.

This LEP Amendment removes the LRA Maps from land in Mount Hutton that Council no longer wants to acquire for a public purpose, while retaining or adding the LRA map where Council wants to acquire the land for a public purpose.

Some land in the study area will require rezoning in line with intended future land uses because of this LRA map review.

Part 2 – Explanation of Provisions

Council is reviewing the LRA Maps in Mount Hutton to ensure that they continue to reflect land that Council wants to acquire for a public purpose. Maps 1 - 8 in Part 4 of this report show the existing and proposed LEP maps. Table 1 below explains the proposed changes to the LMLEP 2014 maps and instrument.

Table 1: Proposed changes to the LMLEP 2014 map and instrument

Amendment Applies to:	**Explanation of Provision**
Land Reservation Acquisition Map (LRA Map)	- Remove land from the LRA Map where Council no longer intends to acquire the land. - Retain or add land to the LRA Map where Council intends to acquire the land.
Land Zoning Map	- Amend the Land Zoning Map for land removed from the LRA Map to ensure consistency with surrounding zones and with the intended future use of the land. - Amend the Land Zoning Map for land added to the LRA Map so that the land is zoned RE1 Public Open Space to reflect its intended future public use.
Height of Buildings Map (HOB Map)	Amend the HOB Map to be consistent with the zone amendments and context.
Lot Size Map	Amend the Lot Size Map to be consistent with the zone amendments.

Below is a summary of the proposed changes to the LRA and Land Zone Maps.

- **Land along Scrubby Creek (affecting 72 and 74 Wilsons Road and 85 Tennent Road, Mount Hutton)**

  It is proposed to retain the LRA Map on both sides of Scrubby Creek within the extent of the 1% Annual Exceedance Probability (AEP) flood[1].

[1] Note that the 1% AEP flood is a flood with a 1% chance of occurring in any given year.

Land covered by the LRA Map will continue to be zoned RE1 Public Open Space to reflect the fact that Council would like to acquire it for a public purpose. Council would like to acquire this land in the future in order to access Scrubby Creek for maintenance and rehabilitation works and so that Council can possibly provide a future shared pathway along the Creek.

- **74 Wilsons Road, Mount Hutton**

  Remove the LRA Map from 74 Wilsons Road associated with the Willow Road extension, as Council no longer intends to build this road. Land removed from the LRA Map will be rezoned from R2 Low Density Residential to be consistent with the adjoining B2 Local Centre zone for the majority of the allotment and RE1 Public Open Space for the land on Scrubby Creek.

- **85 Tennent Road, Mount Hutton**

  Remove the LRA Map from part of 85 Tennent Road, Mount Hutton, as Council no longer needs this property to provide stormwater detention. The land is currently zoned RE1 Public Open Space and it is proposed to rezone the flood free land to R3 Medium Density Residential consistent with adjoining residential land. If the LRA Maps are removed, the land can no longer be zoned RE1 Public Open Space because it is privately owned.

Part 3 of this report provides more details and justification for the changes.

What are the LRA Maps?

The LRA Maps and associated legislation help deliver public amenities and infrastructure by enabling Council and State government agencies to acquire land for a public purpose. The LRA Maps achieve this by limiting the use of affected land. Clause 5.1A of the LMLEP 2014 provides that a consent authority can only grant consent for a specific public purpose on land affected by the LRA Maps. For instance, land affected by the LRA Maps and marked as 'local road' can only receive consent to be developed for a 'road'. Map 3 contains copies of the LRA Maps relevant to this Planning Proposal.

Under section 23 of the *Land Acquisition (Just Terms Compensation) Act 1991,* Council must acquire land shown on the LRA Maps if the landholder can demonstrate that they will suffer hardship if there is a delay in acquiring the land. Therefore, the LRA maps need to be up to date so Council only buys land currently needed for a public purpose.

Figure 1: Locality Map

Figure 2: Air Photo

Part 3 – Justification

A. NEED FOR THE PLANNING PROPOSAL

1. Is the Planning Proposal a result of any strategic study or report?

A number of studies and reports inform this Planning Proposal, as outlined below.

Traffic and Transport study for the Charlestown Contribution Catchment Plan

Council wanted to acquire privately owned land in Mount Hutton in order to extend Willow Road to the southwest to intersect with Wilsons Road as shown in Figure 3 below. The LMLEP 2014 LRA Map contains a note that the acquisition is required for a 'Local Road'. Map 3 in Part 4 of this planning proposal contains a copy of the existing LRA Map for Mount Hutton.

Council adopted the *Lake Macquarie City Council Development Contributions Plan – Charlestown Contributions Catchment* (*Charlestown Contributions Plan*) in 2015. The Plan applies to many suburbs around Charlestown, including Mount Hutton. Contributions plans help to fund public amenities and services required because of new development. Background studies help to determine what should be included in the Contributions Plans. The *Traffic and Transport study for the Charlestown Contribution Catchment Plan* states that (p 90):

> *..it is recommended that the Wilsons Road to Willow Road link not be constructed and removed from the LEP, and the upgrade of Merrigum Street at South Street be listed for construction in 2018 within the Charlestown Section 94 plan.*

It is therefore proposed to remove the Willow Road acquisition layer from the LMLEP 2014 consistent with the *Traffic and Transport* study. An extract of the relevant parts from the *Traffic and Transport Study* is provided in Attachment 2.

Figure 3: Extract from the *Charlestown Contribution Catchment Plan Traffic and Transport Study, May 2015* showing the Willow Road extension

The proposed Willow Road extension is currently zoned R2 Low Density Residential under the LMLEP 2014. Map 1 in Part 4 of this report contains the Existing Zone Map. The R2 zone is inconsistent with the surrounding zones, including B2 Local Centre associated for land adjacent to the Mount Hutton shops and RE1 Public Recreation along Scrubby Creek. Therefore, this Planning Proposal seeks to amend the Zone Map so that the zoning is consistent upon removal of the local road LRA Map. See Map 2 in Part 4 of this report for the Proposed Zone Map.

Catchment Investigation and Concept Design Report for Mount Hutton Section 94 Contribution Plan

85 Tennent Road contains an existing house in the northwest of the allotment with frontage to Tennent Road. Land around the house is currently zoned R3 Medium Density Residential. The LRA map affects the remainder of the property, which contains little existing development and is mostly open grassland.

Land affected by the LRA map is zoned RE1 Public Open Space, as shown on Map 1 in Part 4 of this report. The current LRA Map (Part 4, Map 3) contains a note that the acquisition of 85 Tennent Road, Mount Hutton is for 'Local Open Space'. Council already owns 83A and 89 Tennent Road. Council intended to capture and store stormwater runoff from the surrounding area on 83A, 85 and 89 Tennent Road. 'Local Open Space' was the definition that best fit this acquisition purpose.

The *Catchment Investigation and Concept Design Report for Mount Hutton Section 94 Contribution Plan, 2013 (Catchment Investigation)* was prepared to inform the *Charlestown Contributions Plan*. The *Catchment Investigation* identifies capacity constraints in the existing stormwater drainage system in Mount Hutton. The *Catchment Investigation* considers options to increase the trunk drainage capacity to cater for both existing development in the catchment, as well as potential development if the catchment is fully developed in the future.

Figure 4 below shows the drainage works recommended by the *Catchment Investigation.* The *Catchment Investigation* looked at possible engineering solutions such as expanding existing detention basins, providing new detention basins and upgrading the existing drainage system in critical locations by providing additional pipes. Figure 4 shows that the proposed works include a detention basin on 89 Tennent Road, Mount Hutton.

The *Catchment Investigation* finds that the works shown in Figure 4 below:

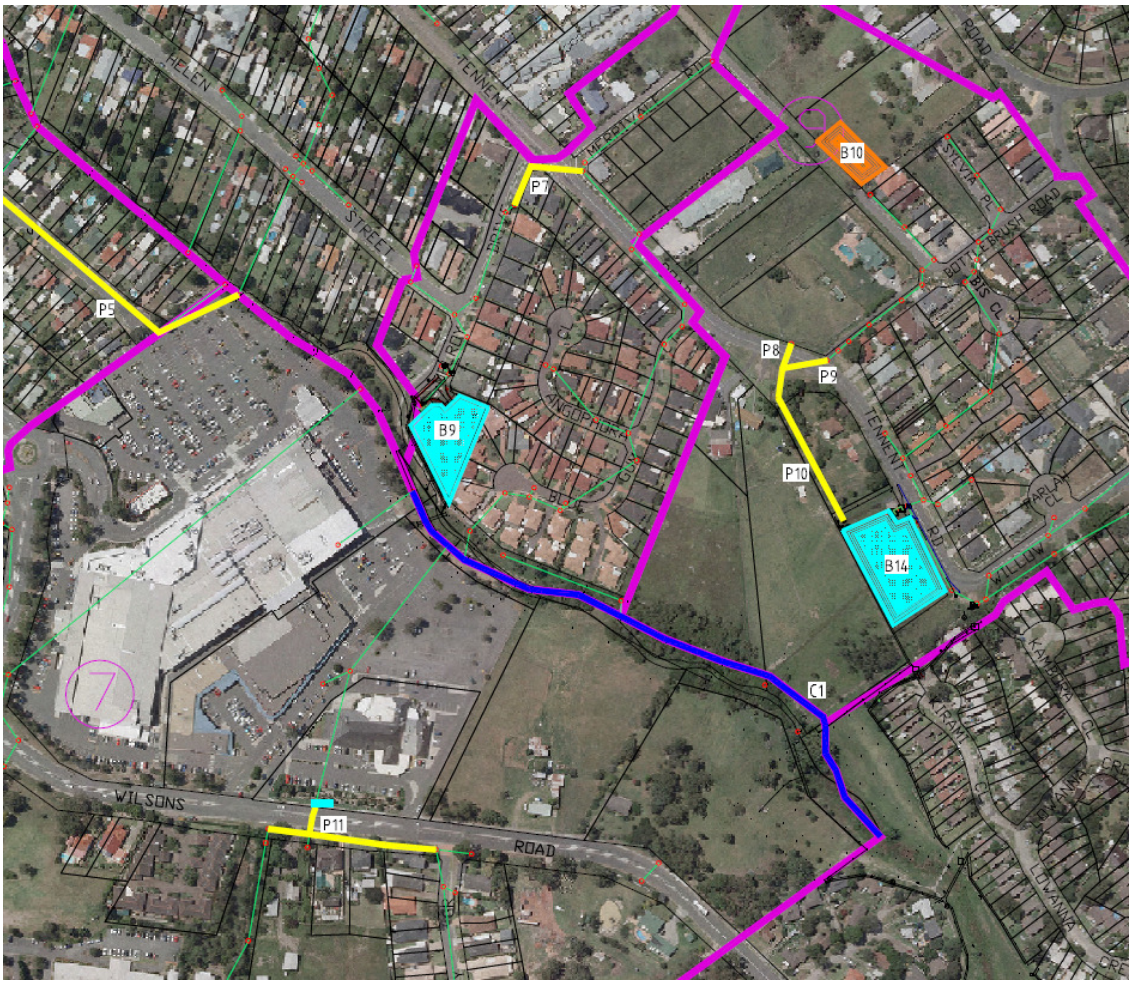
- would not solve all drainage issues within the catchment, and
- would not result in major increases in system capacity.

At present, there is no above floor flooding of existing residences in Mount Hutton during a 1% AEP flood event. The main impact on existing properties during such an event is relatively shallow overland flooding that may result in limited damage to outbuildings.

The works shown in Figure 4 would reduce the incidence of overland flooding in the Ada Street locality (not near the study area), reducing potential flood damages to some outbuildings in this location. The *Catchment Investigation* finds the limited benefits of the works would not outweigh the overall capital cost.

The *Charlestown Contributions Plan* does not allocate section 94 funds for drainage and stormwater works anywhere in the Charlestown Catchment, including in Mount Hutton. Therefore, there is currently no funding allocated by Council to construct the drainage upgrades in Mount Hutton.

Figure 4: Stormwater Drainage Improvements recommended by *The Catchment Investigation and Concept Design Report for Mount Hutton Section 94 Contribution Plan, 2013*



Jewells Wetland Floodplain Risk Management Study and Plan, July 2017

Council adopted the *Jewells Wetland Flood Study* in 2013. Figures 5, 6 and 7 below show the extent, hydraulic categories, depth and velocity of the 1% AEP flood associated with Scrubby Creek in the area relevant to this planning proposal, as mapped by the *Flood Study.*

The *Jewells Wetland Floodplain Risk Management Study and Plan (FRMS&P)* follows on from the *Flood Study*. The *FRMS&P* evaluates and recommends options to manage the risks of flooding in the Jewells Wetland Catchment and was exhibited to the public for comment from 26 May to 25 July 2016.

Australian Rainfall and Runoff: A Guide to Flood Estimation (AR&R) is a national guideline for the estimation of design flood characteristics in Australia originally published in 1987. Engineers Australia released an updated guideline in November 2016. The new guidelines are promoted as best practice so Council engaged the consultants who prepared the FRMS&P to consider the implications of the revised guidelines before providing the FRMS&P Final Report in July 2017.

The AR&R 2016 analysis typically shows minor decreases in peak flood levels in the upper Jewells Wetland catchment and minor increases in the lower catchment. For the upper catchment, the AR&R 2016 approach provides for approximately a 4% reduction in the peak flow to the flood study results. This means that peak flood levels are generally +/- 0.1m for peak flood levels across most of the catchment when compared with the adopted flood study results across the study area. Moreover, general flooding patterns and simulated flood behaviour is consistent with the adopted Flood Study using the updated AR&R 2016 guidelines. Accordingly, the floodplain management options identified and assessed in the FRMS&P Final Report do not change with consideration of the AR&R 2016 results.

The FRMS&P Final Report shows that the drainage upgrades suggested for Mount Hutton by the *Catchment Investigation* have a high cost and low benefit when compared to other flood management options available. The FRMS&P Final Report assigns the drainage upgrades a low priority and does not recommend them as a preferred Management Option (see extract of FRMS&P Final Plan in Appendix 2).

The FRMS&P Final Report finds the *Catchment Investigation* upgrades do little to reduce the risk to flood affected properties, to increasing the volume of water that Scrubby Creek can cope with, and to reducing overall catchment flooding. The Final Report finds that more cost effective and practical flood management options include flood-proofing specific properties, updating flood mapping for Council and emergency services, and improving flood warning and emergency response systems.

If the drainage upgrades shown in Figure 4 take place in the future, the *Catchment Investigation* shows them on land already owned by Council, so further acquisitions are unnecessary, regardless of whether the drainage upgrades occur in the future or not. It is therefore recommended that the LRA Map be removed from the flood free parts of 85 Tennent Road. Land that is free of flooding constraints is proposed to be zoned R3 Medium Density Residential, consistent with surrounding land. The rezoning is needed because privately owned land cannot be zoned RE1 Public Recreation unless Council intends to acquire it.

Figure 5: Existing 1% AEP Flood Hydraulic Categories

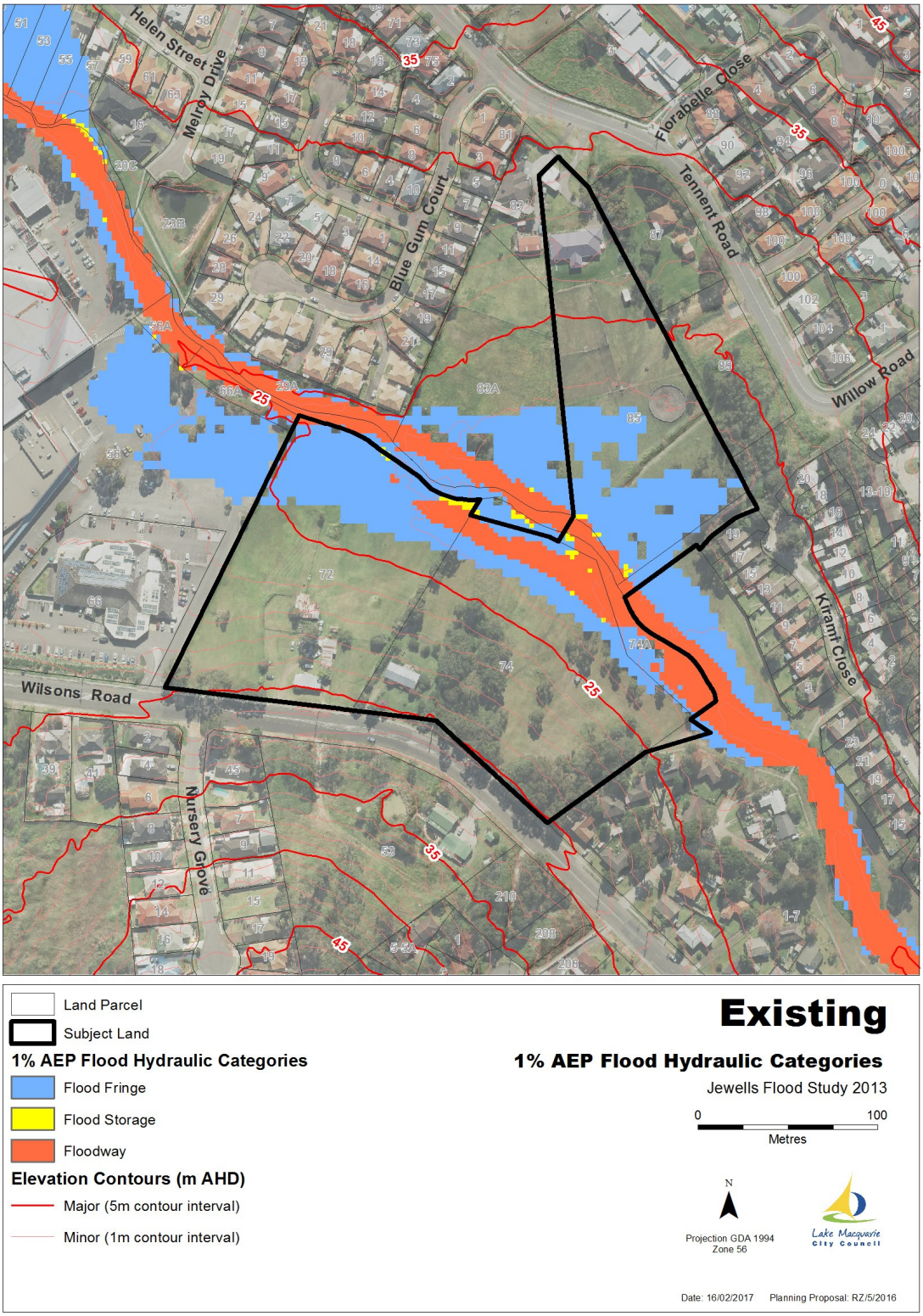


Figure 6: Existing 1% AEP Flood Depth

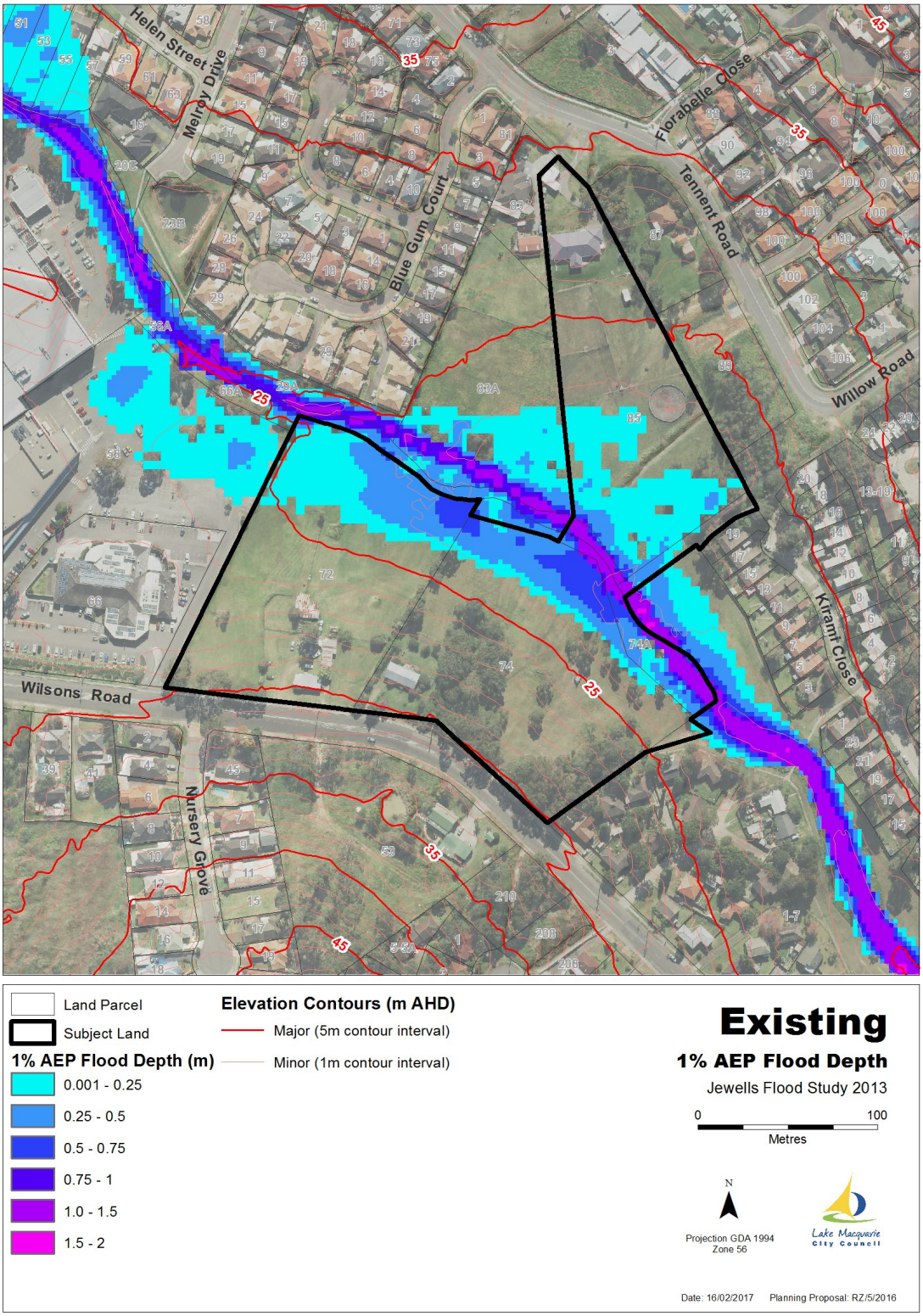
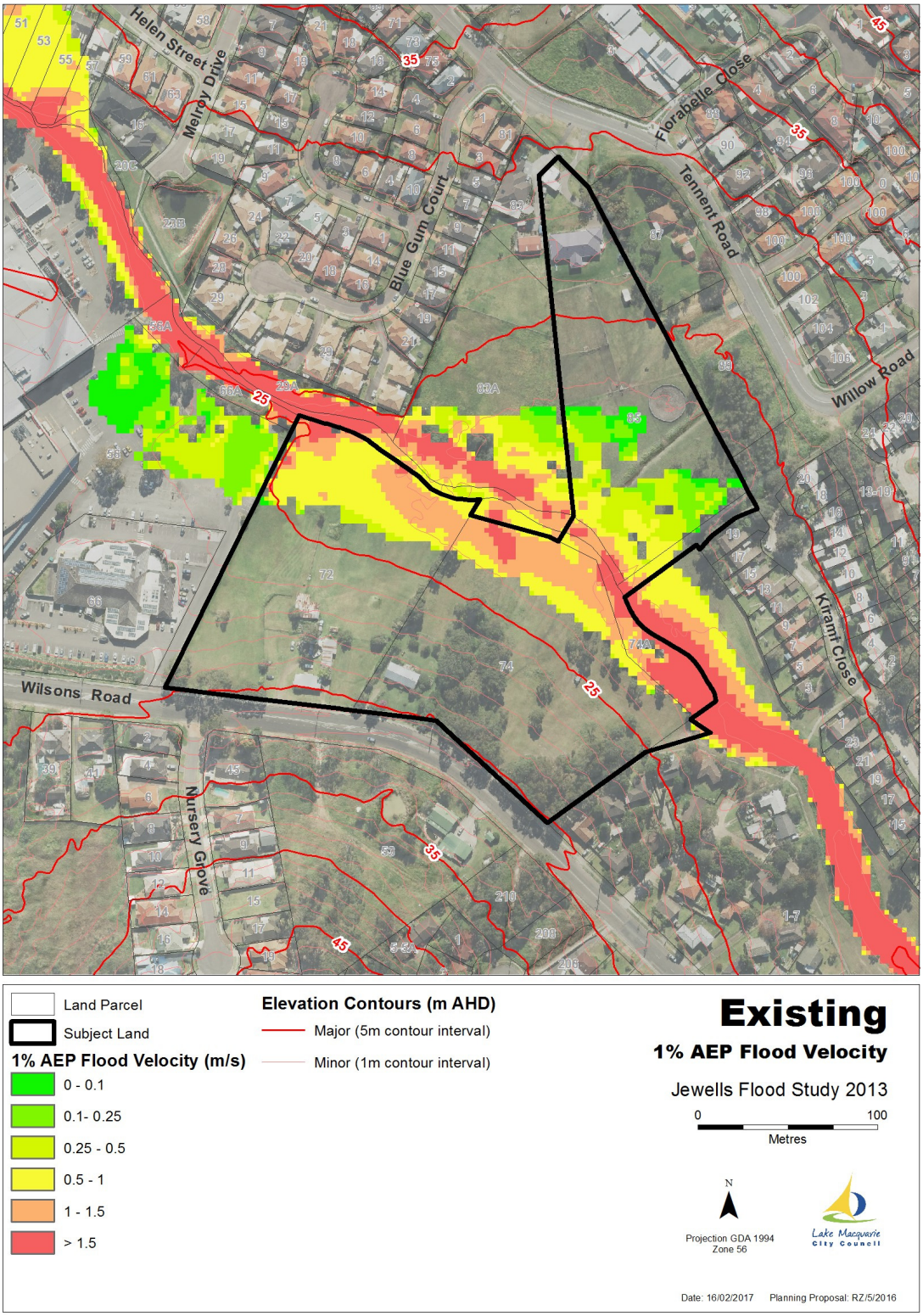


Figure 7: Existing 1% AEP Flood Velocity



2. Is the Planning Proposal the best means of achieving the objectives or intended outcomes, or is there a better way?

Costs and benefits of the Willow Road extension

The *Charlestown Contribution Catchment Plan Traffic and Transport Study*, May 2015 looked at the need for the Willow Road extension based on traffic and population projections to the year 2025. The Study projects that the Mount Hutton / Windale sub-catchment will increase 21% between 2010 and 2025.

The *Traffic and Transport Study* found that Willow Road extension (see Figure 3) would be 268 metres in length and construction costs would exceed $6,500,000 including a bridge, and intersections at Tennent Road and Wilsons Road. The cost of acquiring the land for the Willow Road extension would be additional to the construction costs.

The Willow Road extension would have an estimated car travel time of 20 seconds at 50km/h, plus a delay at either end for intersections. At present, cars trying to get from Willow Road to South Street / Wilsons Road travel 1,030 metres via Merrigum Road. The trip takes around 80 seconds with additional delays at the intersections.

The *Traffic and Transport Study* found that the Willow Road extension would decrease vehicle travel time between Willow Road and South Street / Wilsons Road by 1.5 minutes. While there is a car travel time saving associated with the Willow Road extension, the benefits do not outweigh the total estimated costs of providing the road extension.

Therefore, the *Traffic and Transport Study* recommends removing the Wilsons Road to Willow Road extension from LRA Map layer in the LEP.

Alternative – upgrade the Merrigum Street / South Street intersection

The *Traffic and Transport Study* recommends upgrading the existing intersection at Merrigum Street and South Street to traffic lights, which will help to keep intersection delays to an acceptable level. The upgrade will be required in 2018 at an estimated cost of $2.06m and will facilitate safe movement between Willow Road and Wilsons Road at a considerably lower construction cost than the Willow Road extension.

Based on the recommendations of the *Traffic and Transport Study,* the *Charlestown Contributions Plan* provides funding for the upgrade of the Merrigum Street and South Street intersection in 2018.

Is there a need for the Willow Road extension in the longer term?

Evidence suggests that the Willow Road extension will not be required in the long term because:

- Background studies undertaken to prepare the *Charlestown Contributions Plan* considered the benefits of providing the Willow Road extension against the capital expenditure. The construction and acquisition costs of the Willow Road extension are high and the travel savings time for vehicles are relatively small. Given the high costs of acquiring the land and constructing the road, it is likely that the Willow Road extension proposal will not deliver value for money in the future, even as the local population grows over time.
- The upgrade of Merrigum and South Street intersection will allow the existing road network to operate long into the future at a suitable level of service, negating the need for the Willow Road extension.

Council has an obligation to acquire land under section 23 of the *Land Acquisition (Just Terms Compensation) Act 1991* if the landholder can demonstrate that they will

suffer hardship if there is a delay acquiring the land. Leaving the acquisition layer in the LEP would mean that Council might have to acquire land for the Willow Road extension when there is no longer an intention or funding available to do the work. This would not be a good use of public funds.

It is therefore recommended to remove the Willow Road extension from the LMLEP 2014.

Rehabilitation and remediation of Scrubby Creek riparian corridor

Scrubby Creek drainage channel is in need of rehabilitation. The NSW Department of Industry – Soil Conservation Service recently prepared a Geomorphic Assessment for Scrubby Creek. The Geomorphic Assessment examines roughly 600-metres of Scrubby Creek, from the concrete channel adjacent to Lake Macquarie Fair in Mount Hutton downstream to the Merrigum Street bridge in Windale. The Geomorphology Assessment finds that this part of Scrubby Creek is in moderate to poor condition because of:

- the upstream concrete channel,
- past and ongoing channel incision (erosion) and aggradation (sedimentation), and
- moderate to heavy infestations of invasive weeds including willows that encroach on the channel.

The Geomorphology Assessment finds that sediment is actively depositing in parts of Scrubby Creek near 85 Tennent Road. Willow growth is trapping water and slowing flows, so that sediments in the water have an opportunity to settle in these locations. The willow growth and accumulated sediment reduces the channel flow capacity, resulting in frequent inundation of the surrounding floodplains. The Geomorphology Assessment recommends the following works to improve channel flow capacity:

- Remove the willows.
- Increase the grade and channel depth of parts of the Creek to ensure that water can flow more easily. Faster flowing water will continue to carry sediment through the Creek rather than depositing it.
- Install rock bed structures in parts of the Creek to help maintain the new creek grade.
- Implement an ongoing vegetation management program to ensure that willows do not re-establish.

The recommendations from the Geomorphology Assessment will guide future rehabilitation works in Scrubby Creek. The Geomorphology Assessment recommends works in the lower reaches of the study area are done as stage one to ensure sediments are not trapped further downstream once the willow blockages are removed. The recommended works in the upper reaches of the Creek near 85 Tennent Road will be stage two. Funding also needs to be identified for the works before they can be implemented.

Council also recently installed structural works to address erosion at the end of the concrete-lined channel near the Lake Macquarie Fair shopping centre.

Will physical works in Scrubby Creek change the 1% flood extent?

The works recommended by the Scrubby Creek Geomorphology Assessment are likely to make a difference to the flood extent during frequent, smaller scale events. The changes to the local flood extent will occur because the channel will be better able to convey water in that location for small flood events. However, the whole

floodplain will continue to fill during the larger and less frequent 1% AEP flood event because 'the greater proportion of the flow capacity lies within the broader floodplain corridor' (as noted on p4 of the report in Attachment 3).

Implementing the works proposed by the Geomorphology Assessment will not impact on the extent of flood liable versus developable land. Therefore, there is no need to wait for the physical works to be completed before progressing this planning proposal.

Will extending the concrete channel at Mount Hutton reduce flood impacts?

Residents near Scrubby Creek in Mount Hutton have suggested that extending the concrete channel adjacent to Lake Macquarie Fair further down the creek will reduce the 1% flood extent. However, the report in Attachment 3 shows that extending the concrete drain at Scrubby Creek would only reduce flood levels by a maximum of 3cm in a 1% AEP flood event in some parts of the Creek. Therefore, extending the concrete channel is not justified.

Neither the Jewells Wetland FRMS&P nor the Geomorphic Assessment recommends extending the concrete channel.

Alternative to acquiring land on Scrubby Creek

Council already owns some land on Scrubby Creek within and near the study area. Council would like to acquire land on both sides of Scrubby Creek in the study area to ensure ongoing access to the riparian zone for rehabilitation and maintenance works.

Furthermore, showing the land on the LRA maps does not prevent Council from accepting dedication of the land in the future, or pursuing other acquisition strategies such as direct purchase, compulsory acquisition, or a voluntary planning agreement.

Owning the land would also allow Council to provide a public walking and / or cycling route along the Creek in the future, as described below.

Provision made for improved walking and cycling

Mount Hutton is not a particularly walkable town centre due to a lack of walking infrastructure and the low density of existing development around the centre. The Shopping Centre is also a historically car-centric design. However, the area is suitable for walking and cycling due to the relatively flat topography.

There is an opportunity to improve walking and cycling connections in Mount Hutton if the land on Scrubby Creek is acquired in the future. Both the Mount Hutton Town Centre Plan and the Mount Hutton Precinct Plan in the Lake Macquarie Development Control Plan 2014 (LMDCP 2014) show a proposed shared pathway on Scrubby Creek. Photo 1 shows a well-worn dirt track on the southern side of Scrubby Creek that indicates the desire of the local community to walk to the shops along the Creek.

Photo 1 – Well-worn track

As the dirt track is currently located on privately owned land, there is potential that the landowners could prevent public access in the future. Acquiring land on either side of Scrubby Creek provides an opportunity for Council to formalise a shared pathway in the future.

Council has not allocated funding to design and construct the shared pathway yet. However, Attachment 4 contains walkability maps that show that the shared pathway would significantly improve walkability in Mount Hutton and surrounding areas.

It is not yet known whether it is more cost effective and feasible to provide a shared pathway on the northern or southern side of Scrubby Creek. This will be determined at the detailed design stage of any project. The acquisition of land on both sides of Scrubby Creek provides flexibility to optimise the design and value of any future shared pathway in the future.

Proposed zoning of 85 Tennent Road, Mount Hutton

It is proposed to remove land that is free of flooding constraints within 85 Tennent Road from the LRA map layer and rezone it to R3 Medium Density Residential consistent with surrounding land. The proposed R3 Medium Density Residential is supported by the fact that the site is within walking distance of the Mount Hutton Town Centre.

Land within the extent of the 1% AEP flood extent will continue to be included on the LRA map layer and be zoned RE1 Public Recreation.

A 6 metre wide access strip has been left on the LRA Map on the southeastern boundary of 85 Tennent Road. The strip will provide access from Tennent Road in the northeast to land affected by the 1% AEP flood extent associated with Scrubby Creek to the southwest. The 6m wide access is wide enough for a maintenance vehicle and for a potential shared pathway in the future. Refer to the Proposed LRA Map in Figure 4 for details. When compared with the 1% AEP flood extent, the 6 metre wide access strip comprises a relatively small amount of otherwise 'developable' land within the allotment. Refer to Figures 4, 5 and 6 for the extent of the existing flood and Maps 2 and 4 for the proposed Land Zone Map and LRA Map.

Other LRA Map layers on Scrubby Creek

There are two properties upstream of the study area containing small acquisition layers:

- Lot 11 DP 29368, 35 Helen Street, Mount Hutton
- Lot 9 DP 29368, 39 Helen Street, Mount Hutton

These properties face Helen Street to the northeast and Scrubby Creek runs along the south-western rear boundary of the properties. The acquisition is for a very small portion of these properties adjacent to Scrubby Creek.

Council has already acquired a small portion of land in and around Scrubby Creek from neighbouring properties and these are the last two properties Council is yet to acquire. Council still wishes to acquire a small portion of these properties to obtain access to Scrubby Creek channel for maintenance, so there are no changes proposed to the LRA map layer for these properties.

B. RELATIONSHIP TO STRATEGIC PLANNING FRAMEWORK

3. Is the Planning Proposal consistent with the objectives and actions of the applicable regional, sub-regional or district plan or strategy (including exhibited draft plans or strategies)?

Hunter Regional Plan 2036

The Proposal is consistent with the Hunter Regional Plan. The Vision for the Hunter includes providing 'greater housing choice available in new and existing communities, close to jobs and services and well supported by public transport and walking and cycling options'. Priorities for planning in Lake Macquarie outlined in the Hunter Regional Plan include revitalising existing suburbs and exploring opportunities for new infill development.

The proposed LEP Amendment is consistent with the Hunter Regional Plan because the study area contains substantial amounts of largely vacant land zoned to permit infill development. Bringing the LRA maps in line with Council's current plans to provide public services and infrastructure in Mount Hutton may help to facilitate infill development of these sites by freeing up land that Council no longer wishes to acquire.

The Hunter Regional Plan identifies Mount Hutton as a centre of local significance, which means it is important to facilitate infill development in this location. Furthermore, the LEP Amendment makes provision for a potential shared pathway that would enhance walking and cycling options in the local area if it is delivered in the future. Active transport is encouraged by the Hunter Regional Plan.

4. Is the Planning Proposal consistent with the local council's local strategy or other local strategic plan?

Lifestyle 2030 Strategy (LS2030)

The Planning Proposal is consistent with the aims and objectives of LS2030. Outcome 3.5 of LS2030 envisages that Mount Hutton centre will grow into a 'comprehensive town centre with a mix of commercial services, retail, community facilities, and residential development'.

The main retail and commercial focus of Mount Hutton is the Mount Hutton Shopping Centre. 72 and 74 Wilsons Road are large sites zoned B2 Local Centre that currently contain single dwellings with the potential for infill commercial, retail, medium density residential, seniors living, and community or recreational development. The infill development of these sites is consistent with the LS2030 vision for Mount Hutton to grow into a comprehensive town centre with a mix of uses. Tidying up the LRA map layers as part of this LEP Amendment may increase the development potential of 72 and 74 Wilsons Road by removing the acquisition layer associated with the Willow Road extension that runs through 74 Wilsons Road.

LS2030 identifies a hierarchy of centres in Lake Macquarie. Town centres such as Mount Hutton:

- Provide a range of mixed use, retail, and commercial activities, professional, social services, and community facilities.
- Have medium density residential within and adjoining the centre.
- Serve a number of surrounding business and residential communities.
- Are located on the major transport network or arterial roads.

- Have frequent public transport services to neighbouring urban areas, other town centres and a regional centre.
- Are readily accessible by foot and cycling.
- Express the character of the area.
- Master Plans, Area Plans and Structure Plans will guide development in the town centres.

Attachment 4 contains two maps that compare the improvements in walkability if the shared pathway was constructed compared to no pathway. The maps show that there would be a 216% increase in dwellings within 750 metres walking distance of the shops if the pathway was constructed, which equates to less than a 10 minute walk. There would also be a 37% reduction in the number of dwellings more than 1250 metres walking distance from the shops.

The zones and Area Plans for Mount Hutton and Windale show potential for increased density within the walking catchment of the pathway, so that many more dwellings could benefit from this infrastructure in the future. Therefore, this LEP Amendment could help to increase the opportunities to access Mount Hutton Town Centre by foot or bike.

5. Is the Planning Proposal consistent with applicable state environmental planning policies (SEPPs)?

The Proposal is compared to the provisions of the relevant SEPPs in Table 8 below.

Table 2: Comparison of the Planning Proposal to relevant SEPPs

SEPP	Relevance	Implications
SEPP 55 – Remediation of Land	The SEPP provides planning controls and provisions for the remediation of contaminated land. Clause 6 of the SEPP provides that, when preparing an environmental planning instrument, a planning authority is not to change the use of land, unless: (a) the planning authority has considered whether the land is contaminated, and (b) if the land is contaminated, the planning authority is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for all the purposes for which land in the zone concerned is permitted to be used, and (c) if the land requires remediation to be made suitable for any purpose for which land in that zone is permitted to be used, the planning authority is satisfied that the land will be so remediated before the land is used for that purpose. Note. In order to satisfy itself as	Clause 6 of SEPP 55 requires 'a preliminary investigation' of land for LEP Amendments that propose to carry out development for 'residential, educational, recreational, or child care purposes' where 'there is no knowledge (or incomplete knowledge) as to whether development for a purpose referred to in Table 1 to the contaminated land planning guidelines has been carried out'. This Planning Proposal will result in the rezoning of a small part of 74 Wilsons Road from R2 Low Residential to R3 Medium Density Residential and part of 85 Tennent Road will go from RE1 Public Recreation to R3 Medium Density Residential. The Gateway Determination will indicate whether further investigations are required.

	to paragraph (c), the planning authority may need to include certain provisions in the environmental planning instrument.	
SEPP (Infrastructure) 2007	This policy requires the RMS to be consulted in relation to certain types of traffic generating development. It also contains provisions relating to the development of infrastructure.	The Proposal does not qualify as traffic generating development, as listed in Schedule 3 of the SEPP. The subject site does not have direct access to a classified road and is located within 150m of a classified road.

6. Is the Planning Proposal consistent with applicable Ministerial Directions (s.117 directions)?

An assessment of the Planning Proposal against the applicable Ministerial Directions is provided in Table 3. The table addresses whether the Proposal is consistent with 'what a relevant planning authority must do' if a direction applies.

Table 3: Consistency with applicable Section 117 Ministerial Directions

Ministerial Direction & Relevance	What a relevant planning authority must do if this direction applies	Consistency / Comment
1.1 – Business and Industrial Zones The aim is to encourage employment growth in suitable locations, protect employment land, and support the viability of strategic centres.	A planning proposal must: (a) give effect to the objectives of this direction, (b) retain the areas and locations of existing business and industrial zones, (c) not reduce the total potential floor space area for employment uses and related public services in business zones, (d) not reduce the total potential floor space area for industrial uses in industrial zones, and (e) ensure that proposed new employment areas are in accordance with a strategy that is approved by the Director - General of the Department of Planning.	The planning proposal is **consistent** with this direction and its objectives. The planning proposal retains the existing business zone in the study area. The only changes proposed are to ensure that there is no land zoned B2 Local Centre within the extent of the 1% AEP flood, as this would be inconsistent with s117 direction 4.3. Land affected by the Willow Road extension LRA Map is currently zoned R2 Low Density Residential and will be rezoned to B2 Local Centre on 74 Wilsons Road, Mount Hutton when the LRA Map layer is removed from that land. The planning proposal will not reduce the total potential floor space area for employment uses and related public services in the B2 zone.
1.3 – Mining, Petroleum Production and Extractive Industries The aim is to protect the future extraction of State or regionally significant reserves of coal, minerals, petroleum and extractive industries.	A relevant planning authority is required to consult with the Department of Primary Industries (DPI) to identify any mineral, petroleum and extractive resources in the area subject to the planning proposal.	The planning proposal is **consistent** with this direction. The subject site is located within an existing urban area and it is therefore considered unnecessary to consult with the DPI.

3.1 – Residential Zones The objectives of this direction are to encourage a variety of housing types, to make efficient use of existing infrastructure and services, and to minimise the impact of residential development on the environment and resource lands.	(4) A planning proposal must include provisions that encourage the provision of housing that will: (a) broaden the choice of building types and locations available in the housing market, and (b) make more efficient use of existing infrastructure and services, and (c) reduce the consumption of land for housing and associated urban development on the urban fringe, and (d) be of good design. (5) A planning proposal must, in relation to land to which this direction applies: (a) contain a requirement that residential development is not permitted until land is adequately serviced (or arrangements satisfactory to the council, or other appropriate authority, have been made to service it), and (b) not contain provisions which will reduce the permissible residential density of land.	This direction applies to planning proposals that affect land within an existing or proposed residential zone and in any other zone permitting significant residential development. The study area contains land that is zoned B2 Local Centre, in which residential flat buildings, seniors housing and shop top housing are all permitted with consent. It is also proposed to rezone part of 85 Tennent Road, Mount Hutton to R3 Medium Density Residential once the LRA Map layer is removed from most of the site. The Proposal is **consistent** with this direction, as follows: • The study area contains large areas of largely vacant that could be developed to provide more housing in the future in accordance with the B2 and proposed R3 zone. • The study area is located in proximity to Mount Hutton Town Centre. There is potential that any future redevelopment within the study area will therefore make efficient use of existing infrastructure and services in the Town Centre. • Being adjacent to a Town Centre, the study area is not located on the urban fringe. There is significant infill development potential within the study area. • This planning proposal is accompanied by changes to the LMDCP 2014 to provide design and development guidance for any future redevelopment. • The planning proposal does not contain any provisions that will reduce the permissible density of the land.
3.4 – Integrating Land Use and Transport The direction requires consistency with State policy for the positioning of urban land use zones to help reduce car dependency.	A planning proposal must locate zones for urban purposes and include provisions that give effect to and are consistent with the aims, objectives and principles of: (a) *Improving Transport Choice – Guidelines for planning and development (DUAP 2001),* and (b) *The Right Place for Business and Services – Planning Policy (DUAP 2001).*	The Planning Proposal is **consistent** with the aims objectives and principles of *Improving Transport Choice* and *The Right Place for Business and Services* because it is in close proximity to Mount Hutton Town Centre, where public transport is available. Concentrating development around centres encourages walking and cycling as alternative forms of transport. This planning proposal retains the LRA Map layer on land along Scrubby Creek to provide a potential shared pathway in the future that would improve walking and cycling access to Mount Hutton Town Centre. This planning proposal complies with the principles of concentrating development in centres, mixing uses in centres, aligning centres on transport corridors (Wilsons Road / South Street), linking public transport with land use strategies, and improving opportunities for pedestrian and cycle access.

4.2 – Mine Subsidence and Unstable Land This seeks to prevent damage associated with mine subsidence	The direction requires consultation with the Mine Subsidence Board (MSB) where a draft LEP is proposed for land within a mine subsidence district.	The subject site is located within the Lake Macquarie Mines Subsidence District and therefore consultation is required with the Mines Subsidence Board.
4.3 – Flood Prone Land This seeks to ensure that development of flood prone land is consistent with the NSW Government's Flood Prone Land Policy and the principles of the *Floodplain Development Manual 2005*.	This direction applies when a relevant planning authority prepares a planning proposal that creates, removes, or alters a zone or a provision that affects flood prone land. The provisions of an LEP on flood prone land should be appropriate for the flood hazard considering the potential flood impacts both on and off the subject land. This direction says that a planning proposal must not rezone land in a flood planning area from Recreation to a Residential zone. A planning proposal must not contain provisions that: • permit development in floodways, • permit development that will result in significant flood impacts to other properties, • permit a significant increase in the development of that land, • are likely to result in a substantially increased requirement for government spending on flood mitigation measures, infrastructure or services, • permit development to be carried out without development consent except for the purposes of agriculture, roads, or exempt development. A planning proposal must not provide flood related development controls above the residential flood planning level for residential development on land without adequate justification. A planning proposal must not determine a flood planning level inconsistent with the Floodplain Development Manual 2005 without adequate justification.	This planning proposal is **consistent** with this direction because all land within the extent of the 1% AEP flood is zoned for public recreation and is covered by an LRA map layer. The 1% AEP flood mapping for the study area shown in Figures 5, 6 and 7 of this report is based on the *Jewells Wetland Flood Study*. The Study was prepared to define the existing flood behaviour in the Jewells Wetland catchment and establish the basis for floodplain management activities. The study provides information on flood flows, velocities, levels and extents for a range of flood event magnitudes under existing catchment and floodplain conditions and determined a number of design flood events, including the 1% AEP flood event that has a 1% chance of occurring in any given year. Because the proposed zone boundaries are based on the 1% AEP flood extent, it means that no new development will be permitted on flood prone land. The LEP Amendment will not result in significant flood impacts on other properties because no development or filling will be permitted within the extent of the 1% AEP flood. The Mount Hutton Town Centre Area Plan from the LMDCP 2014 contains controls to help minimise the impacts of flooding on Scrubby Creek, including that development must not result in any net increase in peak stormwater flows to Scrubby Creek. The planning proposal will not permit development to be carried out without consent within the extent of the 1% AEP flood event.

4.4 – Planning for Bushfire Protection The objectives of this direction are to protect life, property and the environment from bush fire hazards, and to encourage sound management of bush fire prone areas.	This direction applies to any planning proposal that will affect, or is in proximity to land mapped as bushfire prone land.	A small corner 74 Wilsons Road, Mount Hutton is identified as bushfire prone land buffer (see Figure 2 below). The buffer is associated with bushfire prone land at 210 Wilsons Road on the other side of Wilsons Road. The part of 74 Wilsons Road that is affected by the bushfire prone land buffer is already zoned B2 Local Centre under the LMLEP 2014 and none of the changes proposed as part of this planning proposal will impact on the bushfire prone land buffer. A referral may be sent to the Rural Fire Service as part of this planning proposal, depending on the requirements of the Gateway Determination, but is probably unnecessary.
5.1 – Implementation of Regional Plans	Planning proposals must be consistent with a regional plan released by the Minister for Planning.	The Proposal is **consistent** with the Hunter Regional Strategy as outlined in Section 3 of this planning proposal.
6.1 – Approval & Referral Requirements The objective of this direction is to ensure that LEP provisions encourage the efficient and appropriate assessment of development.	This direction seeks to minimise the inclusion of provisions in planning instruments that require the concurrence, consultation, or referral of development applications to a Minister or public authority (a). It also sets out consultation and approval requirements, if such provisions are to be included in a planning instrument (b), or if a planning instrument identifies development as designated development (c).	The Proposal is **consistent** with this direction. Consultation is being undertaken with government agencies at the LEP Amendment stage of the development to reduce the need for concurrence, consultation, and referrals at the DA stage. This planning proposal will not create excessive concurrence, consultation, or referral requirements. The Planning Proposal does not identify any development as designated development.
6.2 – Reserving Land for Public Purposes The objectives of this direction are to facilitate the provision of public services and facilities by reserving land, and to facilitate the removal of reservations where the land is no longer required for acquisition.	This direction provides that a planning proposal (4) must not create, alter, or reduce existing zonings or reservations of land for public purposes without the approval of the Director General of the Department of Planning and Environment. This direction provides for a relevant public authority other than Council to require Council to reserve land for a public purpose under the LMLEP 2014. Similarly, a relevant public authority other than Council can require Council to remove land reserved for a public purpose from the LMLEP 2014.	This planning proposal is **consistent** with this direction. Council is the relevant public authority for the existing and proposed LRA Map layers in the LMLEP 2014 that are part of this planning proposal.
6.3 – Site Specific Provisions	This direction seeks to discourage unnecessarily restrictive site specific planning controls.	The proposal complies with this direction. There are no site specific provisions associated with this LEP Amendment.

C. ENVIRONMENTAL, SOCIAL, AND ECONOMIC IMPACT

7. Is there any likelihood that critical habitat or threatened species, populations or ecological communities, or their habitats, will be adversely affected as a result of the proposal?

The proposal will not adversely impact on critical habitat or threatened species, populations or ecological communities, or their habitats, as described below.

Value of the native vegetation within 74 Wilsons Road

Council's Native Vegetation and Corridor Maps 2015 shows that 74 Wilsons Road contain partly cleared native vegetation. The patches of native vegetation within the are isolated and are not part of any Native Vegetation Corridor.

Council's Vegetation Community Mapping 2015 shows that 74 Wilsons Road contains Sugarload Lowlands Bloodwood-Apple-Scribbly Gum Forest, which is not an Endangered Ecological Community (EEC). Given that the vegetation is isolated, partly cleared, and not an EEC, it has comparatively low ecological value.

However, the vegetation has a high visual value, acting as an entry statement between the suburbs of Windale and Mount Hutton. The draft Mount Hutton Town Centre Area Plan in the LMDCP 2014 therefore proposes to retain a pocket of vegetation in the southeast corner of the site fronting Wilsons Road to help maintain the visual amenity of the existing vegetation.

Value of the native vegetation along Scrubby Creek

Council's Native Vegetation and Corridor Maps 2015 show that Scrubby Creek riparian corridor contains partly cleared native vegetation. The patches of native vegetation are isolated and are not part of any Native Vegetation Corridor.

Existing vegetation in the Scrubby Creek corridor is partly cleared and is a mix of weeds and native vegetation. Council started rehabilitation work along Scrubby Creek in 2016 and will continue these works into the future. The intention in leaving the LRA Map on Scrubby Creek is to allow ongoing access to the Creek for maintenance and rehabilitation, including clearing weeds infestations and planting native species, which will help to improve the environmental qualities of the Creek.

Council's Vegetation Community Mapping 2015 shows that the vegetation along Scrubby Creek is comprised of two EECs, being Narrabeen Alluvial Paperbark Thicket (Swamp Sclerophyll Forest on Coastal Floodplains) and Coastal Sheltered Apple-Peppermint Forest.

It is proposed that Council will leave the LRA Map on this land and it will continue to be zoned RE1 Public Recreation.

8. Are there any other likely environmental effects as a result of the planning proposal and how are they proposed to be managed?

A summary of the environmental issues associated with this planning proposal is provided below.

Hydrology, Water Quality, and Flooding

Council adopted the *Jewells Wetland Flood Study* in 2013 (BMT WMB). The study produced information on flood flows, velocities, levels and extents for a range of flood event magnitudes under existing catchment and floodplain conditions. See Figures 5, 6 and 7 of this report for details. The flood study helps to understand flood behaviour in the catchment and provides design flood information that helped set appropriate flood planning levels for the study area.

The Jewells Wetland Catchment is a significant catchment located in the northeast of Lake Macquarie. The catchment extends from a ring of townships along the catchment ridgeline, including Dudley, Whitebridge, Charlestown, Mount Hutton, Tingira Heights, and Floraville, draining through a number of creek systems to a coastal outlet at Nine-Mile Beach, Redhead. Scrubby Creek is one of the tributaries in the catchment.

The proposed LEP Amendment will ensure land within the extent of the 1% AEP flood is appropriately zoned to avoid impacts from flooding and to avoid increasing flood impacts elsewhere in the catchment. Refer to Maps 2 and 4 for the proposed Land Zone Map and LRA Map.

The flood maps in Figures 4, 5 and 6 show that the irregular shaped 1% AEP flood extent on 85 Tennent Road is comprised of flood fringe, with shallow, low velocity water.

Any new development on land B2 or R3 with low hazard flood level will be required to construct dwellings to the flood planning level. This applies to land above the 1% AEP flood level plus 0.5m freeboard. Building above the 1% AEP flood levels plus freeboard provides an additional level of protection for individual property owners living outside of but near the 1% AEP high hazard flood areas.

Potential contamination

The study area is comparatively free of development, containing only single dwellings and largely cleared land. The Gateway Determination will help to decide whether a Phase 1 Contamination Assessment is required for this LRA map layer review. To assist, an initial desktop evaluation of the study area using Council records shows that it is unlikely that the study area contains significant contamination, as follows:

- Land in the study area is not identified in the *Lake Macquarie Contaminated Land or Potentially Contaminated Land Database*.
- Land within the study area was not zoned for industrial, agricultural, or defence purposes under the LMLEP 2014, the LMLEP 2004, or the LMLEP 1984.
- The land was zoned Non-Urban 'A' under the Northumberland County District Planning Scheme (gazetted in 1960). Agriculture, forestry, country dwellings, rural industries were permissible in the zone.
- No evidence was found of an activity listed in Table 1 below ever being approved on land in the study area via a search of Council's electronic records.
- A review of historical air photos indicates that the land within the study area has been relatively clear of vegetation and consisted of comparatively large parcels of land with single dwellings since before 1961. None of the activities listed in Table 1 is evident on the site in the aerial photographs. Grazing and / or other low-intensity agricultural uses may have taken place within the study area in the past given the large blocks and cleared nature of the site.
- The site contains buildings that were probably constructed prior to the mid-1980s, as determined by the site inspection and the historical aerial photos. Therefore, it is likely that asbestos building materials have been used and exist on site within the study area. Some of the previous buildings on site that have been demolished over time may have also contained asbestos. The sites may have also experienced illegal dumping. However, these uses are not listed in the table below.

- A search of the *Protection of the Environment Operations Act 1997* (the POEO Act) licence register indicates that the study area has never been regulated through licensing or other mechanisms in relation to any activity listed in Table 1.
- A review of the record of notices issued under the *Contaminated Land Management Act 1997* indicates that there have been no land use restrictions on the property relating to possible contamination, such as notices issued by the EPA or other regulatory authority.
- 85 Tennent Road is currently used to keep horses, which is a semi-agricultural activity. However, keeping horses is unlikely to result in contamination.
- The *Lake Macquarie Contaminated Land or Potentially Contaminated Land Database* indicates that a 'possible site contamination' condition applies to nearby 56 (Lot 101 DP 1115833) and 56A (Lot 31 DP 831676) Wilsons Road, Mount Hutton. The notation is most likely associated with Pasminco slag, which was used extensively in the 1980s and early 1990s as a drainage medium behind concrete road/footpath kerbing. This notation does not affect the study area.
- The site does not contain Acid Sulphate Soils.

Table 4: Table of Activities that May Cause Contamination

Table 1 - Some Activities that may Cause Contamination (referenced from p. 12 of the Managing Land Contamination Planning Guidelines)

• acid/alkali plant and formulation	• engine works	• power stations
• agricultural/horticultural activities	• explosives industry	• railway yards
• airports	• gas works	• scrap yards
• asbestos production and disposal	• iron and steel works	• service stations
• chemicals manufacture and formulation	• landfill sites	• sheep and cattle dips
• defence works	• metal treatment	• smelting and refining
• drum re-conditioning works	• mining and extractive industries	• tanning and associated trades
• dry cleaning establishments	• oil production and storage	• waste storage and treatment
• electrical manufacturing (transformers)	• paint formulation and manufacture	• wood preservation
• electroplating and heat treatment premises	• pesticide manufacture and formulation	

Heritage

The site does not contain and is not within proximity to any known heritage or Aboriginal heritage items. This has been confirmed by a review of the LMLEP 2014 and an AHIMS search.

Acid Sulfate Soils

Acid Sulfate Soils do not affect the subject site.

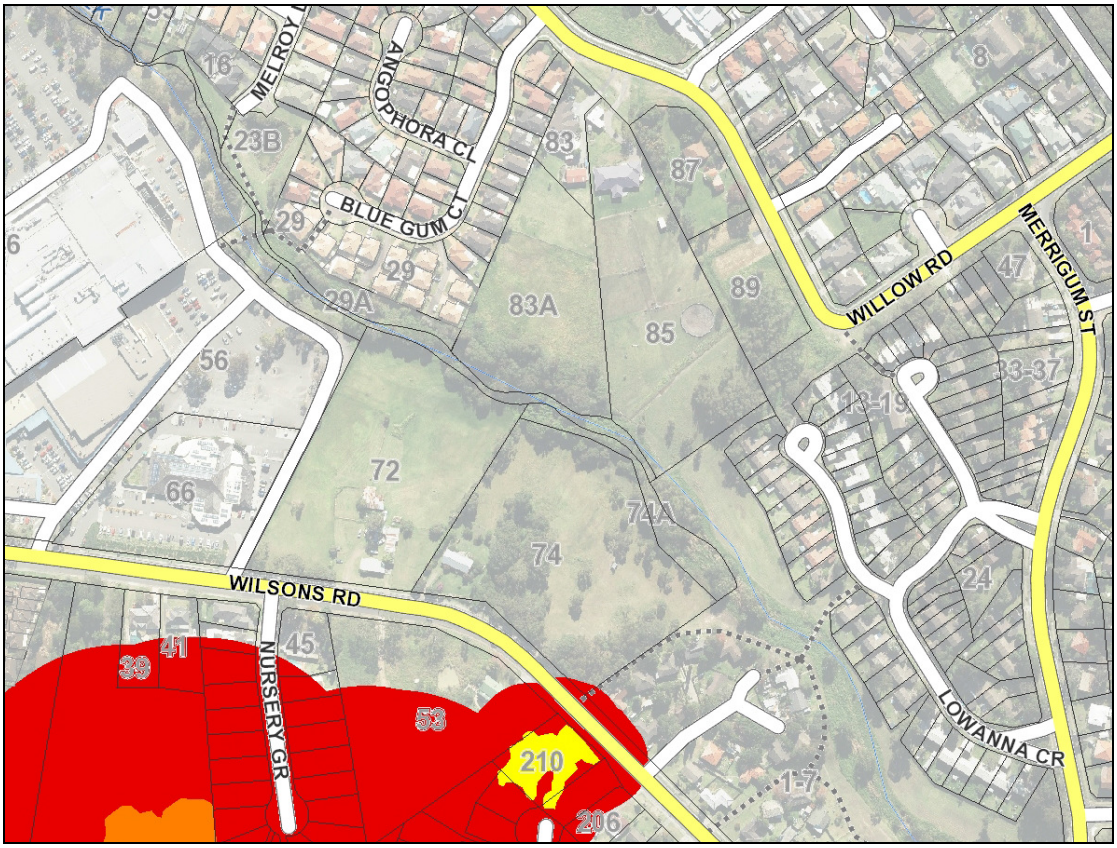
Bushfire

A small corner of 74 Wilsons Road, Mount Hutton is identified as bushfire prone land buffer (see Figure 8 below). The buffer is associated with bushfire prone land Vegetation Category 2 at 210 Wilsons Road. Wilsons Road is located between 74 Wilsons Road and the bushfire prone land.

The part of 74 Wilsons Road affected by the bushfire prone land buffer is already zoned B2 Local Centre under the LMLEP 2014 and none of the changes proposed as part of this planning proposal will impact on the bushfire prone land buffer. It is

unlikely that referral to the Rural Fire Service is required as part of this planning proposal, but this will be clarified by the Gateway Determination.

Figure 8: Bushfire Prone Land Map



9. How has the planning proposal adequately addressed any social and economic effects?

Mount Hutton is not a particularly walkable town centre due to a lack of infrastructure and permeability, as well as the low density of much of the existing development around the centre. If Council provides a shared path along Scrubby Creek in the future, it would significantly improve the walkability of Mount Hutton by increasing the number of residents within walking distance of the shops. Some of the properties within the walking catchment of the Mount Hutton shops, including some that would directly benefit from the proposed path, have lower than average car ownership and may be more reliant on walking. An existing well-worn dirt track demonstrates the desire for a path along the Creek.

The LEP Amendments will provide a small amount of additional residential zoned land in proximity to the town centre at 85 Tennent Road, Mount Hutton. Abandoning the proposed Willow Road extension from 74 Wilsons Road rids this land of the impediment caused by its inclusion on the LRA map layer. Bringing the LRA maps in line with Council's current plans to provide public services and infrastructure in Mount Hutton may help to facilitate infill development of these sites by freeing up land that Council no longer wishes to acquire. Some of the permissible uses on the land include commercial, retail, medium density residential, seniors living, and community or recreational development.

D. STATE AND COMMONWEALTH INTERESTS

10. Is there adequate public infrastructure for the planning proposal?

Any future development in the study area will be required to provide electricity, water, wastewater, and telecommunication services. The study area is within an existing urban area.

Consultation with Hunter Water Corporation will be undertaken as part of the Gateway Determination.

11. What are the views of state and Commonwealth public authorities consulted in accordance with the Gateway determination?

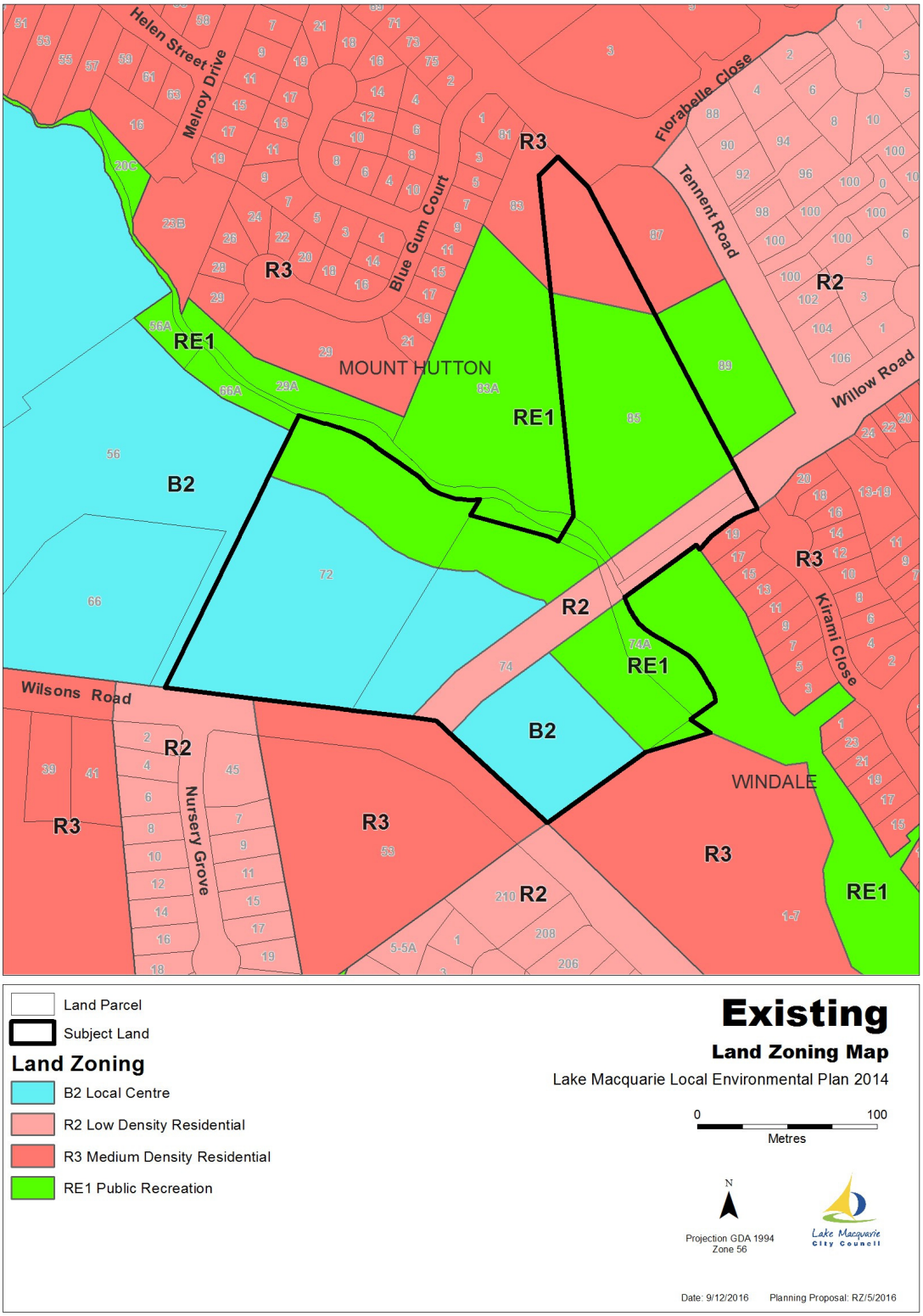
This section will be updated once a Gateway determination is received. It is likely that the Gateway determination will require consultation with the following state and Commonwealth agencies.

- Mines Subsidence Board (within a Mines Subsidence District)
- NSW Office of Water (regarding Scrubby Creek)
- Hunter Water Corporation (regarding the ability to service additional R3 zoned land)
- Office of Environment and Heritage (for flooding)

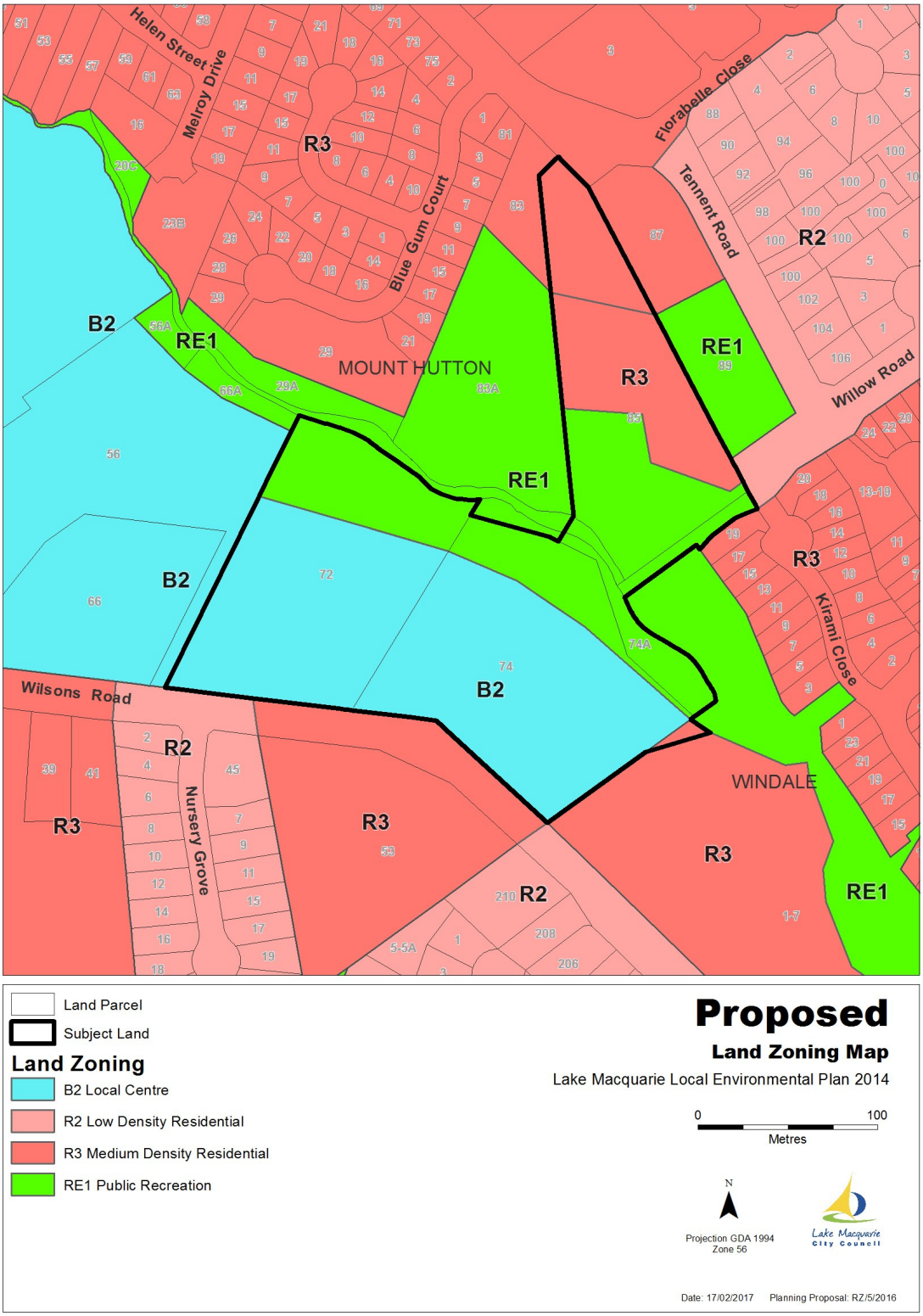
Part 4 – Mapping

The existing maps from the LMLEP 2014, as well as the proposed changes are provided below.

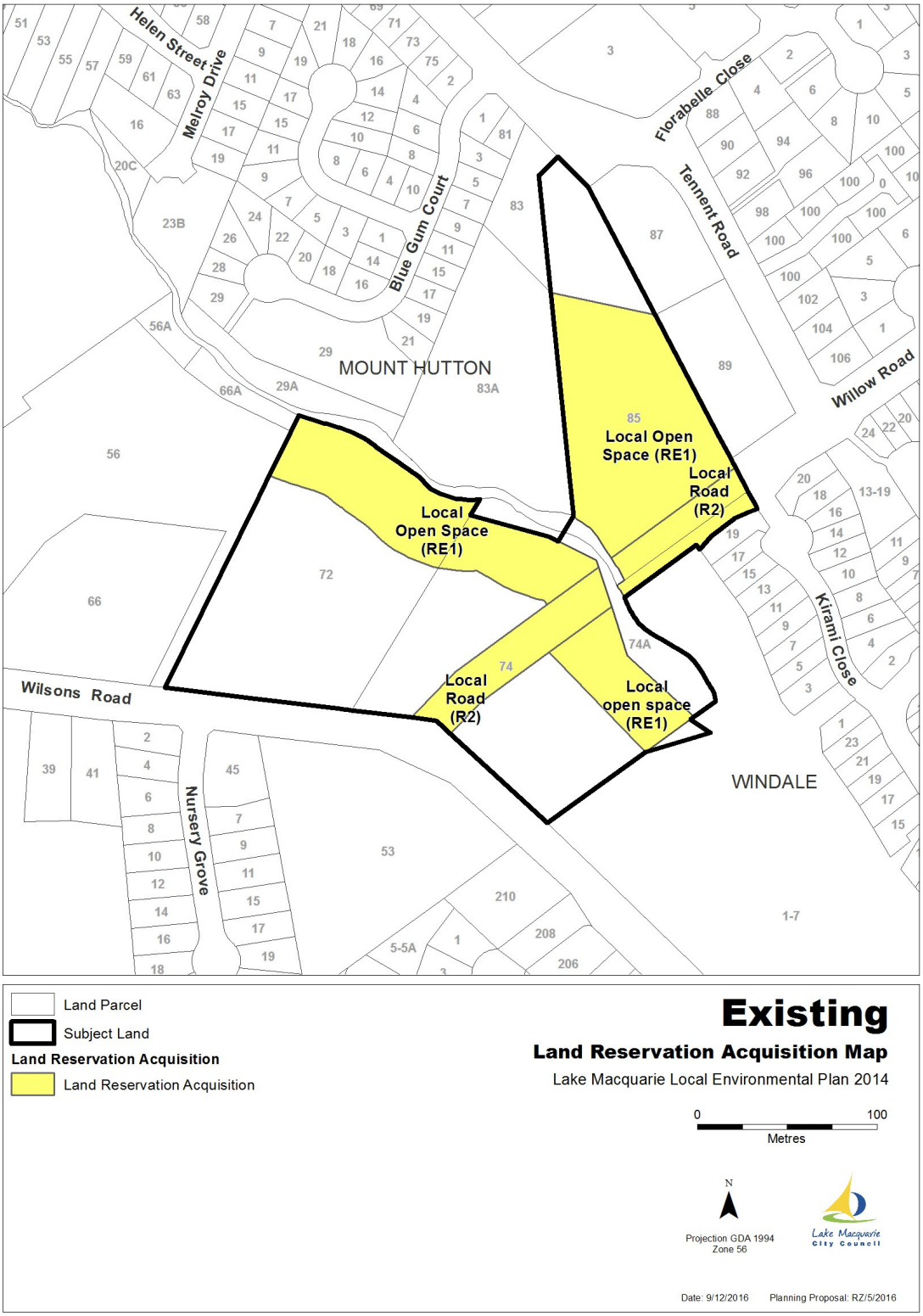
Map 1: Current Zone Map from LMLEP 2014



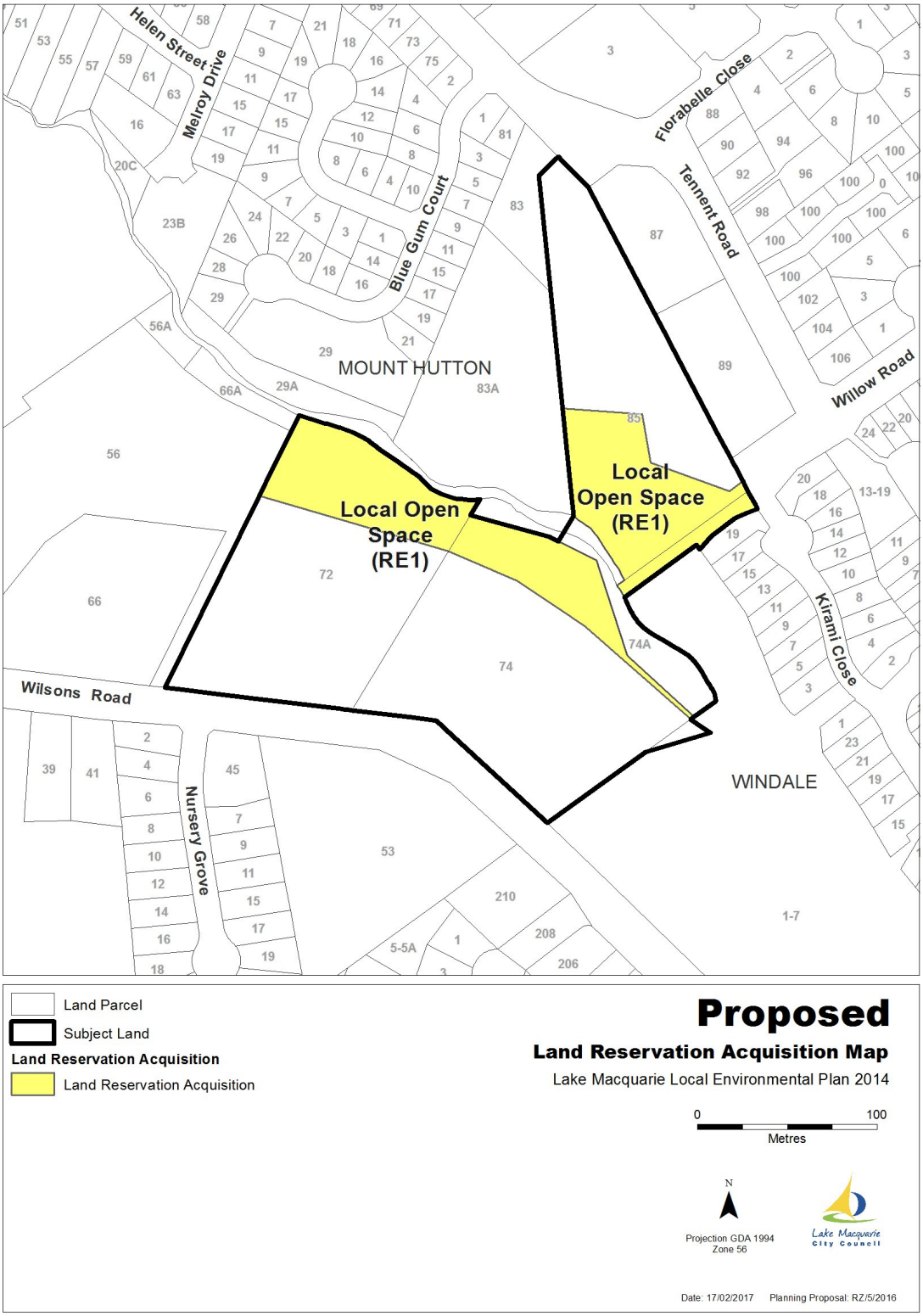
Map 2: Proposed Zone Map under LMLEP 2014



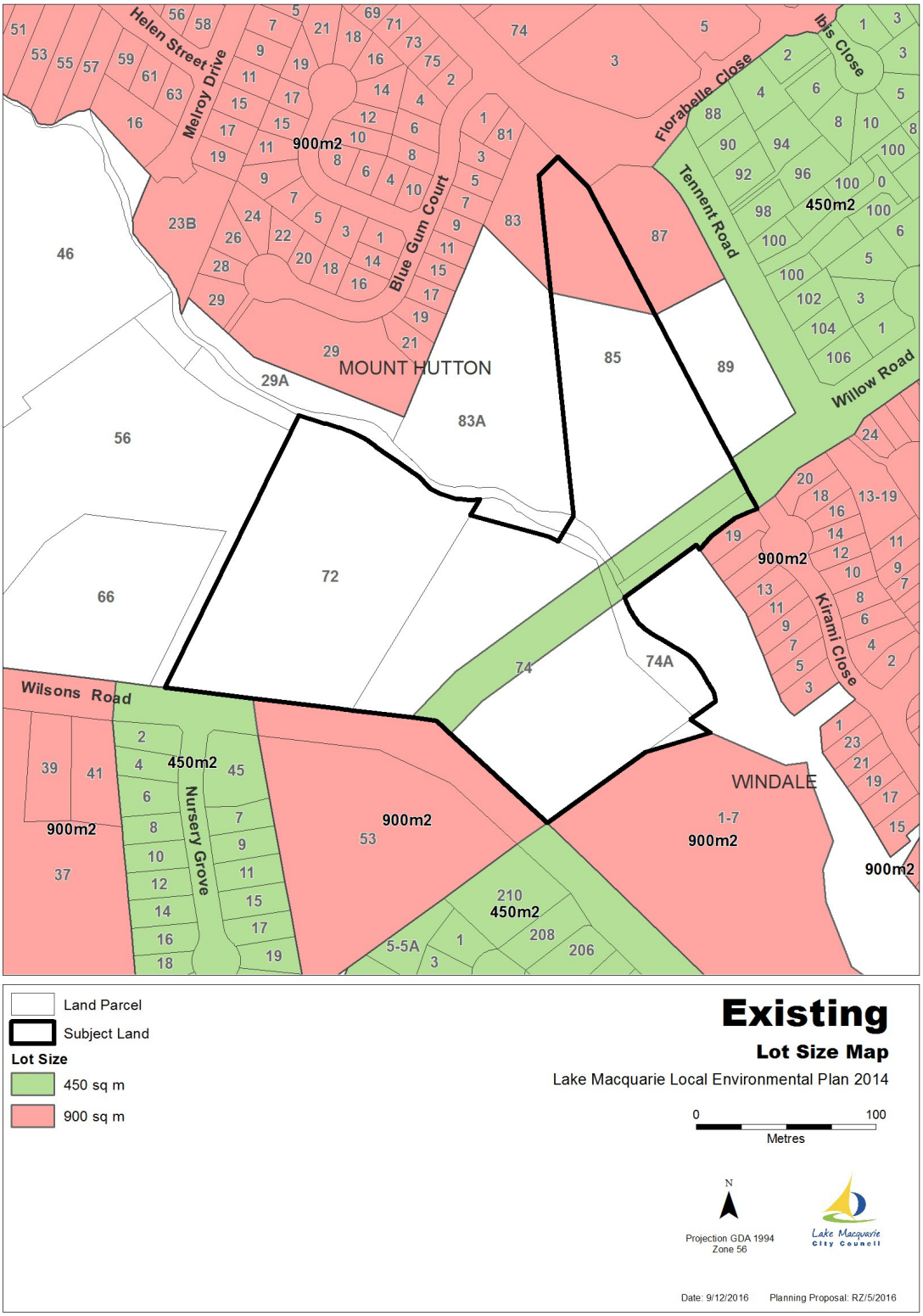
Map 3: Existing Land Reservation Acquisition Map from LMLEP 2014



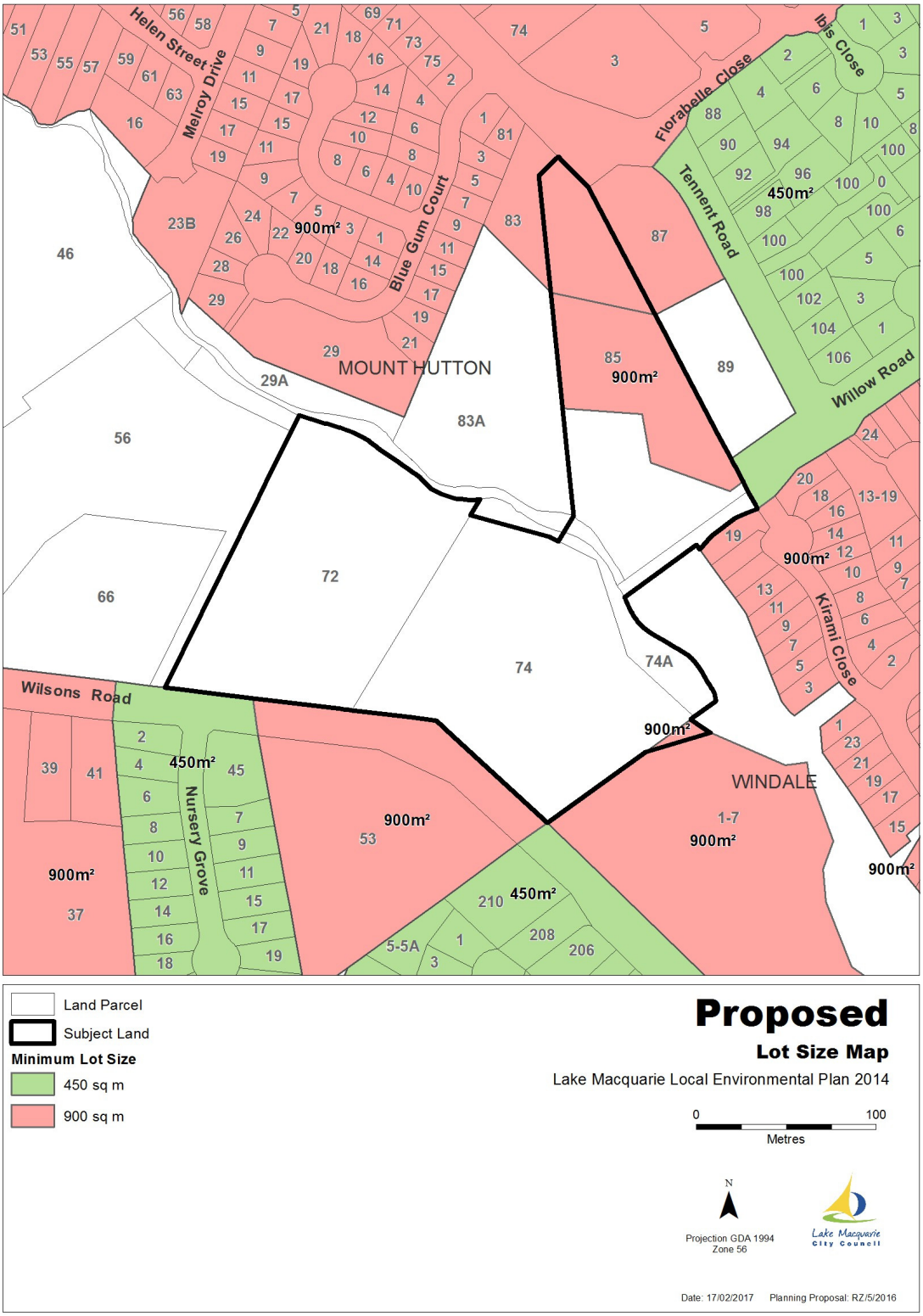
Map 4: Proposed Land Reservation Acquisition Map under LMLEP 2014



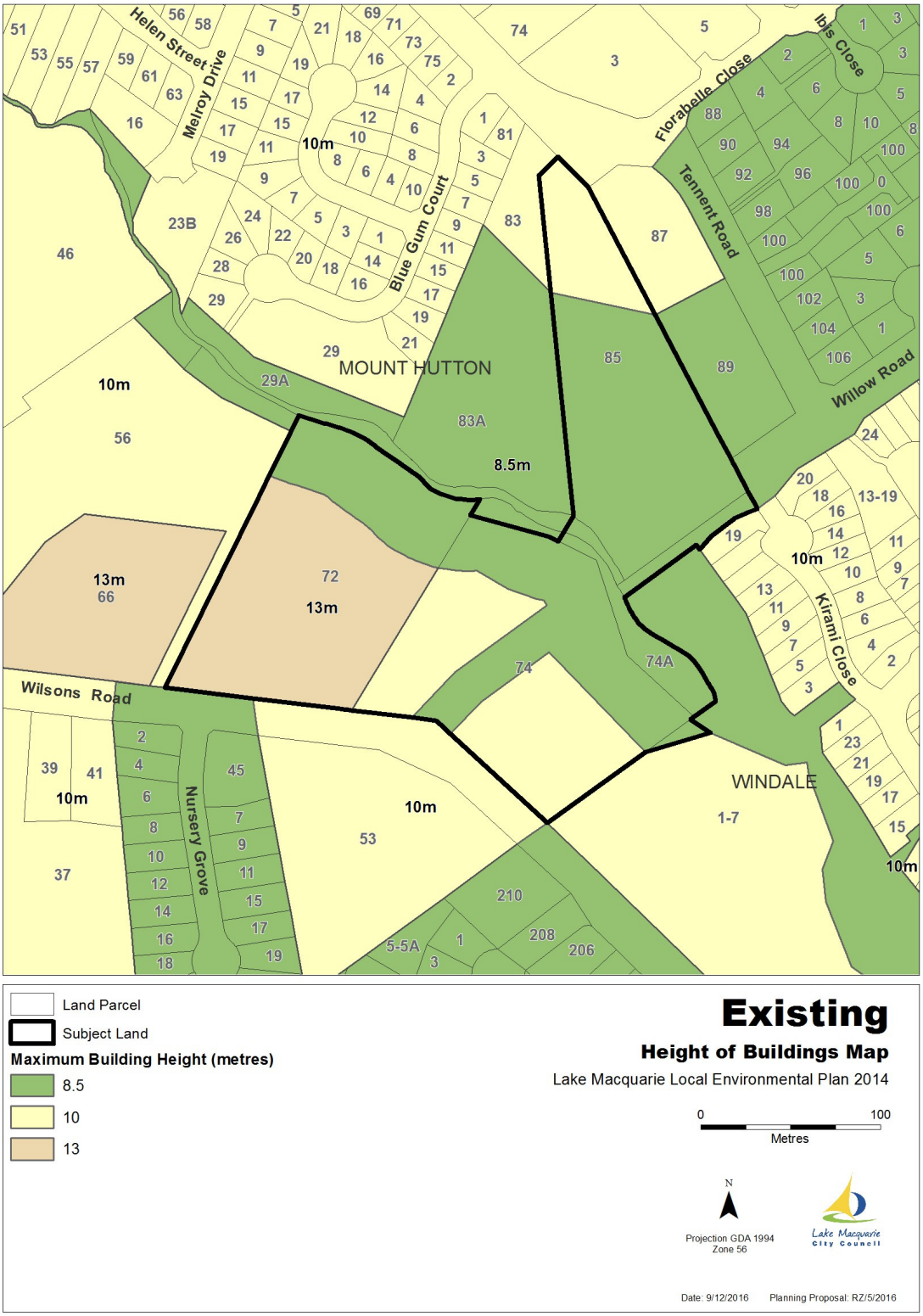
Map 5: Current Lot Size Map under LMLEP 2014



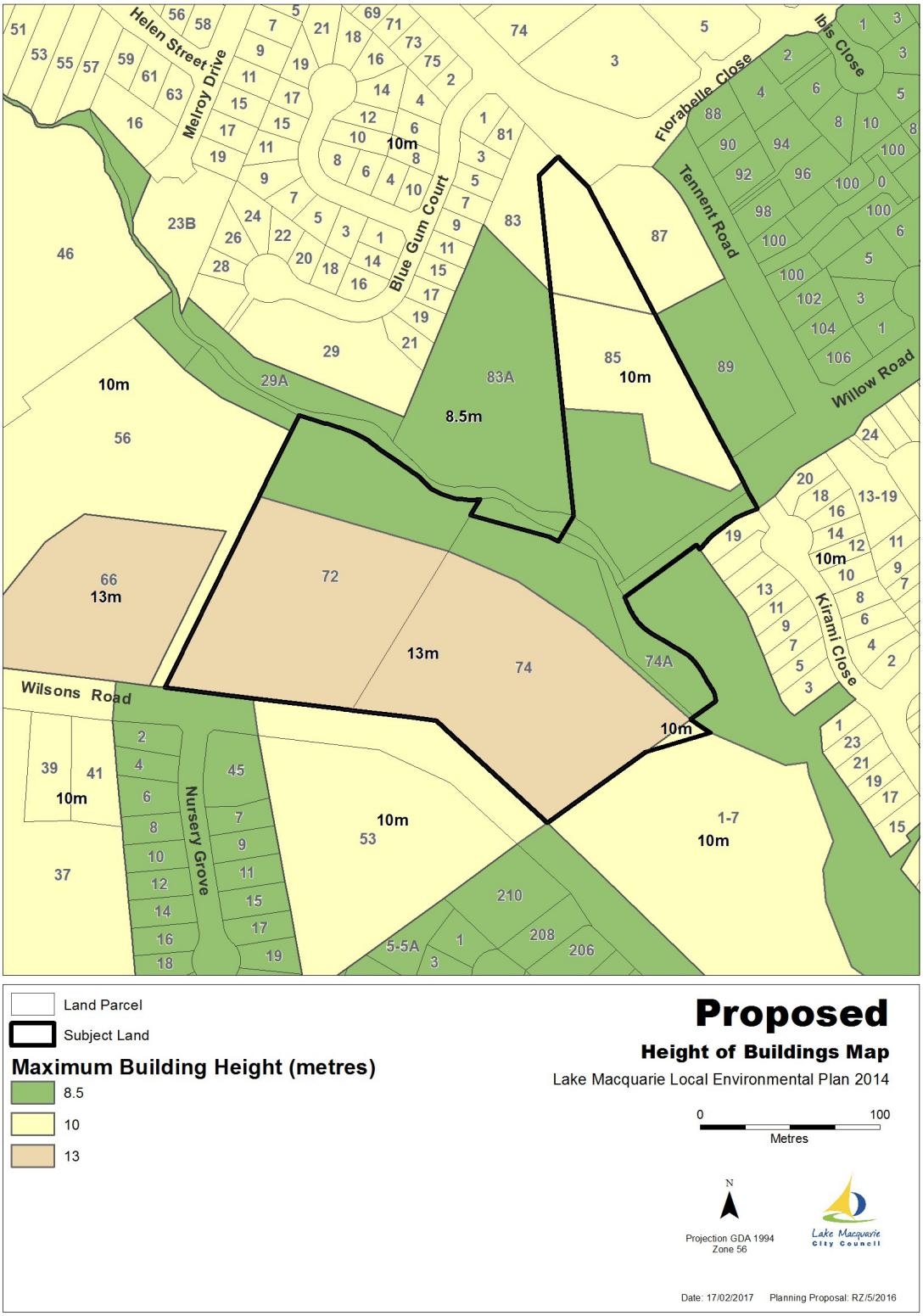
Map 6: Proposed Lot Size Map under LMLEP 2014



Map 7: Current Height of Buildings Map under LMLEP 2014



Map 8: Proposed Height of Buildings Map under LMLEP 2014



Part 5 – Community consultation

Community consultation will be undertaken in accordance with the requirements of the *Environmental Planning and Assessment Act 1979*.

It is likely that the planning proposal and other relevant material will be available for public comment for a period of 28 days. Exhibition material will be provided in accordance with *A guide to preparing local environmental plans*.

Community consultation will take place at the same time as agency consultation.

Part 6 – Project timeline

Anticipated commencement date (date of Gateway determination)	1 September 2017
Anticipated timeframe for the completion of required technical information	N/A
Timeframe for government agency consultation (pre and post exhibition as required by Gateway determination)	4 October 2017
Commencement and completion dates for public exhibition period	9 September to 9 October 2017
Dates for public hearing (if required)	N/A
Timeframe for consideration of submissions	31 October 2017
Timeframe for the consideration of a proposal post exhibition	31 October 2017
Date of submission to the Department to finalise the LEP	1 November 2017
Anticipated date RPA will make the plan	30 November 2017
Anticipated date RPA will forward to the Department for notification	1 December 2017

Attachment 1: Extract from the Charlestown Contribution Catchment Plan, Traffic and Transport Study, May 2015

10.7 Wilsons Road to Willow Road link, Mount Hutton

The Wilsons Road to Willow Road link (Figure 10.19) has previously been identified in the LEP. The proposed road link is 268 metres in length with an estimated travel time of 20 seconds at 50km/h, plus delay at either end for intersections.

The alternative to this link is travelling along Merrigum Road from Willow Road to South Street, and South Street from Merrigum Street to Wilsons Road, which at 1,030 metres takes around 80 seconds to travel, plus delay at the intersections. To determine if this road link is required within this Section 94 plan, the intersections of Merrigum Street at Willow Road, and Merrigum Street at South Street have been analysed to determine if the delay will be increased to an unacceptable level at either intersection, potentially warranting the link to be constructed.

The Mount Hutton / Windale sub-catchment is projected to increase 21% between 2010 and 2025.

Figure 10.19: Proposed Wilsons Road to Willow Road link, and Merrigum Street and South Street existing alternative

10.7.1 Merrigum Street and Willow Road intersection

The Merrigum Street and Willow Road intersection (Figure 10.20) has been analysed for the 2025 horizon year and continues to operate well with the 20% sensitivity (Table 10.50). Therefore, this intersection does not require an upgrade prior to 2025.

Figure 10.20: Merrigum Street and Willow Road intersection, 2010

Table 10.50: Merrigum Street and Willow Road, 2025 with 20% sensitivity

Site: Merrigum Street and Willow Road - 2025 PM + 20%

PM peak
Stop (Two-Way)

Lane Use and Performance	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Merrigum Street													
Lane 1	79	0.0	1165	0.068	100	11.5	LOS A	0.3	1.9	Short (P)	10	0.0	0.0
Lane 2	331	1.3	456	0.725	100	26.1	LOS B	6.1	43.3	Full	500	0.0	0.0
Approach	409	1.0		0.725		23.3	LOS B	6.1	43.3				
East: Willow Road south-west bound													
Lane 1	594	1.2	1654	0.359	100	5.3	LOS A	2.2	15.6	Full	500	0.0	0.0
Approach	594	1.2		0.359		5.3	NA	2.2	15.6				
West: Willow Road north-eastbound													
Lane 1	38	2.6	1848	0.021	20[6]	0.0	LOS A	0.0	0.0	Short (P)	10	0.0	0.0
Lane 2	176	2.4	1696	0.104	100	3.3	LOS A	0.6	4.0	Full	500	0.0	0.0
Approach	215	2.5		0.104		2.7	NA	0.6	4.0				
Intersection	1218	1.4		0.725		10.9	NA	6.1	43.3				

10.7.2 Merrigum Street and South Street Intersection

The Merrigum Street and South Street intersection (Figure 10.21) currently operates at an adequate LoS, with Merrigum Street operating at a LoS of C (Table 10.51). Merrigum Street at South Street is restricted by the concrete pedestrian refuge island installed at the intersection, which makes it unable to have two lanes on approach to South Street.

Figure 10.21: Merrigum Street and South Street intersection, 2010

Table 10.51: Merrigum Street and South Street, 2014

Site: Merrigum Street and South Street - 2014 PM

New Site
Stop (Two-Way)

Lane Use and Performance	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: South Street westbound													
Lane 1	101	0.6	1942	0.052	20[6]	0.0	LOS A	0.0	0.0	Short (P)	10	0.0	0.0
Lane 2	343	1.0	1315	0.261	100	6.5	LOS A	2.1	14.6	Full	500	0.0	0.0
Approach	444	0.9		0.261		5.0	NA	2.1	14.6				
North: Merrigum Street													
Lane 1	316	1.7	377	0.837	100	38.9	LOS C	9.1	64.4	Full	500	0.0	0.0
Approach	316	1.7		0.837		38.9	LOS C	9.1	64.4				
West: South Street eastbound													
Lane 1	203	1.6	1837	0.111	63[5]	8.2	LOS A	0.0	0.0	Short (P)	20	0.0	0.0
Lane 2	333	5.1	1888	0.176	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	536	3.7		0.176		3.1	NA	0.0	0.0				
Intersection	1296	2.3		0.837		12.5	NA	9.1	64.4				

The Merrigum Street leg reaches a LoS E in 2018 (Table 10.52), at which time it will require upgrading. Due to the constrained road width, it is recommended that signalisation is the most appropriate option (Figure 10.22).

Table 10.52: Merrigum Street and South Street, 2018. Merrigum Street reaching LoS E

Site: Merrigum Street and South Street - 2018 PM

New Site
Stop (Two-Way)

Lane Use and Performance	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: South Street westbound													
Lane 1	109	0.6	1942	0.056	20[6]	0.0	LOS A	0.0	0.0	Short (P)	10	0.0	0.0
Lane 2	361	1.0	1287	0.280	100	7.0	LOS A	2.4	16.8	Full	500	0.0	0.0
Approach	469	0.9		0.280		5.4	NA	2.4	16.8				
North: Merrigum Street													
Lane 1	333	1.6	349	0.953	100	64.4	LOS E	15.8	112.1	Full	500	0.0	0.0
Approach	333	1.6		0.953		64.4	LOS E	15.8	112.1				
West: South Street eastbound													
Lane 1	215	1.5	1838	0.117	63[5]	8.2	LOS A	0.0	0.0	Short (P)	20	0.0	0.0
Lane 2	352	4.8	1891	0.186	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	566	3.5		0.186		3.1	NA	0.0	0.0				
Intersection	1368	2.2		0.953		18.8	NA	15.8	112.1				

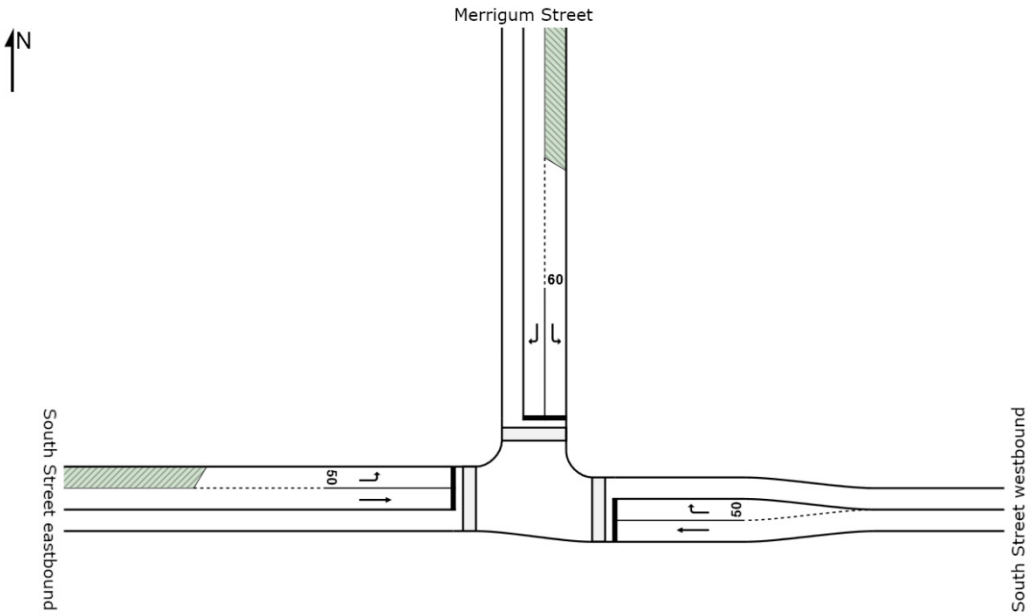


Figure 10.22: Merrigum Street and South Street proposed signalisation upgrade

The intersection was modelled as signals (Table 10.53), and with 10 year growth (Table 10.54), with the intersection operating at a LoS B. To test the sensitivity of the upgrade, 20% was added to the traffic volumes and this was modelled, with the intersection remaining at a LoS B (Table 10.55).

Table 10.53: Merrigum Street and South Street signalised, 2018

Site: Merrigum Street and South Street - 2018 PM

New Site
Signals - Actuated Cycle Time = 67 seconds (Practical Cycle Time)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: South Street westbound													
Lane 1	347	0.6	1189	0.292	100	6.8	LOS A	5.3	37.6	Full	500	0.0	0.0
Lane 2	115	1.8	261	0.440	100	34.0	LOS C	3.4	24.1	Short	50	0.0	0.0
Approach	462	0.9		0.440		13.6	LOS A	5.3	37.6				
North: Merrigum Street													
Lane 1	165	0.6	386	0.428	100	34.8	LOS C	4.9	34.3	Short (P)	60	0.0	0.0
Lane 2	163	2.6	381	0.428	100	35.0	LOS C	4.8	34.4	Full	500	0.0	0.0
Approach	328	1.6		0.428		34.9	LOS C	4.9	34.4				
West: South Street eastbound													
Lane 1	212	1.5	603	0.351	100	27.6	LOS B	5.3	37.9	Short (P)	50	0.0	0.0
Lane 2	346	4.9	1157	0.299	100	6.9	LOS A	5.4	39.1	Full	500	0.0	0.0
Approach	558	3.6		0.351		14.8	LOS B	5.4	39.1				
Intersection	1348	2.2		0.440		19.3	LOS B	5.4	39.1				

Table 10.54: Merrigum Street and South Street signalised with 10-year life, 2028

Site: Merrigum Street and South Street - 2028 PM

New Site
Signals - Actuated Cycle Time = 74 seconds (Practical Cycle Time)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: South Street westbound													
Lane 1	395	0.5	1182	0.334	100	7.9	LOS A	7.0	49.0	Full	500	0.0	0.0
Lane 2	131	1.6	249	0.525	100	36.3	LOS C	4.3	30.6	Short	50	0.0	0.0
Approach	525	0.8		0.525		15.0	LOS B	7.0	49.0				
North: Merrigum Street													
Lane 1	187	0.6	425	0.441	100	36.3	LOS C	6.0	42.0	Short (P)	60	0.0	0.0
Lane 2	185	2.3	420	0.441	100	36.4	LOS C	5.9	42.1	Full	500	0.0	0.0
Approach	373	1.4		0.441		36.3	LOS C	6.0	42.1				
West: South Street eastbound													
Lane 1	240	1.3	646	0.371	100	28.4	LOS B	6.5	46.3	Short (P)	50	0.0	0.0
Lane 2	394	4.3	1154	0.341	100	8.0	LOS A	7.0	50.7	Full	500	0.0	0.0
Approach	634	3.2		0.371		15.7	LOS B	7.0	50.7				
Intersection	1532	1.9		0.525		20.5	LOS B	7.0	50.7				

Table 10.55: Merrigum Street and South Street signalised, 2028, plus 20% sensitivity

Site: Merrigum Street and South Street - 2028 PM + 20% sensitivity

New Site
Signals - Actuated Cycle Time = 92 seconds (Practical Cycle Time)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: South Street westbound													
Lane 1	474	0.4	1226	0.386	100	9.2	LOS A	10.3	72.0	Full	500	0.0	0.0
Lane 2	157	1.3	241	0.651	100	41.1	LOS C	6.5	45.7	Short	50	0.0	0.0
Approach	631	0.7		0.651		17.1	LOS B	10.3	72.0				
North: Merrigum Street													
Lane 1	225	0.5	443	0.509	100	42.7	LOS D	8.9	62.7	Short (P)	60	0.0	9.0
Lane 2	222	1.9	438	0.507	100	42.8	LOS D	8.8	62.6	Full	500	0.0	0.0
Approach	447	1.2		0.509		42.8	LOS D	8.9	62.7				
West: South Street eastbound													
Lane 1	288	1.1	781	0.369	100	28.4	LOS B	8.8	62.4	Short (P)	50	0.0	25.1
Lane 2	472	3.6	1201	0.393	100	9.2	LOS A	10.3	74.1	Full	500	0.0	0.0
Approach	760	2.6		0.393		16.5	LOS B	10.3	74.1				
Intersection	1838	1.6		0.651		23.1	LOS B	10.3	74.1				

10.7.3 Conclusion

The link between Wilson Road and Willow Road is expected to cost approximately $6,500,000 for the 270 metre section of road including a bridge, and an intersection at Tennent Road and at Wilsons Road. The link provides the benefit of decreased travel time between the two points (saving approximately 1.5 minutes). The travel time saving is not considered to outweigh the construction costs.

The existing link along Merrigum Street and South Street between Willow Road and Wilsons Road requires a signalisation upgrade of the intersection of Merrigum Street at South Street at an estimated cost of $2.06m. This upgrade is required to be

constructed in 2018, and will facilitate safe movement between Willow Road and Wilsons Road at a considerably lower construction cost.

Therefore, it is recommended that the Wilsons Road to Willow Road link not be constructed and removed from the LEP, and the upgrade of Merrigum Street at South Street be listed for construction in 2018 within the Charlestown Section 94 plan.

Attachment 2: Extract from the Jewells Wetland Floodplain Risk Management Study and Plan Final Report, July 2017

Location	Mitigation Option	Comment
		culvert reach runs through private property and provides for a change in alignment of the Dicks Creek channel. Channel capacity upgrades of this reach may improve flooding conditions for the flood affected industrial properties on Arnhem Close and Nevin Close. **Recommended for further investigation**

7.1.1 Mount Hutton Stormwater Drainage Improvements

A stormwater quantity and quality management study (2013) for major drainage infrastructure within Mount Hutton was undertaken to update the Charlestown Contribution Catchment Section 94 Plan. The study included a review of the trunk drainage system to identify existing capacity constraints. Options to increase the trunk drainage capacity were investigated to cater for both existing catchment development and potential future catchment development (fully developed state).

Possible engineering solutions such as expanding existing detention basins, providing new detention basins and upgrading the existing drainage system in critical locations by providing additional pipes were investigated. Design model results indicated that localised improvements in overall drainage system capacity were achievable, however, the proposed work would not solve all drainage issues within the catchment.

The works proposed in the study are included in Appendix D and comprises:

- Seven new detention basins,
- Five existing detention basin upgrades,
- Ten pipe upgrades,
- Six gross pollutant traps,
- Two new wetlands, and
- Modification to three existing wetlands.

The above upgrades (including land acquisitions) were estimated to cost $17.3m (2012 rates).

A summary of the results of the 2013 study modelling for the Ada Street locality is provided in Table 7-2. The table provides for the design peak flows for the existing stormwater drainage system and an upgraded system under two development scenarios: the existing catchment development; and a future fully developed catchment state.

The table of results show the reduction in peak discharges for the proposed system upgrades achieved through the provision of significant additional flood detention. However, as noted in the table, the upgraded system does not achieve any major increases in system capacity which is still less than 5% AEP capacity.

Despite the current system capacity in the Ada Street locality being less than 10% AEP capacity, the resulting peak flood level for events up to the 1% AEP design flood condition does not cause

above floor flooding of existing residences. The main impact to existing properties is relatively shallow overland flooding. The drainage system upgrades would reduce the incidence of this overland flooding. Shallow overland flooding may cause damages to outbuildings/property on the lots separate to the main residence. However, in terms of large scale flood damages, these are limited given there is no above floor flooding in this locality. Whilst a benefit to the Ada Street locality is realised in terms of reducing the incidence of overland flooding, the limited reduction in potential flood damages is small compared to the overall capital cost of works.

The reductions in peak discharges afforded through the upgrade works also has limited benefit further downstream in the Jewells Wetland catchment. The next location downstream where there are significant potential flood damages is downstream of Kalaroo Road. Design 1% AEP peak flows in this location are in excess of 130m^3/s. Accordingly, the potential flow reductions summarised in Table 7-2 represent only minor change.

Notwithstanding the above, there are broader benefits of the proposed upgrade works in relation to local stormwater management and planning for future catchment development. Accordingly, within the context of the Jewells Wetland Floodplain Risk Management Plan, general support is provided to the concepts presented for the drainage system upgrades. The Plan does not provide a direct recommendation for the works based on the limited benefit in terms of existing property affectation and flood damage.

Table 7-2 Summary of Drainage System Analysis (City Projects Engineering, 2013)

Scenario	Existing Drainage System	Proposed Upgraded System
Existing Catchment Development		
5% AEP Discharge (m^3/s)	11.74	7.72
1% AEP Discharge (m^3/s)	15.50	9.68
Approximate capacity	<10% AEP	<5% AEP
Future Fully Developed Catchment		
5% AEP Discharge (m^3/s)	13.25	9.04
1% AEP Discharge (m^3/s)	17.02	11.1
Approximate capacity	<10% AEP	<5% AEP

7.1.2 Road and Culvert Upgrades

Culvert and/or road upgrades at creek crossing locations along Kalaroo Road and Oakdale Road and have been identified as potential flood mitigation options in order to provide higher flood immunity to these transport routes.

The Kalaroo Road crossing of Crokers Creek in particular has been identified to have a relatively low existing flood immunity standard (<20% AEP). In major rainfall events, the crossing is effectively a low-level causeway, such that any significant flow in the catchment has the potential to inundate the road and provide subsequent disruption to traffic. Being in the lower catchment, and prone to flooding for longer duration events, the crossing can be affected for longer periods of time.

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The Costs / Resource Needs criterion represents a rating wherein a High Rating reflects the lowest costs, while a Low Rating reflects the highest costs. This has been adopted for consistency with the other criteria.

Table 7-4 Rapid Analysis Assessment Criteria

	LOW (STOP / reassess)	MEDIUM (SLOW)	HIGH (GO)
Performance	Action is not particularly effective over the short or longer terms	Action provides only a short-term fix, or is only partly effective over the long term	Action provides an effective long term solution to the risks identified
Practicality	Acton would be difficult to implement through existing constraints, approvals required etc. Would be very demanding to successfully implement	Action would have some hurdles for implementation, which may take longer and demand more effort to overcome.	Action is straightforward to implement with few barriers or uncertainties
Community Acceptability	Unlikely to be acceptable to the majority of the community and politically unpalatable. Significant championing required by Council and State.	Would be palatable to some, not to others. Briefing by Councillors, GM and community education required.	Is very politically palatable, acceptable to community. Minimal education required
Environmental Impacts	Likely to have significant adverse environmental impacts unable to be effectively managed	Likely to manageable environmental impacts through appropriate assessment and planning	No significant environmental impact identified. Environmental / ecological benefit through measure implementation
Costs / Resources	Very Expensive (more than $1,000,000) and/or very high (unmanageable) resource demands on authorities	Moderately expensive (e.g. $100,000 - $1,000,000) and/or high resource demands on authorities	Manageable costs (< $100,000) and manageable resource demands on authorities

The results of the Rapid Analysis are presented in Table 7-5. This table also gives a Total Score for each action. The score is calculated based on the following points system:

- All HIGH (go) criteria have a score of +1
- All MEDIUM (slow) criteria have a score of 0
- All LOW (stop and reassess) criteria have a score of -1.

The scoring in the rapid analysis provides some indication on the recommended prioritisation of the recommended measures. The higher scoring options typically have few barriers to implementation whilst providing effective floodplain risk management benefit.

Table 7-5 Assessment of Management Options

Performance	Performance	Practicality	Community Acceptability	Environmental	Costs/ Resources	Total Score
Structural Measures						
Drainage System Upgrades Mount Hutton Catchment	LOW	MED	HIGH	MED	HIGH	-1
Lake Street Windale Detention Basin	LOW	MED	HIGH	HIGH	MED	1
Gateshead Industrial Detention Basin	LOW	MED	HIGH	HIGH	MED	1
Gateshead Industrial Channel Works /Levee	LOW	MED	HIGH	HIGH	MED	1
The Sanctuary, Redhead Holiday Park Levee	LOW	MED	MED	HIGH	MED	0
The Sanctuary, Redhead Holiday Park Channel Widening	MED	MED	HIGH	LOW	MED	0
The Sanctuary, Redhead Holiday Park Channel Maintenance	MED	MED	HIGH	MED	MED	1
Kalaroo Road Raising and Culvert Upgrade	MED	MED	HIGH	MED	LOW	0
Oakdale Road Raising and Culvert Upgrade	MED	HIGH	HIGH	HIGH	MED	2
Property Modification						
Investigate House Raising Program	MED	HIGH	MED	HIGH	HIGH	3
Floodproofing of individual properties	MED	HIGH	MED	HIGH	HIGH	3
Planning and Development Controls						
Update Hydraulic Category Mapping	HIGH	HIGH	HIGH	HIGH	HIGH	5

Performance	Performance	Practicality	Community Acceptability	Environmental	Costs/ Resources	Total Score
Adopt Flood Planning Area Mapping	HIGH	HIGH	MED	HIGH	HIGH	4
Flood Warning and Emergency Response						
Install Automated Flood Warning Signs	LOW	HIGH	HIGH	HIGH	HIGH	3
Update to Local Flood Plan and Emergency Response	HIGH	HIGH	HIGH	HIGH	HIGH	5
Ongoing Community Education and Awareness	MED	HIGH	HIGH	HIGH	HIGH	4

Of note in the table are the lowest scoring options being most of the structural options. This is reflective of the relative scale and costs associated with the works, the considerable planning required for implementation of the options, and limited performance in terms of flood damages reductions. Whilst some of the structural options have a net positive total score, the "Low" performance criteria essentially excludes the options from the Plan recommendations. The cost of implementation of these options cannot be justified given limited or no benefit in flood risk reduction despite favourable scoring in other criteria. Accordingly on this basis, the following structural options are not recommended in the Plan:

- Drainage System Upgrades Mount Hutton Catchment
- Lake Street Windale Detention Basin
- Gateshead Industrial Detention Basin
- Gateshead Industrial Channel Works /Levee
- The Sanctuary, Redhead Holiday Park Levee

The Mount Hutton Stormwater Drainage Improvements were discussed in further detail in Section 7.1.1. The benefits of potential drainage upgrades were noted as being limited given there is no above floor flooding in this locality. However, it is acknowledged that the incidence of overland flooding may be reduced and being part of a Section 94 Contributions Plan, the upgrade works investigated cater for potential future catchment development (fully developed state). Accordingly, whilst not directly recommended in the current Plan, general support is provided to the concepts presented for the drainage system upgrades in managing potential flood impacts of future catchment development.

Channel widening and maintenance works in the lower Crokers Creek channel will potentially have significant environmental and associated planning constraints. In order to further consider the merit

of these flood management options, the environmental constraints need to be identified. Accordingly, the Plan provides for the recommendation of an Environmental Investigation specific to channel widening/vegetation removal in the lower wetland area. A favourable outcome from the environmental assessment would then see an update of the Plan to formally include the channel works as appropriate.

The Kalaroo Road raising option represents a major construction with high cost in order to increase existing road flood immunity. The lesser scale of works for the Oakdale Road culvert upgrade provides for a higher relative feasibility score compared to Kalaroo Road. In both cases, most benefit is derived from the reduced traffic disruption from road closures. Increasing the Oakdale Road culvert capacity on Dicks Creek will benefit the private property on the downstream side of the road which is currently directly exposed to road overflows at this location.

The Investigation of a House Raising Program is recommended in the Plan, however, as previously noted this will be subject to the outcomes of other investigations recommended. Specifically, this includes the outcomes of the environmental assessment on channel widening in the Lower Crockers Creek and the update of the flood risk mapping in accordance with AR&R revisions (in particular IFD rainfall and temporal pattern changes). In taking these recommendations through in the Plan, the following sequence of implementation is suggested:

1. Environmental investigation to confirm opportunity for channel widening. If deemed an available option, undertake design and modelling to confirm reduction in flood levels and corresponding property inundation.
2. Update of design flood conditions in accordance with recommendations in AR&R revisions. Initial indications are with revised design rainfall that flood planning levels may increase in the lower catchment. Redefine number of properties at risk and requirement for a house raising program.
3. Undertake house raising program investigation to confirm numbers of potential properties based on flood risk and construction type, potential uptake based on landowner support, benefit-cost analysis of program, identification of potential funding sources.

There are few barriers to implementation of the remaining measures including:

- Update of flood mapping in Council system for flood planning and development control
- Installation of automated flood warning signs at Kalaroo Road
- Using flood study mapping and flood to intelligence in local flood response planning
- Ongoing community awareness initiatives for flood behaviour and response in the catchment

It is noted that the Kalaroo Road warning signs was designated as "low performance" yet remains a recommended measure. The benefit of the measure predominantly lies with the opportunity for advanced warning/notification of road closure. This may enable road traffic advice to be relayed and disseminated more readily to reduce road closure impacts. From a flood risk perspective, the signage would provide an immediate warning and deterrent for drivers to attempt passing through the floodwater. Accordingly, there is benefit from a public safety aspect. The value of the warning signs would be enhanced through installation of a system that enables direct flood warning

Attachment 3: Flood Impact Assessment for Proposed Concrete Lined Channel at Scrubby Creek, Mount Hutton

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Our Ref: JDE: L.N20289.001.docx

8 June 2017

Lake Macquarie City Council
126-138 Main Road
Speers Point NSW 2284
Box 1906
HRMC NSW

Attention: Greg Jones

Dear Greg,

RE: FLOOD IMPACT ASSESSMENT FOR PROPOSED CONCRETE LINED CHANNEL AT SCRUBBY CREEK, MOUNT HUTTON

BMT WBM was requested to undertake a flood impact assessment to investigate the impact of extending the existing concrete lined channel on Scrubby Creek in Mount Hutton. Specifically, the assessment includes determination of the peak flood levels and flood behaviour for the 1% Annual Exceedance Probability (AEP) design event. The change in design flood level conditions associated with the channel modification will be identified and assessed. The following provides a summary of the analysis and results.

Existing Design Flood Conditions

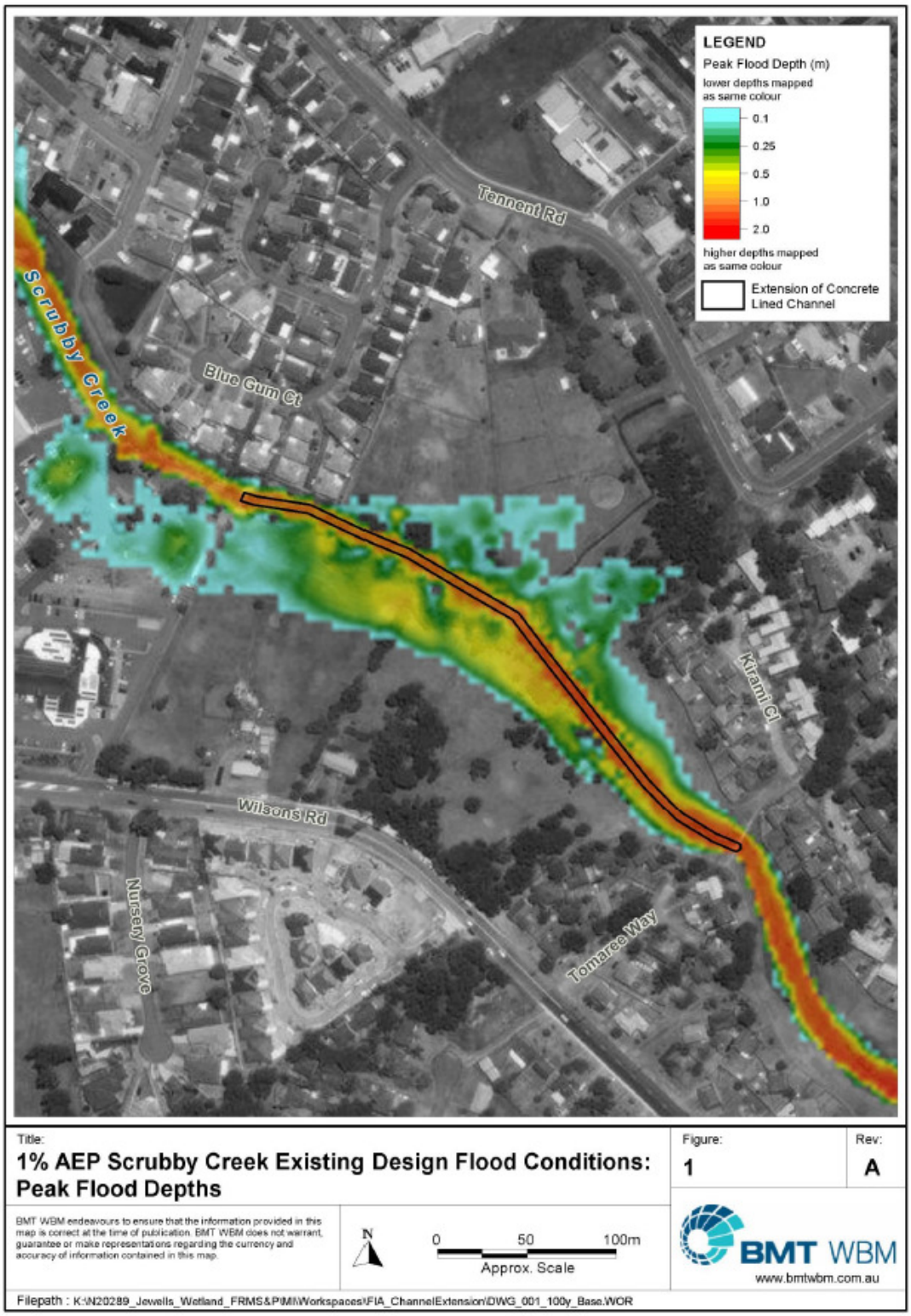
The locality of the channel modification is shown in Figure 1. There is an existing concrete line channel within the Scrubby Creek waterway alignment, extending from Warners Bay Road to Blue Gum Court (adjacent to north-east corner of Lake Macquarie Fair). The proposed works comprise the extension of this existing concrete lined channel downstream to the waterway crossing at Tomaree Way.

The existing TUFLOW model developed by BMT WBM for the Jewells Wetland catchment as part of the Jewells Wetland Flood Study was utilised for this assessment.

The simulated base case (i.e. existing condition) 1% AEP flood condition is presented in Figure 1. The limited capacity of the Scrubby Creek channel is exceeded during the 1% AEP design event, with floodwaters inundated the adjacent low-lying floodplain areas.

Flood Impact Assessment

The concrete lined channel extension was represented in the model providing a section of lower hydraulic roughness representative of the upstream section of connecting channel. The change in peak flood levels compared to existing conditions are presented in Figure 2 for the 1% AEP design flood event. There are minimal changes to existing flood conditions associated with an extension of the concrete lined channel. The change in peak flood levels is generally limited to ±0.02 m, with two small localised areas showing a reduction in peak flood levels of ~0.03 m.



Title:
1% AEP Scrubby Creek Existing Design Flood Conditions: Peak Flood Depths

Figure: 1

Rev: A

BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

N

0 50 100m

Approx. Scale

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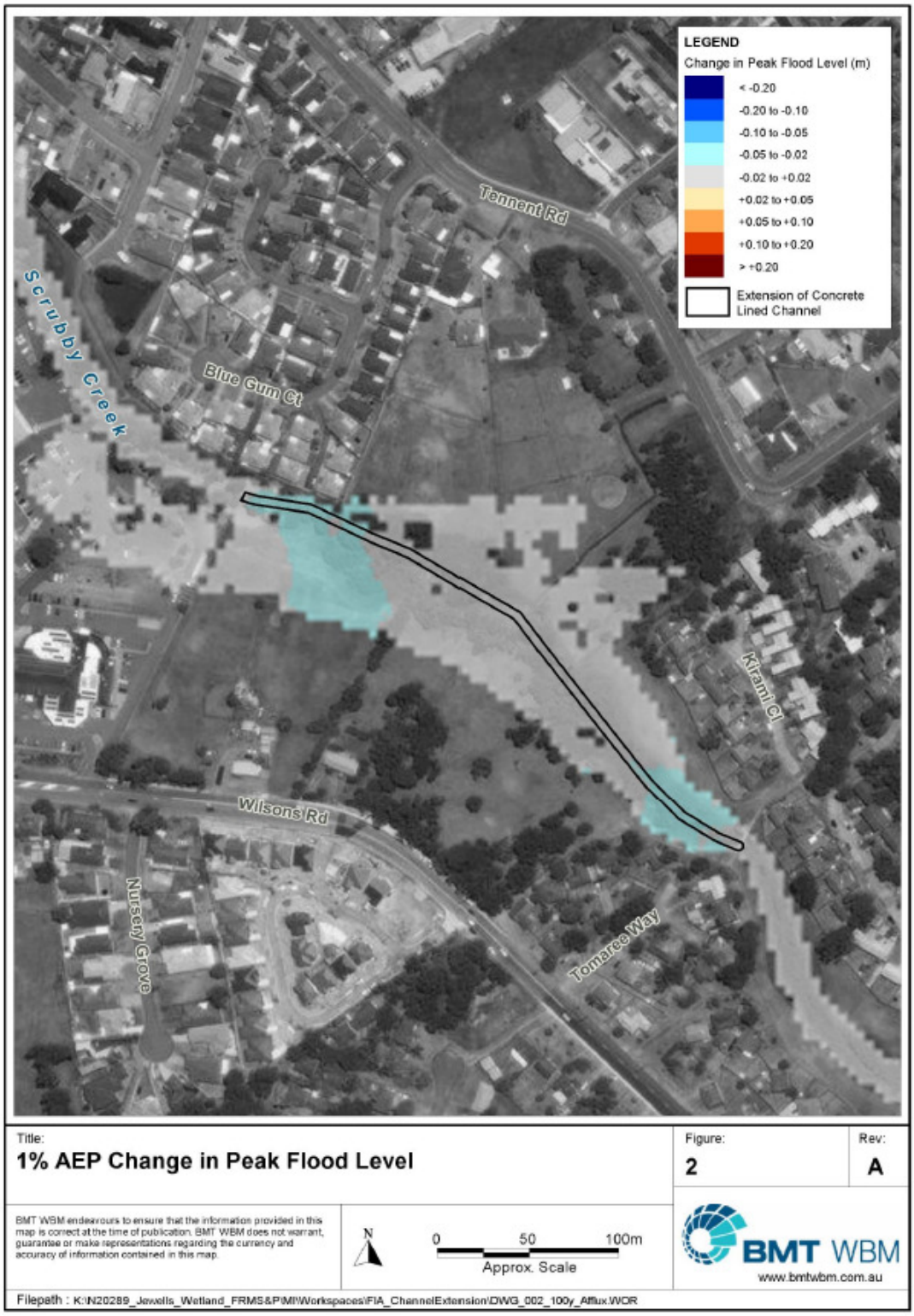
LEGEND
Change in Peak Flood Level (m)
< -0.20
-0.20 to -0.10
-0.10 to -0.05
-0.05 to -0.02
-0.02 to +0.02
+0.02 to +0.05
+0.05 to +0.10
+0.10 to +0.20
> +0.20
Extension of Concrete Lined Channel
Tennent Rd
Scrubby Creek
Blue Gum Ct
Kirami Cl
Wilsons Rd
Nursery Grove
Tomaree Way
Title:
1% AEP Change in Peak Flood Level
Figure:
2
Rev:
A
BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.
N
0
50
100m
Approx. Scale
BMT WBM
www.bmtwbm.com.au
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The minimal impact of extension of the concrete lined section of Scrubby Creek can be attributed to the small proportion of total flow conveyed in the small channel. The greater proportion of the flow capacity lies within the broader floodplain corridor. In order to significantly reduce flood levels within this section of Scrubby Creek, the flow capacity of Scrubby Creek would need to be increased. This would require extensive channel excavation to deepen and/or widen Scrubby Creek, and filling of the adjacent floodplain to contain the floodwaters within the Scrubby Creek channel.

We trust that this report satisfies your requirements. If you have any further questions regarding any aspect of this report then please do not hesitate to contact the undersigned.

Yours Faithfully
BMT WBM

Joshua Eggleton

Environmental Engineer

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Attachment 4: Walkability Maps